

# Harehills Medical Centre

Mechanical & Electrical Services  
Particular Specification

Ref: P1371-ME-SPC-001 Rev T02

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# AMENDMENT HISTORY



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# 1 MAIN CONDITIONS OF CONTRACT



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## 1 MAIN CONDITIONS OF CONTRACT & PRELIMINARIES

Please refer to the main conditions of contract and preliminaries documentation.

## 2 GENERAL REQUIREMENTS

### 2.1 INTRODUCTION

This Particular Specification is intended to indicate the minimum standard of works, workmanship and materials that will be accepted in the provision by the Contractor for the building services installation for the proposed Medical Centre in Harehills.

This Particular Specification shall be read in conjunction with the main contract preliminaries and should there be a conflict, the main contract preliminaries shall prevail and the Engineer shall be informed accordingly.

This Particular Specification and pricing enquiry information prepared by the professional team shall form a single entity and be complementary to each other. Any conflict between this information shall be highlighted and advised during the tender period.

The Contract works shall consist of the supply, delivery, installation, testing, commissioning, setting to work and demonstrations of the installations described herein.

The Contractor shall examine all drawings submitted by the Design Team and/or sub-trades to ensure that the tender return is based on all relevant information.

The Contractor shall co-ordinate the services on site with other trades.

Any discrepancy between this Particular specification and accompanying information shall be clarified with the Engineer before tendering. After acceptance of the tender the Engineer's interpretation thereof will be binding on the Contract.

### 2.2 DEFINITIONS

The following definitions shall apply:

"Engineer" - shall mean The Mechanical & Electrical Services Consultant Engineers.

"Contract Administrator" or "Project Manager" - shall mean the person(s) appointed by the Employer in this Capacity.

"Building Services Contract" and "Contract" - shall be read as meaning the "Engineering Contract or Subcontract".

"The Contractor" - shall be read as meaning the "Engineering Contractor or Subcontractor".

"The Main Contractor" - shall mean the Contractor to whom the contract is awarded and who may employ other Contractors (Sub-contractors).

"Subcontract Works" - shall mean the design, supply to site, installation, testing, commissioning and handing over of a complete and working installation.

"Installations" - shall mean those works specified within the Particular specification

"Specification" - shall mean this document, together with any other specifications issued during the progress of the works.

"Design Intent Drawings": drawings and schematics prepared by the Mechanical & Electrical Services Consultant Engineers up to RIBA Stage 4 Technical Design to indicate extent of the services installations to part of the Employers Requirements".

"Installation Drawings": Stage 5 Construction drawings and schematics prepared by the Contractor, based on the Stage 4 Technical Design, to indicate specific detailed design proposals for the installation, including co-ordination between trades and in cognisance of the latest architectural, interior and structural information.

"Builderswork Drawings": drawings prepared by the Contractor to indicate all work to be carried out by the Building Contractor to facilitate the installation of the Subcontract Works.

"Tender Documentation" - unless otherwise indicated this shall mean the Conditions of Contract and Preliminaries, Particular Specification, design intent layouts, accompanying design team information and the Tender Return Documentation.

The Contractor shall ensure they are fully aware with their exact responsibilities for the project It is recommended that the requirements of BSRIA BG6 " A Design Framework For Building Services 5<sup>th</sup> Edition 2018 is fully understood.

### 2.3 STATUTORY REQUIREMENTS & REGULATIONS

The Contractor shall include in the tender for all costs to complete the works in accordance with all Statutory Requirements and Standards current at the time of tender as required.

The Contractor shall be required to comply with all current Statutory Requirements, Local and National Regulations. These shall include, but not be limited to, the Water Supply Authority, the Water Supply (water fittings) Regulations 1999, the Electricity Authority, the Health and Safety at Work Act, The Electricity at Work Act 1989, and Asbestosis Act, and all subsequent revisions and updates to the preceding documents.

The Contractor shall give all such notice required by the Statutory Authorities and shall also pay all fees where requested. Provision shall be made in the tender for all costs to be met in the testing or in taking any special measures required by the Authorities concerned.

### 2.4 CONTRACT REQUIREMENTS

The Contract covers the supply, delivery, off-loading, installation, production of Installation Drawings and services co-ordination, cabling, wiring, connecting, making off, testing, commissioning, handing over and demonstration on completion with full operating and maintenance manuals in a satisfactory working order and replacement of all faulty parts during the 12 months defects liability period of all systems, items, parts and apparatus as specified.

The Contractor shall include for all works and materials allied and incidental, which are not explicitly specified, but, which are necessary to complete the installation as a working whole.

By acceptance of the contract, the successful Contractor shall accept full responsibility for the successful installation and operation of all the works specified herein.

Inclusion shall be made for transport of all materials, plant and equipment to site, for all necessary off-loading unpacking, storage and assembly. The Contractor shall pay for all associated charges for labour, freightage, demurrage and craneage.

The Contractor shall, wherever necessary, pay all fees to manufacturers, suppliers, inspectors etc. for attendance, installation, commissioning and testing of any part of the mechanical or electrical plant and / or items of equipment, included in this contract.

The Contractor shall allow in his tender for full liaison with and attendance of the Engineer in respect of:

- Inspection of workmanship and material standards
- Witnessing testing and commissioning
- Client instruction in the day to day operation of the engineering services installation
- Client hand over and demonstrations

Where drawings differ from the specification the more onerous requirement shall be costed.

### 2.5 BUILDERSWORK, FABRICATION & INSTALLATION DRAWINGS

Following appointment, the Contractor shall prepare installation and coordination, builders work and fabrication drawings. The drawings shall be prepared on the basis of the actual specific plant and equipment to be installed and in relation to the latest architects', interiors and structural engineers' information.

It is recommended that the requirements of BSRIA BG6 " A Design Framework For Building Services 5<sup>th</sup> Edition 2018 is fully understood in terms of the Level Of Information and Level of Detail for the technical design during RIBA Stages 4 and 5.

The drawings shall be completed to include the following services and details as a minimum where applicable:-

- .01 Above Ground Drainage Drawings, including invert levels
- .02 Hot & Cold Water Services Drawings
- .03 Gas Services Drawings
- .04 Heating Layouts and Controls
- .05 Comfort Cooling Drawings
- .06 Supply and Extract Ventilation Drawings
- .07 Pipework Installation Drawings
- .08 Lighting and Emergency Lighting Drawings



- .09 Small Power & Communication Drawings
- .10 Fire Alarm and Disabled Refuge/Intercoms
- .11 Staff/Patient Alarm Drawings
- .12 Security Drawings (Access Control, Intercom, CCTV and Intruder Alarm)
- .13 Schematic Drawings
- .14 Plantroom/Switchroom Drawings
- .15 Builderswork in Connection with Services
- .16 Services Coordination Drawings, including Sections and Elevations
- .17 External Lighting and External Services Drawings
- .18 All other Specified Plant Manufacturer Drawings

Works shall not be allowed to commence on site until these drawings are reviewed and commented upon by NOVO and the design team. These shall be coordinated with the architects reflected ceiling plans and the architects detailed 1:20/1:50 room layouts for each room that indicate the agreed locations of fittings and fixtures.

Drawings shall be produced at 1:50 scale as a minimum, with 1:20 scale for plantrooms etc.

Within two weeks of appointment, the subcontractor shall be responsible for sending to the structural engineer drawings indicating size and location of plant with all weights and point loads.

The Contractor shall, before the relevant work proceeds, issue the required number of copies of the drawings to the Design Team for examination. The Contractor shall allow 10 working days (14 calendar days) for examination of the drawings from the date of receipt. The Contractor shall also allow within his programme for any modifications to the drawings that the Design Team may require as a result of the drawings examination process.

The Contractor shall agree with the Design Team a phased programme for the approval of drawings, with dates for submission on a schedule form. Where this form is not submitted in advance of receipt of the drawings, the Design Team shall not be responsible for late return of the drawings.

Failure of the Contractor to submit his drawings in a timely fashion related to the contract programme and the information above shall not relieve him of his contractual responsibilities and no claims shall be allowed for cost of programme implications resulting.

### **2.5.1 Builders Work In Connection**

Unless otherwise stated hereinafter the cutting, drilling and forming of holes in the fabric of the building for the passage and for the support of the pipes and ductwork, building in of sleeves, making good, the casting of plant and equipment bases, the forming and fitting of timber grounds and frames, the excavation and the forming of ground ducts and trenches will be carried out by a Main Building

Contractor. The full extent of the builders work shall be scheduled by the Contractor for the Main Building Contractor during the tender period to ensure that all costs are fully included.

The Contractor shall include for all setting and marking out of the builderswork required in connection with the services installation and for the preparation of builders work drawings showing full details of the requirements.

The Contractor will be held fully responsible for the accuracy of the information marked on his drawings and shall be aware of the individual holes or parts of composite holes allotted to him and that he carry out his installation strictly in accordance with the positions agreed with the Structural Engineer / Engineer.

The Contractor shall:

Upon acceptance of the Building Services Contract, programme, prepare and submit builders work drawings and schedules for the various sections of the builders work in sufficient time to allow any necessary details to be incorporated on the architectural and structural drawings.

Submit preliminary copies of builderswork drawings and schedules for approval, within 10 working days (14 calendar days) of request made by Design Team and/or the Main Building Contractor followed by three copies of final details. Drawings will require to be clear prints on paper. Builderswork drawings will show full dimensioned positions, sizes, nature and details of all holes, chases, ducts, trenches, supports, plinths, bases and foundations required the overall sizes and weights and plant and equipment in an approved manner.

Be aware that the provision of these drawings will not absolve any required attendance upon site prior to the commencement of the Main Building Contract Work, in order to instruct the Building Contractor concerning the builderswork requirement.

### **2.6 TEMPORARY SITE ELECTRICS**

The Contractor shall fully allow for all temporary lighting and power requirements required for this contract, which shall conform fully to section 704 of the wiring regulations (construction site installations) and health and safety requirements.

### **2.7 CO-ORDINATION OF THE WORKS/PROGRAMME**

The Contractor shall be required to co-ordinate and integrate the installations covered by this Contract with all other works forming the overall Project. In order to do this the Contractor shall produce any information, including detailed design and drawing work which is necessary to ensure suitability, compatibility and correct location and integration within the system of components selected by him to meet the requirements of this specification and with those being provided and installed by others. All setting out dimensions shall be the responsibility of the Contractor.

Dimensions where plant or equipment is to be installed within or close to existing buildings or structures shall be measured accurately by the Contractor.

The Contractor shall:

Co-ordinate between services to be provided under this contract and installation to be provided by other contractors/trades, in conjunction with the Main Building Contractor.

Provide all necessary information and issue any necessary drawings in due time, and provide assistance as required to the Main Building Contractor, for the accurate, setting out, co-ordination and installation of such work.

Be aware that it should be his responsibility to liaise with other contractors/trades to obtain the necessary information for co-ordination purposes. This includes technical data for design and installation purposes.

Be aware that high degrees of accuracy will be required in the setting out and co-ordination of services in ducts, ceiling voids and roof spaces.

Make due allowances for working in conjunction with other contractors/trades employed on the works. Make due allowances for working in conjunction with fit-out contractors and direct specialists employed by the Client and for attending all necessary weekly co-ordination meetings to agree the fit out works.

Arrange with the Main Building Contractor and/or other trades as to times for commencement of work on site, delivery of materials, and to give them such notice as necessary.

Also provide the main contractor and/or other contractors/trades all necessary information including that required for the co-ordination of holes and builders work and co-operate with them to ensure proper progress of the work.

Attend co-ordination meetings to arrange and agree the programme of works and sequence of installation to progress the works.

### **2.8 CONSTRUCTION (DESIGN & MANAGEMENT) REGULATIONS**

The Contractor is advised that the works will be carried out under the Construction (Design & Management) Regulations and shall make all necessary allowances as required under the said regulations.

### **2.9 BREEAM**

Building Research Establishment Environmental Assessment Method (BREEAM) is a tool for assessing and reducing the environmental impact of new buildings during operation by examining issues related to management, health and wellbeing, energy, transport, water, materials, land use, ecology and pollution, and awarding credits for compliance with best practice.

The government has formally adopted BREEAM as the benchmark for environmental performance of buildings.

Aspects of a developments building service systems along with its design and construction contribute to its overall rating under the BREEAM assessment.

BREEAM aims to minimise the environmental impact of building by reducing energy usage in construction and management and promoting a healthy and comfortable indoor environment.

It is a requirement of this project that the new building achieves a Design and Procurement and Post Construction stage certified BREEAM rating of 'Excellent as contained in the detailed BREEAM Report by the BREEAM Assessor issued with the main contract preliminaries.

The Services Contractor shall carefully cross reference their tender and construction stage with the BREEAM report provided by the BREEAM consultant. If there are any discrepancies the BREEAM Consultant's report shall always take precedence. The BREEAM Assessors report defines the criteria that are to be included within the Services Contractor's tender, design and construction phases of the project.

The Services Contractor shall ensure that relevant mechanical and electrical services are supplied, installed and commissioned to comply with BREEAM 2018 standards, in line with the credits targeted by the current assessment.

The BREEAM pre-assessment shall be made available by the Main Contractor upon request from the Services Contractor.

### 2.10 METHOD STATEMENTS

Method statements are considered an essential part of the contract.

On the award of the contract, the Contractor shall produce method statements covering, but not be limited to:

- Delivery of major plant items, off-loading and craneage
- Isolation of primary services
- Installation of mechanical and electrical services
- Testing and commissioning of mechanical and electrical services

Each method statement shall be issued two weeks prior to commencement of the activity. The method statement shall identify, in Particular, future maintenance and access.

### 2.11 MAINTENANCE

Plant and equipment shall be located and laid out in such a manner so as to allow suitable access for maintenance, and future periodic testing and inspection, in accordance with good Health and Safety practice, manufacturer's recommendations and CIBSE Guide M

During normal maintenance, the life of the engineering services will usually require the replacement of components of engineering systems.

Generally, maximum weights and dimensions will need to be agreed to ensure the access can facilitate this.

Access to service risers/plant will be required to enable inspection, maintenance and replacement expansion to be undertaken safely.

Access routes and walkways will be provided in plant areas and service voids to enable inspection, maintenance and replacement to be undertaken.

### 2.12 SELECTION & INSTALLATION OF EQUIPMENT

The Contractor shall as part of his contract:-

Ensure that installation and selection of equipment and services are done to the satisfaction of the

Engineer.

Provide a list of all final equipment and ancillaries selected for this contract in the form of schedules.

Schedule shall include:	-	Reference
	-	No. of
	-	Location
	-	Equipment composition
	-	Area to be served
	-	Equipment make and model
	-	Physical size (mm x mm x m)
	-	Weight (kg)
	-	Motor output (if appropriate)
	-	Duty (kW)
	-	Number of phases (if appropriate)
	-	Starting method (if appropriate)
	-	Electrical load (e.g. kW)
	-	Volume handled (litre/sec or m <sup>3</sup> /sec)
	-	Resistance (Pa or KPa or ohm)
	-	Anticipated time of delivery
	-	Running cost of control plant
	-	Remarks

Highlight all equipment with delivery periods longer than 3 weeks.

Ensure that the services penetrate structural elements only in those locations agreed with the Design Team and Structural Engineer.

### 2.13 EQUIPMENT, MATERIALS & WORKMANSHIP

The standards of equipment, materials and workmanship shall be as detailed in this Particular Specification. If not detailed the workmanship standards will be required to be of the highest level for the nature of this project.

All work carried out under this contract should be executed in the manner set out as above, and in compliance with current legislation and codes of practice, to the complete satisfaction of relevant industry standards.

All work should conform to the best principles of modern practice and should be carried out by fully competent tradesperson of appropriate grades, under skilled supervision.

The Mechanical and Electrical Contractors or associated sub-contractor shall have as a minimum the following accreditations to prove competence for their respective installations:

Electrical Installation - NICEIC Approved

Fire Alarm Installations – BAFE Approved

Security Installations – NSI and/or NACOSS Approved

Voice/Data Installations – Network Cabling/Solutions Approved/Manufacturer Approved

Gas Installations - Gas Safe Registered

Heating & Ventilation Installations – BBES Registered

Air Conditioning Installation – BBES and Refcom  
ISO 9001:2008 Quality Management Standard

The Contractor shall ensure that all plant, material and installations are new, undamaged, free from corrosion, not sub-standard and conform to the requirements of the specification.

All materials supplied and work carried out under this Contract shall be the best of their respective kinds and shall also be to the approval of the Engineer. The Engineer may order the removal and/or destruction of any equipment, materials or workmanship that he has not approved.

The Contractor shall carry out the whole of the work in an expeditious and workmanlike manner, by competent workmen, under skilled supervision, using only first class materials of the type indicated in the specification.

The Contractor shall be responsible for specialist installations and supplies which are specified for Particular plant or equipment to be completed in accordance with the specifications and ensure integration and co-ordination with all other works.

It shall be the responsibility of the Contractor to verify that all equipment and materials supplied meet the specified criteria, conditions and duties, ratings, etc.

All electrical equipment and work shall comply with the BS 7671 18<sup>th</sup> Edition IET Wiring Regulations Amendment 3: 2015.

### 2.14 MAKES OF EQUIPMENT

The manufacturers contained within the appendix of this Specification detail the makes/types of equipment on which the Particular Specification has been prepared.

The Contractors tender shall be based on these manufacturer's makes/types of equipment.

### 2.15 QUALITY STANDARDS

The services installations shall be manufactured and installed in accordance with the standards as listed below. Any relevant standards that may be issued subsequent to the acceptance of this Tender shall be complied with, provided that the part or parts of the work affected has not already been completed.

- a) Conditions of Contract and Preliminaries
- b) Quality Standards as set out below:-
  - NHS Health Technical Memorandums
  - Avoiding danger from underground services (HS (G) 47)
  - The Construction Regulations
  - Temporary Site Electric's.
  - Electricity Supply Authority Regulations.
  - Building Regulations
  - Health and Safety at Work Act.
  - Environmental Protection Act.
  - Local Building Control Requirements.
  - The Building Regulations
  - Fire Precautions Act.

- COSHH Requirements and Health and Safety Executive.
- BSRIA Guides.
- Loss Prevention Regulations.
- Latest edition of British Standard Specifications, British Standard Codes of Practice and European Norms (current at date of tender)
- Gas Regulations
- Water Supply (Water Fittings) Regulations 1999
- The Local Authority Environmental Health Officer's requirements.
- The Local Authority Planning and Licensing Officer's requirements
- The Local Building Control requirements
- The Local Fire Officer's requirements
- The Health and Safety at Work Inspectorate's requirements
- All other standards specifically noted within this Specification
- Construction (Design and Management) Regulations
- The Electricity at Work Regulations
- Requirements of the Utility Companies

In the event of a contradiction between this Particular Specification and any British Standards or Code of Practice, the Standards or Code of Practice shall be followed and the Engineer informed.

### 2.16 AS INSTALLED DRAWINGS & OPERATING & MAINTENANCE MANUALS

The Contractor shall produce As Installed Drawings and Operating and Maintenance manuals to the satisfaction of the Engineer.

The Manuals shall be prepared to Class D in accordance with the BSRIA Handover, O&M Manuals, and Project Feedback. A toolkit for designers and contractors (BG 1/2007).

3 No hard copies of the manuals shall be provided, together with 2 No hard copies of the drawings, which are to be produced in AutoCAD 2002 format with all AEC layering convention. In addition to this 3 No copies of the complete O & M's shall be provided USB Flash Stick complete with as installed drawings.

A draft hard copy of the manual shall be issued to the Design Team for comment, 2 weeks before completion of the project.

The manuals shall incorporate all testing and commissioning results and certificates, together with plant schedules, duties and settings, all in typewritten format.

The instructions within the manuals shall cover all items of equipment, plant, accessories etc. installed as part of the mechanical and electrical services, including descriptions of physical attributes and full operational and maintenance details.

Please refer to the appendix for the O & M checklist.

### 2.17 SPARES & CONSUMABLE

The Contractor shall allow in his tender for the following new items to be fitted or left at site, depending on the Engineers inspection, at the end of the 12 months defects liability period:-

1. Spare MCB's/RCBO's/Fuses (5 No of each type / size used)

2. Spare dust covers for Fire Alarm Detectors (20 No)
3. Any specialist tools supplied with or required to maintain the plant installed

### 2.18 MAINTENANCE LOG BOOK

The Contractor shall provide Maintenance Log Book(s) for M & E services equipment in accordance with the recommendations of CIBSE TM31 Building Log Book Tool Kit.

The Maintenance Log Book(s) shall cover all items of equipment which require regular maintenance, in accordance with the O & M Manuals.

Items of equipment as indicated in Maintenance Log (Book(s) shall be categorised under system headings in accordance with BSRIA 'Operating and Maintenance Manuals for Building Services Installations' Application Guide 1/87 Appendix 2, or as in the agreed format to accord with the approved O & M Manuals.

The Contractor shall be aware that the Maintenance Log Book(s) is/are part of the necessary handover documentation, and hence its submission shall be carried out at the same time as that for the O & M Manual(s).

### 2.19 PROGRAMME OF WORKS

The Works shall be carried out in a Particular sequence and manner; reference should be made to the Conditions of Contract and Preliminaries for the proposed commencement, duration, phasing, sequence, hours of working and completion dates.

The Contractor shall prepare and agree a master programme of work for to meet contractual commitments which shall be returned with their tender.

The master programme shall include specific details of the intended starting and completion dates for all the principal sub-divisions of the works including Sub Contractors. Evidence shall be provided that the Contractor has an adequate labour force available for the duration of the contract to ensure the programme dates on are achieved, and that his suppliers, specialist Sub Contractors and nominated suppliers can provide the required services and materials at the required time.

The Contractors programme information shall be integrated into the main project programme for the works.

The Contractor shall ensure that adequate allowance is made in the programme for commissioning of the engineering services installations, demonstrations and preparation of As Installed drawings and Operating and Maintenance Manuals.

### 2.20 PROTECTION OF EQUIPMENT, WORK & STORAGE

The Contractor shall ensure that all plant, materials, equipment, etc. that are delivered to site shall be safely and securely stored and protected against weather and other damage. All plant, materials, etc., shall be kept under protective covers or be kept in their packing cases until required for use.



The Contractor shall on arrival thoroughly inspect all deliveries for conformity with the specification and for damage. He shall immediately record and report any damage/substandard plant and material and he shall without delay propose remedial actions so as to obviate any potential knock-on effect on the progress of his works.

Storage of plant and materials shall be strictly in accordance with manufacturer's recommendations. Plant and materials shall be brought on site in support of the Contractor's programme and shall not be held on site prior to installation for longer than is reasonable. It shall be noted that there is very minimal site storage and the Contractor may have to store deliveries off site,

Remedy or replacement from deterioration in condition of plant and materials caused by inadequate site storage conditions, or prolonged site storage shall be to the account of the Contractor. It shall be the Contractor's responsibility, to ensure at all times the installed works are protected from damage arising from any cause.

No damages on the building fabric, floor finish and other services will be caused, directly or indirectly, by equipment and materials provided by the Contractor, under storage, during installation or during operation. All damages as a result of this shall be rectified immediately at the expense of the Contractor, at no extra cost to this Contract.

### **2.21 TESTING, SETTING TO WORK & COMMISSIONING**

Prior to handover the Contractor shall test, set to work and commission the installations to the full satisfaction and acceptance of the Engineer and to meet the requirements of this Particular Specification, design intent layouts and accompanying pricing information.

The Contractor shall be responsible for carrying out all necessary quality assurance inspections prior to testing, setting to work and commissioning. His Inspections shall pay Particular attention to conformity with specification, completeness of installation and mechanical damage.

An Engineer will be allocated to witness all testing, setting to work and commissioning of all systems prior to handover. The Contractor shall make available all the necessary documentation to allow him to undertake such witnessing in the form of working drawings, test sheets, checklists and the relevant clauses of the specification and related documents contained therein.

The Contractor shall be responsible for any cost and programme implications resulting from a lack of production of this information.

### **2.22 CLIENT DEMONSTRATIONS**

#### **2.22.1 Demonstration**

Operations of each system shall be demonstrated to the users/occupiers of the building. These demonstrations shall generally take the form of a presentation and answer forum, and will take place at locations throughout the building applicable to the relevant systems. These demonstrations shall be supplemented with relevant extracts from the Operation and Maintenance Manuals and shall be available at the presentation.

#### **2.22.2 Training of Maintenance Staff**

In addition to the demonstrations referred to above and prior to the contract completion date, the Contractor shall allow for a period of full and comprehensive training of maintenance staff, where applicable, to familiarise them with the correct operation and the running of the equipment. Training shall be during normal working hours on site and shall be a minimum of, but not necessarily limited to, a 1 day consisting of 2 half day consecutive visits.

### **2.23 VARIATIONS, ADDITIONS & OMISSIONS**

The Contractor shall carry out any variations, additions or omissions that the Engineer or Client, through the Contract Administrator or Project Manager shall direct. Whilst carrying out such amendments, the Contractor shall be bound by the same conditions of contract.

Variations etc. shall be carried out by prior agreement to supplementary quotations agreed in writing. Such quotations shall be prepared by the Contractor within 2 days of being requested to do so.

### **2.24 SCHEDULE OF RATES**

The Contractor shall in preparation of the costs for the proposed works complete a full schedule of rates for the mechanical and electrical services installation.

This shall accurately summate, duly cross reference and show the build-up of cost to each element and system outlined within the tender / pricing summary.

### **2.25 CONTINGENCIES & PROVISIONAL SUMS**

The Contractor shall include in his tender for any contingencies or provisional sums as requested by the Project Quantity Surveyor.

The sums shall only be expended in part or in full or not at all on the written instructions of the Contract Administrator or Project Manager. In the event of these sums not being dispensed in part or in full on completion of the project the remaining sums shall be indicated as a credit on the Service Contractor's final account and the remaining sum deleted from the fee monies paid to the Contractor.

### **2.26 SITE MEETINGS**

The Contractor shall allow for attendance at site meetings as required by the Design Team. Their representative at site meetings shall be a responsible person i.e. Contracts Manager authorised by their Company to act fully on their behalf in all decisions required to be made.

### **2.27 VISITS TO SITE**

Tenderer's are advised to visit site to familiarise themselves with site conditions and access, no claim based on a lack of information due to the Tenderer failing to visit the site will not be accepted. Please refer to Main Contract Preliminaries to arrange access to site.

### **2.28 MOUNTING HEIGHTS OF EQUIPMENT**

The Contractor shall discuss and agree final positions and heights of all outlets and equipment prior to installation with the Design Team. A typical mounting height layout has been issued for tender purposes.

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### 2.29 TECHNICAL QUERIES

Any technical queries should be raised with the Contract Administrator or Project Manager as identified in the tender enquiry documentation. The technical query will then be answered by the relevant discipline within the design team.

### 3 MECHANICAL SERVICES

#### 3.1 SCOPE OF WORKS

The scope of works shall generally comprise of the production of co-ordination, installation drawings, supply, installation, testing, commissioning, setting to work and demonstrations of the following:

- Incoming Water Services Supply and Liaison with Provider
- Supply & Extract Ventilation Systems
- Comfort Cooling/Heat Pump Systems
- Electric heating Systems
- Domestic Hot Water ASHP and Electric Boiler Installation
- Domestic hot water services
- Domestic cold water services
- Controls and power wiring to Mechanical plant and equipment
- Thermal insulation
- Above ground drainage
- Testing and Commissioning.
- Services Identification.
- Demonstration of Mechanical Services.
- Testing and Commissioning of Systems.
- As Fitted Drawing Information and Operating and Maintenance Manuals.
- Provision of Co-Ordinated Installation Drawings.
- Provision of Builders Work Requirements and Information Required By Main Contractor Including Marking Out on Site.
- Attendance at All Necessary Site, Progress Meetings Etc.

The Contract covers the supply, delivery, off-loading, installation, cabling, wiring, connecting, making off, testing, commissioning, demonstration and handing over in a complete and satisfactory working order.

The Contractor wherever necessary shall pay all fees to manufacturers, suppliers, inspectors, etc. for attendance, commissioning and testing of any part of the electrical plant or items of equipment included in this Contract.

Contractor shall ensure all pulsed outputs to suit the metering strategy are provided

#### 3.2 INCOMING MAINS COLD WATER SERVICE

##### 3.2.1 General

The Contractor shall be responsible for the full the supply, installation, testing and commissioning of the water services installation as detailed within this Particular Specification and accompanying layouts.

##### 3.2.2 New Water Service

The Contractor shall procure a new water supply to serve the building. The water supply shall be routed from Harehills Lane from a meter located outside of the site boundary.

### **Main Contractor**

The Main Contractor shall be responsible for all builders' work, excavating back-filling all trench works from the boundary water meter to the point of entry to the building. The Main Contractor shall be responsible for the procurement of the supply

Yorkshire Water have provided a quotation a new incoming water service and meter from Harehills Lane. the water main shall rise within the Plantroom

The Main Contractor shall be responsible for informing the Water Authorities of the supply being made live.

This includes for: -

- a) Provision of the water meter complete with volt-free connections for monitoring via the BMS.
- b) Chlorination of mains cold water pipework.

### **Services Contractor**

The Mechanical Services Contractor shall be responsible for all distribution pipework from the boundary meter into the proposed development.

Prior to procurement the Main Contractor and/or Service Contractor shall ensure all pulsed outputs to suit the metering strategy are provided.

## **3.3 DOMESTIC WATER SERVICES**

### **3.3.1 General**

The Contractor shall be responsible for the full the supply, installation, testing and commissioning of the domestic water services installation as detailed within this Particular Specification and accompanying layouts. The Medical Centre shall be direct mains fed. The entire installation shall be fully compliant with HTM 04-01.

Domestic hot water shall be heated via Air Source Heat Pumps to 55°C, with top up to 65°C provided via a wall mounted electric boiler.

### **3.3.2 Electromagnetic Water Conditioner**

The contractor shall install an electromagnetic water conditioner within the plantroom on the incoming water service. The unit shall be a line size Hy-Mag unit. The unit shall be installed fully in accordance with the manufacturers recommendations.

### **3.3.3 Metering and Leak Detection**

The external utility water meter shall be shall be connected to the BMS. A water meter shall be installed within the plantroom, this shall also be connected to the BMS. The BMS shall monitor the two meters against adjustable pre-set consumption values to provide leak detection over the external mains.

### 3.3.4 Air Source Heat Pumps

3No ASHP units shall be installed externally. These shall be connected in a reverse return arrangement to a buffer vessel. The ASHP units shall maintain 55°C in the buffer which shall in turn feed the low calorifier coil via twin head pump. This primary system shall incorporate a safety valve, an expansion vessel and pressurisation unit. The ASHP units shall be supplied by Adveco and shall be installed fully in accordance with the manufacturers recommendations. The units shall be installed within vandal resistance cages.

### 3.3.5 Electric Boiler

An electric boiler shall be installed within the plantroom. This shall be connected to the upper circuit of the calorifier. The unit shall provide heating of water from 55°C to 65°C and shall also provide additional duty in times of peak demand. The unit shall be installed with a filling loop complete with double check valve. The unit shall incorporate an integral safety valve. The unit shall be supplied by Adveco and shall be installed fully in accordance with the manufacturers recommendations.

### 3.3.6 Pressurisation Unit

The Contractor shall supply and install a pressurisation systems in the Plant room in the position indicated on the drawings.

The secondary pipework system shall be served by hot water pressurisation unit which shall comprise of a make up unit with duty/standby pumps and galvanised spill and fill tank. The unit shall incorporate interconnecting pipework and valves, high and low pressure switches, pressure gauge and control panel.

The units shall be as detailed on the mechanical drawings and equipment schedules.

### 3.3.7 ASHP Primary Circulation Pump

The Contractor shall supply and install pipe mounted circulating pumps. The circulating pumps shall be supplied by AOSmith/Adveco.

Each circulating pump shall be supported on purpose made channel iron brackets on the suction and delivery connections.

All circulating pumps shall be in accordance with BS.1394 and BS.1947 and to the details as below:-

The twin head pumps shall have an auto-changeover facility built into the control panel (see Controls Section of this Specification) to enable the standby head in the event of a failure with the primary head. The Contractor shall supply a blanking plate for each size of pump to allow removal of one pump head for maintenance etc., while allowing the second head to operate normally.

### 3.3.8 Thermometers

The Contractor shall supply and install dial thermometers on each boiler primary circuit flow and return; and on each compensated flow after the zone valve and on each zone return to the header.

The thermometers shall be of the vapour pressure type having a separate BSPT screwed pocket.

The thermometers shall stand clear of any insulation.

The thermometers shall be 100mm diameter but otherwise be in accordance with the Standard Section of this Specification.

### 3.3.9 Domestic Hot Water Calorifier

The contractor shall install a new calorifier within the plant room. The calorifier shall be a twin coil unit. The lower coil shall be heated via Air Source Heat Pumps. The upper coil shall be heated via a wall mounted electric boiler. The calorifier shall be installed fully in accordance with the manufacturers recommendations and shall be fitted with the manufacturers unvented kit complete with safety valve and **flow through** expansion vessel.

The unit shall be supplied by Adveco and shall be installed fully in accordance with the manufacturers recommendations.

### 3.3.10 Destratification Pump

A destratification pump shall be installed as indicated on the schematic. The pump shall provide disinfection on the cylinder on a daily basis. The pump shall be set to operate via the BMS for two hours a day outside of the occupied period. For the purposes of commissioning the pump shall be set to operate at 01:00 hours every day. The pump shall be supplied by Adveco.

### 3.3.11 Domestic Hot Water Circulator

The mechanical Contractor shall supply, install, test and commission a domestic hot water circulation pump complete with the necessary valves and fittings to ensure adequate flow throughout the domestic hot water distribution system.

The pump start-stop shall be controlled via the mechanical control panel which shall initially be set to operate continuously but have the option for time clock control allowing the pump to be switched off during periods of low usage as determined by the operator.

The pump shall be as Grundfos or other equal and approved manufacturer.

### 3.3.12 Blending Valves

The Contractor shall supply and install blending valves to regulate the hot water supply to a maximum of 43 °C to all draw offs to all outlets, except kitchen, clean and dirty utility sinks. Where not installed, "Caution Hot Water" labels shall be provided in these locations. The H.W.S. return shall terminate 300mm from the H.W.S. connection to the valve.

The valves shall be installed with their own integral check valves, strainers, isolating valves and wall mounting kit to the manufacturer's recommendations and shall be supplied Oventrop and shall be TMV3 valves.

### 3.3.13 Sanitary Shut Off Valves

The contractor shall install solenoid valves on the cold water supply to sanitary accommodation. These shall be controlled via PIR and accompanying control panel. The system installed shall be a 'PIR WaterSave' system supplied by Andel.

### 3.3.14 Pipework, Valves & Fittings

The Contractor shall supply and install all pipework and fittings as indicated on the drawings and described in the specification.

All new hot and cold water services pipework shall be installed in copper crimp tube to BS EN 1057 R250. All pipework is to be concealed within IPS units or ceiling voids. If pipework cannot be routed in this manner it shall be boxed in under the contract.

Line size isolation valves shall be provided on the final connection to each draw off, whether or not indicated on the drawings. Full provision shall be made for air venting of the water systems by means of air vents provided at the highest points in the system or sections which are required to be vented. **Pipework shall be connected direct to brassware, no flexible connections shall be installed at final connections.**

#### 3.3.14.1 Press Fit & Express Fit Systems

This shall apply to the following systems or equal and approved:

1. Yorkshire Express Fit copper.

When using above systems the Contractor shall:

1. The manufacturer's proprietary system components shall be used along with approved components such that the full manufacturer's warranty is fully maintained. (e.g. Yorkshire Express Fit shall only be used with Yorkshire pipework).
2. Not be used for final connection to plant / equipment, except connections to sanitary ware.
3. Be installed fully in accordance with manufacturer's written instructions.
4. Take account of the increased requirements for expansion / contraction using natural flexibility.
5. Be of a minimum pressure rating of PN16.
6. When offered as an alternative the system resistance shall not be increased, Contractor shall include for increased pipe sizes as necessary.
7. Ensure that the following is included for and provided by the manufacturer:
  - a) All fitters to have attended manufacturer's training course and have appropriate current certification.
  - b) Site progress inspections with written inspection reports and details of corrective action / comments to be completed by manufacturer own Engineers.
  - c) Site completion inspections with written inspection report and details of corrective action / comments to be completed by manufacturer own Engineers.
  - d) 25 year installation and materials warranty provided by manufacturer, project specific certificate to be provided.
8. Offsite fabrication shall be employed to the maximum extent, on site jointing shall be the minimum necessary to connect prefabricated sections.
9. Each joint shall be marked with the fitters individual symbol / initials (after joint has been crimped) corresponding with a key included in the O&M manuals to allow quality monitoring of jointing process and visual check that joint has been crimped. Any joints not permanently marked shall be cut out and replaced.



10. Manufacturer's storage recommendations shall be meticulously complied with due to increased susceptibility of these systems.
11. In areas of high humidity, externally and wherever moisture may be in contact with the system (e.g. chilled water etc.) the manufacturer's recommendations with regard to additional corrosion protection such as anti-corrosion tape to fittings shall be complied with in full.
12. Condition of specialist jointing tools and jaws / terminals etc. shall be continuously monitored and replaced in accordance with manufacturer's recommendations.
13. Only manufacturer's own seals / "o" rings etc. shall be used, where a choice of material is offered this shall be selected to give the maximum life for the system as a whole (e.g. Butyl rubber rather than PTFE).
14. Connections to valves and equipment shall be completed in accordance with the fitting / pipework manufacturer's recommendations using preparatory fittings wherever they are available.
15. When installed in confined spaces and voids the manufacturer's minimum recommended spacing around the services shall be provided to enable future connections and repairs to be undertaken without removing adjacent services etc.
16. Supports for the pipework system shall:
  - a) Be the manufacturer's purpose designed support system incorporating pipe carriers.
  - b) Be suitable for the expansion / contraction system employed.
  - c) Prevent stress on joints, Particular when connecting to risers & equipment.

Where required unions shall be provided on pipework up to and including 54mm whilst 67mm and above shall flanged.

Line size isolation valves shall be provided on the final connection to each draw off, whether or not indicated on the drawings. Full provision shall be made for air venting of the water systems by means of air vents provided at the highest points in the system or sections which are required to be vented.

Drain points shall be provided on all items of plant and equipment, at all low points in water services installations and on the branch side of all main isolating valves and cocks.

Where sleeved pipework, etc, penetrates fire compartment/separating walling and floors, this shall be suitably fire stopped in accordance with Building Regulation Standard.

### **3.3.15 Pipe Sleeves & Wall Plates**

Pipe sleeves shall be fitted where the pipes pass through walls, floors and ceilings. The sleeves are to be of sufficient internal diameter to allow free movement of the pipes. The sleeves shall be cut so that the ends finish flush with the finished surface of the floor, wall or ceiling. All burrs are to be removed from the inside of the sleeve before fitting and except where otherwise stated, the pipes are to be fixed concentrically with the sleeves.

Sleeves are to be fixed in a manner that will prevent them becoming detached from the building fabric and it shall be the Sub-Contractor's responsibility to ensure that they are so fixed and that they do not project beyond the finished surface.

The ends of the sleeves in habitable or occupied areas are to be finished with chromium plated hinged floor, wall and ceiling plates with set screw fixings, as supplied by Ideal Standard Ltd. These plates shall be fixed around the pipes and not over the sleeves.

Where necessary, the plates are to be shaped to suit the building structure, but wherever possible, pipes are to be spaced so as to allow standard split plates to be fixed without cutting.

The size of the pipe sleeves shall be in accordance with the following Table:-

Pipe Size (mm)	15	20	25	32	40	50	65	80	100	125
MS Sleeve(mm)	32	40	50	65	80	100	100	100	125	150
Hard PVC Sleeve (mm)	25	32	40	50	50	65	80	100	125	150

NOTE: Sleeves for copper heating pipework shall be constructed from copper tube.

#### 3.3.16 Insulation

All pipework and fittings shall be thermally insulated Thermal insulation shall be CFC free phenolic foam installed fully in accordance with manufacturers requirements and recommendations. Valves shall be provided with jackets, not valve boxes. Pipework in ceiling voids, risers and areas where pipework is boxed in shall be insulated.

Insulation thickness shall be as recommended by BS5422

A complete vapour seal shall be made to all cold water services pipework and fittings even at support points The Contractor shall include for making the final connections to all items of sanitaryware and equipment that requires a water supply.

All pipework within plant room shall be wrapped in Isogenopak.

#### 3.3.17 Thermostatic Balancing

The contractor shall install automatic thermostatic balancing valves on the HWS return system. The valves shall be installed as per the Tender layouts to manufacturers recommendations.

The valves shall be a combination of Kemper MultiFix & EtaTerm valves, manufactured by Kemper.

#### 3.3.18 Legionella Risk Assessment

On completion of the works the contractor shall include in their O&M information a Legionella Risk Assessment and schematic in accordance with HSE Approved Code of Practice and guidance L8.

#### 3.3.19 Automatic Air Vents

The Contractor shall supply and install automatic air vents complete with escape pipes within the high points of the hot water pipework distribution whether or not indicated on the drawings.

Care shall be taken to ensure that vents are fitted at the highest points of the sections they are intended to vent. All automatic air vents shall be preceded by a lock shield valve if not fitted with integral shut off.

### 3.3.20 Drain Off Cocks

The Contractor shall supply and install drain off cocks' at all low points of the hot and cold pipework distribution whether or not indicated on the drawings. Drain off cocks shall be as manufactured by Pegler Yorkshire Ltd or equal and approved.

The drain off cocks shall be 4 sizes smaller than the pipework systems in which they are installed from a minimum size of 15mm up to a maximum size of 42mm.

### 3.3.21 Draw Offs

Each separate draw-off or range of draw-offs shall be fitted with a stop cock, the head clearly marked HOT or COLD as appropriate.

The pipework shall be connected to each draw-off point. All co-ordination of the installation of the final connections to the draw-off point shall be allowed for by the Building Contractor with all other involved trades.

The Contractor shall supply and install blending valves to regulate the hot water supply to a maximum of 43°C to all draw offs to all outlets, except laundry except wash hand basins in these areas (TMV3 Scheme).

Blending valves shall be installed beneath wash basins or where detailed on the tender drawings. The H.W.S. return shall terminate 300mm from the H.W.S. connection to the valve.

Line size isolation valves shall be provided on the final connection to each draw off.

### 3.3.22 Systems Testing

The systems shall be filled with water and subjected to a hydraulic pressure test of at least twice the working head of the lowest point of the system, but in any case not less than 1000 kN/m<sup>2</sup> (143 p.s.i.g) for mains cold water system, and 350 kN/m<sup>2</sup> (50 p.s.i.g.) for Domestic Hot Water. The test pressure must be sustained for one hour before inspection commences and for the duration of the inspection without "topping up".

All pipework shall be tested at intervals up to the maximum, i.e. 0.5 bar, 1 bar, 1.5 bar, 2. Bar, 2.5 bar, 3 bar then maximum test pressure to ensure that all joints are checked tested.

For each test pressure, the domestic hot water system shall then be run under normal working conditions for a period of one hour and then inspected under load. The system shall be allowed to cool to ambient conditions, i.e. for 24 hours and the heat load re applied for one hour and then inspected. Any faults which occur due to thermal expansion and contraction shall be rectified.

### 3.3.23 Cleaning & Sterilisation

The Contractor shall chlorinate commission and test the whole of the new and modified water services in accordance with BS 6700 and Health and Safety document HS (G) 70. Chlorination shall be completed within 24 hours prior to handover. Contractor to provide certification of chlorination.

### 3.4 ELECTRIC HEATING

#### 3.4.1 General

The Contractor shall be responsible for the supply, installation, testing and commissioning of an electric heating installation to serve areas not covered by the VRF system as detailed within this Particular Specification and on the accompanying layouts.

#### 3.4.2 Radiant Panels

Where indicated on the drawings, the contractor shall install electric radiant panels. These shall be installed within the ceiling grid or recessed into MF ceilings. The units shall be supplied by Solray or equal and approved. The units shall be controlled via wall mounted tamperproof thermostats.

Where installed within grid ceilings, the units shall be Solray CT Tile units. Where installed within MF ceilings, the units shall be Solray PB Strip units, which shall be installed flush. The units require additional battens within the ceiling to be mounted flush. The M&E contractor shall coordinate this with the Main Contractor.

All radiant panels shall be installed fully in accordance with the manufacturers recommendations.

#### 3.4.3 Electric Panel heaters

A wall mounted panel heater shall be installed within the Reception area to provide additional heating for occupant comfort. The units shall be supplied Dimplex complete with Lot 20 thermostatic 7-day programmable controls.

#### 3.4.4 Warm Air Curtain

The main entrance doors shall be provided with an over door warm air curtain. The warm air curtain shall recessed flush mounted air curtain. The unit shall be supported independently. The warm air curtain shall be centrally arranged above the door and shall cover the full door opening width and height.

The warm air curtain shall be controlled using a return air sensor. When the air temperature drops below the set point the unit shall be activated until the air temperature reaches the desired room temperature. The unit shall be linked back to the automatic control system to provide fault indication and overall time control to ensure the unit is not in operation out of occupied hours. The unit shall be supplied by Envirotec or equal and approved.

### 3.5 VENTILATION

#### 3.5.1 General

The Contractor shall be responsible for the design, supply, installation, testing and commissioning of the ventilation installation as detailed within this Particular Specification and accompanying layouts.

Generally areas are to be naturally ventilated to rooms provided with openable windows or mechanically ventilated via heat recovery units.

All ventilation systems shall be installed and tested in accordance with the requirements of HTM 03-01 & DW144 and commissioned in accordance with the requirements of the CIBSE Commissioning Codes for air systems.

This section of the works includes for the installation of the general extract ventilation system.

The commissioning shall be carried out by an approved specialist on behalf of the Contractor.

### 3.5.2 Heat Recovery Ventilation Systems

The Heat Recovery Ventilation units shall be fitted wholly in accordance with the manufacturer's installation instructions. Units shall be supplied with F7 filters. The units shall be controlled via the central AE200 controller. This shall be integrated via BACnet to the BMS.

The supply and extract fan units shall be as supplied and manufactured by Mitsubishi Electric.

### 3.5.3 Extract Fans

The Contractor shall install of the extract fans as per the design intent drawings. The fans shall be controlled under a time schedule via the BMS.

Fans shall be installed to manufacturers recommendations and shall be mounted on AV mounts.

### 3.5.4 Supply & Extract Grilles

The Contractor shall supply and install the supply and extract grilles. The grilles shall be fitted wholly in accordance with the manufacturer's installation instructions.

The grilles shall be as manufactured by Gilberts or equal and approved.

### 3.5.5 Ductwork

The ventilation system shall be manufactured and installed in accordance with the requirements of B&ES specification DW144.

The Contractor shall supply and install turning vanes on all square ductwork bends whether or not indicated on the tender drawings. It is the responsibility of the Contractor to allow for all transformation pieces to enable ductwork and ductwork-mounted equipment to be compatible.

All ductwork shall be identified in accordance with DW144, and shall have the following additional labelling:

- i. extract or exhaust
- ii. Plant code reference number
- iii. Direction of flow

All identification shall be placed in areas where it is easily visible and/or areas where identification is essential for maintenance.

The Contractor shall ensure that all installed ductwork shall be cleaned internally on completion by brushing, vacuum cleaning etc. to remove dirt, swarf, oil and grease etc. before commissioning.

During the installation, all open ended ductwork shall be provided with temporary covers until installation of the next section and in all cases, this is to be done overnight.

Ductwork and associated equipment shall be adequately supported throughout the installation, in accordance with DW 144. The Contractor shall, wherever possible support supply and extract ductwork and equipment from internal walls and shall allow for all associated supports/brackets. Where support from internal walls is not practical, the Contractor shall provide supports and hangers by means of galvanised mild steel angle and drop rods.

Supports and brackets for ductwork shall be made adjustable for height and alignment and where practicable shall be fitted at each joint of the ductwork on vertical ducts at intervals not exceeding 2500mm and adjacent to flexible joints and other equipment.

Supports for horizontal ductwork shall be provided at not more than 2.5m centres and items of equipment shall be supported by means of galvanised angle iron stools when situated near floor level.

### **3.5.6 Fire/Smoke Dampers & Volume Control Dampers**

The Contractor shall include all volume control dampers as necessary to satisfactorily balance the system.

As a minimum, dampers shall be provided on all main branch/zone connections, to grilles.

Where ductwork passes through fire walls, floors cavity barriers and where indicated on the architect's fire strategy drawings ductwork shall be provided with automatic fire/smoke dampers.

These shall be of the 'Actionair' type 'Smokeshield PTC' ES Rated dampers, or equal and approved, with opposed bladed dampers with 75mm x 0.5mm thick stainless steel aerodynamic interlocking blades incorporating synthetic seal, with steel blade end bearings and peripheral gasketing. Housed in a galvanised steel fully welded 1.2mm spigotted casing suitable for square, rectangular, circular or flat oval connections.

The totally enclosed precise movement opposed blade drive shall be positioned out of airstream for protection against damage, be hard wearing and free running.

The Control Mode/Damper connection shall be by means of the snaplock™ drive interface mechanism, which is totally independent of the ductwork

SmokeShield 'ES' Rated Fire Dampers with their appropriate control modes shall have spring Fail-Safe Closed operation.

Fire dampers shall be mounted in purpose made frames depending on the construction of the wall and mounted to the manufacturers recommendations and fixed to the soffit. In the ductwork adjacent to the damper suitably sized access panel shall be provided for re-setting and inspecting the damper.

Any access panels are to be agreed with the architect before they are provided, and are to be minimised and designed out wherever possible.

Smoke/fire dampers shall be controlled via a dedicated smoke control panel. The panel shall be an Actionair Action Pac EMB control panel or equal and approved. The panel shall be interfaced with the fire alarm panel to close damper upon alarm. The panel shall provide LED indication for status monitoring of dampers.

### 3.5.7 External Louvres

The Contractor shall supply and install the external weather louvres as a part of their works to be passed to the Main Contractor for installation within the façade. All louvres shall be provided with bird mesh. External louvres are to be integrated into the fenestration.

RAL Colour of external louvres to be agreed by the Architect prior to ordering.

### 3.5.8 Attenuators

The Contractor shall generally supply and install attenuators and acoustic louvres where necessary to accord with the design noise criteria.

In all instances, the noise ratings as detailed in the Acoustic Consultants requirements shall not be exceeded, with all plant running.

Noise level readings shall be provide at the commissioning stage to prove the selection of the attenuator is correct and meeting the requirements of this specification. Attenuators shall be supplied by Allaway Acoustics, CAICE acoustics or equal and approved.

### 3.5.9 Ductwork Cleanliness

The Contractor shall ensure all ductwork is installed in accordance with DW/TM2 Guide to Good Practice (Internal Cleanliness of New Ductwork Installations 1991). The ductwork shall be installed to the intermediate standard. Access doors shall be installed either side of all ductwork components and at all changes in direction, and as a minimum of:

- Every 13m for ductwork 600 x 300 or greater
- Every 3m for ductwork smaller than 600 x 300 in rectangular or square profile
- Every 7 to 9m for circular ductwork

### 3.5.10 Vibration Isolation

The Contractor shall ensure that all fan motors and any other vibration inducing equipment are suitably isolated from the building structure by anti-vibration mountings.

For MVHR/AHU units and duct mounted fans the connection onto the ductwork shall be made with flexible connections whether or not indicated on the drawing.

The Contractor shall ensure that prior to final connection that all plant and ductwork are squarely lined up such that flexible connections do not form part of an offset connection.

### 3.5.11 Builderswork

The Contractor shall ensure that all services penetrations through construction, shall be provided with the requisite installation frame or sleeve to allow the Main Contractor to build up to the respective service.

The Contractor shall ensure that no ductwork is built directly into the structure.

The Contractor is responsible to fully identify all builderswork requirements to the Main Contractor, prior to construction including all holes through walls, penetrations, cavity barriers etc.

## 3.6 AIR CONDITIONING SYSTEMS

### 3.6.1 General

The Contractor shall design, procure, install, commission and set to work air conditioning system as detailed in this specification.

Heating & cooling it to be delivered to the space by wall unit strategically located as to avoid potential draughts and to maintain accurate coverage of the conditioned space.

The external condensers shall be located in the externally with a protective enclosure provided, that does not restrict air movement and is set out to the air conditioning unit manufacturer's required clearances.

The equipment shall be supplied by Daikin. The Contractors shall appoint Daikin to test and commission the DX systems as well as appoint them to programme and commission the controller. The system shall incorporate an Intelligent Touch Manager DCM601B51 controller, linked to the BMS via a BACnet interface unit.

### 3.6.2 4-Way Discharge Cassette Units

The units shall be manufactured from galvanised steel plate insulated with closed cell expanded polyurethane foam. The ceiling panel shall be manufactured from ABS plastic. Air shall be discharged by an aerofoil bladed centrifugal turbo fan through four outlets on the perimeter of the ceiling panel. The four outlets shall each include electronically adjustable vanes to alter the angle of the airflow. The room air shall be returned to the unit through one grille in the centre of the panel. The return air to the unit will be filtered through a synthetic fibre washable filter installed in the unit.

### 3.6.3 Wall Mounted Unit

The unit will be manufactured from ABS plastic and be painted Munsell 1.0Y 9.2/0.2. Air will be discharged by a tangential line flow fan through an outlet in the bottom front edge of the unit. The outlet will have electronically adjustable vanes to enable variable air discharge through the horizontal to vertical downward planes. The outlet shall also include manually adjustable guide vanes to alter the airflow pattern in the horizontal directional plane.

Air shall be returned to the unit through grilles mounted in the front face of the unit above the outlet. The return air shall be filtered by synthetic fibre washable filters mounted behind the return air grilles.



The unit shall have a drain lift up mechanism fitted as standard

### 3.6.4 Remote Controller

Each unit shall be supplied with a remote controller. The controller shall be wall mounted. It will be manufactured in ABS plastic with a LCD display and will be the manufacturer's standard colour.

The controller will be capable of altering the following functions on up to sixteen indoor units (within a group):

- On/Off
- Operating mode
- Setpoint
- Fan speed
- Louver position (if applicable)
- Timer settings
- Test run

The controller shall also be capable of displaying the following items:

- On/Off
- Operating mode
- Setpoint
- Return air temperature
- Fan speed
- Louver position (if applicable)
- Timer settings
- Filter
- Fault diagnosis
- Test run

Setpoint range shall be limited to prevent tampering.

All remote controller functions can be locked off or all remote controller functions can be locked except On/Off.

Automatic switch off timer options shall turn off the unit after 30 min to 4 hours.

When units are set in one group, no additional cabling shall be required between indoor units.

The external condensers for the comfort conditioning system shall be located in the zone identified.

The Contractors shall check with the architect and the engineer that the setting out of these units meets the approval of the local planning officer.

### 3.6.5 Controls & Control Wiring

The Contractor shall supply and install interconnecting control wiring between the indoor and outdoor units and control wiring between remote controllers, centralised control and relevant components. This work shall be co-ordinated with the Electrical Contractor for the routing and trunking of the cables.

All control wiring shall be carried out in full accordance with the manufactures requirements and recommendations and tagged with ID reference at 3 metre intervals for ease of identification and maintenance.

Control wiring shall not be run next to power wiring. A minimum space separation of 100mm between both control and power cables shall apply or suitable metal fillet dividers shall be provided.

All control wiring is to be carried out in 2-core 1.5mm 2 LSF shielded cabling with colour coding and tagged with ID number at 3 metre intervals as per schematics for ease of identification and maintenance.

The DX / VRF system shall be connected to a Daikin Intelligent Touch central controller. All heat recovery units shall be connected to the AE200 controller.

The control panels shall be fully installed, tested and commissioned by the Mechanical Contractor prior to Client demonstrations with the appropriate terminations for any lighting controls via the integral timeclocks and overrides switches by the Electrical Contractor.

### **3.6.6 Installation**

The fixing of all air conditioning equipment, installation of all refrigerant pipework and full commissioning shall be performed by a specialist refrigerant installer who shall be authorised to install the manufacturers equipment (certificate of approval must be submitted prior to commencement on site).

The installation of all internal and external units, refrigerant pipework, inter-connecting wiring, commissioning and testing shall be carried out by an approved refrigerant systems installers, from whom the Sub Contractor shall obtain quotations. The Sub Contractor shall clearly state on his tender submission the specialist Contractor he intends to employ to carry out the work.

The Contractor shall seek the written authority of the Engineer to the use of his proposed refrigerant system installer.

Full access shall be afforded to site during the installations stage of the project to allow them to verify that installation methods are fully in accordance with the manufacturers requirements and that the equipment warranties will not be invalidated.

### **3.6.7 Vibration Isolation**

The Contractor shall ensure that all fan motors and any other vibration inducing equipment are suitably isolated from the building structure by anti-vibration mountings.

For all elements of the DX / VRF system the connection onto the ductwork shall be made with flexible connections whether or not indicated on the drawing.

The Contractor shall ensure that prior to final connection that all plant and ductwork are squarely lined up such that flexible connections do not form part of an offset connection.

### 3.6.8 Refrigerant Pipework

The Contractor shall design, supply, install, test and commission all interconnecting refrigeration pipework between the outdoor and indoor units.

All pipework to be carried out in refrigerant quality soft / medium drawn copper tubing to BS2871 Part 2: 1972 and complete with the appropriate headers and joints.

Pipework should be carried out by an Approved (certificate approval must be submitted prior to installation commencement) Refrigerant Engineer and accordance to BSEN 378 2000 specification (or latest version if updated) and the manufacturers design and installation instructions. All pipework must be suitable for R407C or R410A.

The length/height difference parameters and outside diameter of all piping is to be in accordance with the manufacturer's requirements and recommendations.

Longest possible lengths of copper pipe should be utilised to minimise joints on site.

Appropriate refrigeration installation tools must be utilised. Dry Nitrogen must be utilised at all times in the system during brazing. Interconnecting pipework between indoor and outdoor units shall be thermally insulated and vapour sealed in accordance with the standard specification. The thermal insulation shall be Zero ODP (cfc and HCFC free) phenolic foam, installed fully in accordance with their requirements and recommendations. After installation of pipework, and prior to sealing of insulation joints and starting of equipment, pipework should be pressure tested to 28Kg/cm<sup>2</sup> (430psi), held for 24 hours and checked for leaks, vacuumed/dehydrated to (-752mm Hg) 2 torr, and held at that setting for 12 hours (minimum).

Refrigerant (R407C or R410A) charge weight must be calculated, to the actual installed length of pipework in accordance to manufacturer's recommendations.

The charging should be carried out with an appropriate charging station.

Pipework to be properly fixed and supported at a minimum of 1.5 metres centres and where required should be run on galvanised trays. All pipework to be labelled with ID number (condensing unit's ref.) at 3 metre intervals.

Joints in copper pipe shall be brazed. Brazing shall be carried out to the requirements of the HVCA Code of Practice – Brazing and Bronze Welding of Copper Pipe and Sheet.

### 3.6.9 Condensate Drains

The Contractor shall supply and install condensate drains from each indoor unit.

#### **Condensate drains are to be gravity drains wherever possible.**

If required, condensate is to be pumped into a high level gravity condensate drain which will be connected into the above ground drainage system.

Condensate pipework shall be installed in PVC tube. Where required unions shall be provided to gain access for maintenance and removable full bore cap end (rodding eyes) shall be provided.

The Contractor shall determine the requirement for thermally insulating condensate pipework, thermal insulation shall be applied to prevent condensation, where required. Where insulation is needed it shall be Zero ODP (cfc and HCFC free) phenolic foam, installed fully in accordance with their requirements and recommendations.

All condensate drains at the connection point into the main drain shall be provided with a proprietary waterless trap arrangement (Hep-vo hygienic self-sealing waste valve) on the inlet connection to all traps a purpose made copper tundish shall be provided.

### 3.6.10 Refrigerant Leak Detection

The contractor shall install a refrigerant leak detection system to comply with BS EN 378 and BREEAM Pol 01. The system shall incorporate refrigerant detectors which shall alert occupants to a refrigerant leak via audible and visual alarm.

The system shall incorporate Daikin UK.MVH-300 Leak Detectors linked to indoor units to isolate solenoid valves on alarm. Within the Sever room a UK.MVH-300/R32 leak detector shall be installed. The system shall be linked to a UK.IMEC-RAD-32 Channel Integrator which shall be connected to a UK.IAMC supervisor alarm panel located in Reception.

### 3.6.11 Installation Philosophy

The comfort conditioning system shall consist of ceiling mounted and wall mounted cassette units which link to a common external condenser by a network of pipe work.

The Contractor shall design the system so that no micro climates occur within each room/area.

Each room shall have its own wall mounted controller, which shall control all units within that room unless indicated otherwise on the design intent layouts.

The building is to be comfort cooled and heated using suitably sized to overcome the room loads and also not to exceed NR 35 in the open plan areas.

Each indoor unit shall be selected to operate at low speed at design conditions.

Each indoor unit shall be equipped with a removable IEC (kettle type) plug and socket arrangement with 3M of flex.

The Contractor shall supply and install all condensate pipework and fittings including running traps etc. as required for the drainage of the system. All condensate pipework shall be in UPVC.

Where required unions shall be provided to gain access for maintenance and removable full bore cap end (rodding eyes) shall be provided.

All condensate pipework not in heated areas shall be thermally insulated to avoid freezing.

At positions where the condensate drain connects to the main drain the Contractor shall be responsible for making the final connection. All condensate drains (at the connection point to the main drain) shall be via Hepvo self-sealing waste valves or equal and approved.

The Contractor shall include remote indication for all condensate pumps should be included in the event of failure.

The refrigerant pipework shall be run and clipped on galvanised steel tray which in turn is supported from the structure via Unistrut and threaded supports

Class O insulation and proprietary jointing and seaming systems shall be installed such that all pipework where possible runs on top of tray. All refrigerant pipework runs and lengths shall be strictly in accordance with manufacturer's recommendations.

All interconnecting power and controls wiring from the weatherproof and/or local rotary isolators shall be provided by the Contractor. The weatherproof rotary Isolators shall be provided adjacent to the condensing unit by the Contractor.

Where services penetrate the building fabric a suitably rated fire resisting material shall be used for fire stopping.

The DX / VRF system shall be fully tested, commissioned and set to work in accordance with the manufacturer's recommendations. The Mechanical Contractor shall liaise with the Engineer giving an adequate period of notice (minimum 10 working days) for the Engineer to witness all final commissioning of the system.

Engraved Traffolyte labels shall be fixed to all external condensers items.

The Contractor shall employ a structural engineer to check the loadings of the condenser units and to design the structural support for the system. Units shall be supported by a "bigfoot" system or equal and approved.

The routing of refrigerant pipework shall have adequate access for future replacement and repairing of pipework. All refrigerant pipework shall be installed on cable tray with adequate supports. Attention is drawn to the weather proofing, which is to be co-ordinated with the architect. The Contractor shall route external refrigerant pipework in a suitable location to allow good access to the condensers.

The Contractor shall ensure that all services penetrations through construction shall be provided with the requisite installation frame or sleeve to allow the Main Contractor to build up to the respective service.

The Contractor shall ensure that no pipe work is built directly into the structure.

The Contractor is responsible to fully identify all builders-work requirements to the Main Contractor, prior to construction including all holes through walls, penetrations, cavity barriers etc.

### 3.7 SANITARY PIPEWORK

#### 3.7.1 General

The Contractor shall include for the supply, installation, testing and commissioning of the complete above ground drainage systems to include the following;

General waste installations serving sanitary accommodation as detailed by the architect comprising of new uPVC and MuPVC pipework and fittings.

The Contractor shall include for the complete above ground drainage pipework installation including connection into the below ground drainage system, the supply and fixing of all sanitary ware, as

indicated on the architect's drawings, the installation of overflows from all items of equipment requiring an overflow including WC's and final testing and certification upon completion of the works.

All sanitary ware and equipment is detailed within the architectural specification.

The above ground soil and waste installation shall be provided, arranged to convey soil and waste water from each and every sanitary fitting to the underground drainage system. The installation shall be in accordance with BS EN 12056, The Building Regulations and to the requirements of the Local Public Health Authority.

### **3.7.2 Sanitary Plumbing Pipework & Fittings**

All materials shall comply with the requirements of the latest editions of the appropriate British Standard Specifications, including any amendments current at the commencement of the Contract. Pipework and fittings shall be suitable for the range of temperatures of conveyed fluids to be handled.

Soil pipe connections to WC pan spigots, or similar soil appliance outgo, shall comprise "Multikwik" or similar connector jointed into plain end pipe. Flexible connections will not be accepted.

Soil and waste pipes excluding stacks shall be UPVC complying with the relevant requirements of BS 5255 & BS 4514. Solvent welded joints will be permitted but adequate provision shall be made to cater for thermal expansion and dismantling of pipework, by use of slip joints with rubber gaskets.

Flexible connectors shall not be installed.

All pipework and fittings shall be supplied by Polypipe Terrain or equal and approved

### **3.7.3 Overflows**

Pipework shall be uPVC complying with the relevant requirements of BS EN 1329- 2:2000, BS EN 1455-1:2000 and BS 4514:2001. Solvent weld fittings complying with BS shall be used.

### **3.7.4 Traps**

Tubular traps shall be polypropylene deep seal two piece pattern complying with the relevant requirements of BS EN274:2002 colour white, with universal compression outlet connection. Plastic bottle traps shall be polypropylene deep seal with adjustable sliding inlet tube, removable base, and universal compression outlet connection.

### **3.7.5 Sanitary Plumbing Installation Workmanship**

All pipes, fittings and components shall be checked for soundness and freedom from defects and damage prior to installation.

All stacks shall be installed truly vertical, and horizontal pipework shall be true in alignment and to uniform gradient. All stacks shall be supported by at least one pipe support bracket in a manner to support the vertical load and in any case the distance between pipe supports shall not exceed the distances specified in the following clauses of this specification.

Pipe supports shall be fixed as the pipework installation proceeds. Improperly supported pipework shall not be left for later fixing of pipe supports.

All suspended pipework shall be positioned as close to the slab soffit as practicable. Provision shall be made in the fixing of branch pipes to the main vertical stack to prevent shearing or deformation due to vertical movement of the main pipe.

All bends on soil stacks shall be long radius. All changes of direction and branch connections on suspended soil and waste pipe runs shall be made with 135° bends and branches, except where this is not practicable, in which case the fittings shall have the greatest angle possible below 135°. All pipework joints shall be airtight and watertight.

All pipework shall be securely supported with substantial brackets. Hangers and accessories shall be galvanised or zinc plated or other equal and approved rust-proof.

Care shall be taken to ensure that the pipe axis is parallel with the axis of the pipe ring or bracket and that drop rod supports are vertical. All supports shall be in alignment and shall not impose side strain on the pipework and shall provide a uniform pipe gradient.

Additional supports shall be provided at branch connections and changes of direction on suspended pipework providing a stable and secure pipework system capable of being rodded through without detriment to the system.

Branch connections shall be supported independently and not used to help in the support of its parent main.

### **3.7.6 PVC Pipework Installation**

The installation, method of jointing and fixing shall comply in all respects with the manufacturer's site work instructions. Solvent welded joints shall be made using the manufacturer's approved cement, after cleaning the areas to be joined with the manufacturer's cleaning fluid as required. Seal ring fittings shall be used where necessary to accommodate thermal movement.

Cut ends of pipes shall be formed square with a fine toothed saw and then made smooth.

For solvent welded joints the pipe shall be pushed fully in against the shoulder of the socket.

Standard fittings shall not be altered in any way and if any special fittings prove necessary they are to be made by the manufacturer.

Branch pipe connection fittings shall comprise boss connections and/or equal and unequal branch fittings.

Joints between uPVC pipe and other materials shall be made with the fittings and jointing materials recommended by the uPVC pipe manufacturer.

Pipes shall be fixed so that they are supported to provide thermal movement with brackets and fittings supplied by the Pipe system manufacturers. Such fixings shall be provided wherever necessary to locate and stabilise the pipework in correct alignment and to uniform gradient.

Where passing through a fire protected compartment all waste pipes shall be fitted with an intumescent fire seal to BS 476.

All pipework systems shall be vented in accordance with BS EN12056-2:2000.

### 3.7.7 Testing

5 days' notice shall be given to the Building Control Officer and the Engineer to witness any test. The Sub-contractor shall supply all assistance and apparatus necessary to carry out the testing.

Before testing all pipes must be cleared of debris. A Test Certificate shall be issued for every successful test. Certificates are to be numbered with the Room Numbers for which they apply.

If any test fails to demonstrate the satisfactory nature of the installation, the Sub-Contractor, at his own expense, shall locate and remedy any faults and re-test until the system fully meets the requirements. After testing ensure any open ends are properly sealed.

## 3.8 WIRING TO MECHANICAL PLANT

### 3.8.1 General

The Contractor shall be responsible for the supply, installation, testing and commissioning of all wiring to mechanical plant and associated installations as detailed within this Particular Specification and on the accompanying layouts.

The Contractor shall include for all cabling, conduits and trunking for 240V/415V power wiring, as required, to all items of mechanical plant as shown on the drawings and as detailed in the Specification.

The Contractor shall also include for all cabling, conduits and trunking for ELV and controls wiring as required to all items of mechanical plant as shown on the drawings and as detailed in the Specification.

All valves, pumps, fans, duct mounted detectors, detectors, control panels, BMS outstations etc., will be supplied, installed and commissioned.

The Contractor shall include for fixing of all wall mounted detectors, thermostats etc.

In general, the power wiring shall be carried out using PVC insulated cables run in plastic conduits and cable trays which shall be carried out as a concealed/flush installation but surface installed to equipment within ceiling and roof spaces. Conduit and trunking in plant rooms shall be galvanised.

Conduits to equipment positioned more than 450mm away from walls shall be installed so as to drop vertically from above and thus not restrict access around the equipment.

The Contractor shall include for all necessary fixings and brackets etc., to provide a dependable and rigid support.

Conduits may, however, be fixed to plinths/supports for mechanical equipment with the approval of the Contractor.

Connections at panels and equipment shall be made using shell clamps or 'crimp on' lug to suit the



terminals provided.

Conduits to all equipment shall terminate within 600mm of the item. All LV items shall have an isolating switch of suitable rating installed at the end of the conduit. Where isolators are provided by the Mechanical Contractor, they shall be manufactured by surface isolators of the correct IP rating. Final connections to pumps shall be via plug and sockets.

Conduits to ELV BMS equipment will generally terminate at a circular conduit through box to be completed with compression gland, sealing gasket and box lid cover.

Final connections to all roof mounted equipment shall be via flexible conduit, as PVC sheathed flexible metal KOPEX brand, to be installed with a separate earth wire.

The final connections to small items of equipment shall be via flexible cables, this shall be carried out using Butyl insulated and sheathed flexible cable with compression glands used at the equipment.

The cables to ELV equipment shall terminate via fixed connectors to be installed in the circular conduit box. The Contractor shall allow for final connections to all items of ELV equipment including termination of any cables provided fixed to equipment.

The Contractor shall refer to Mechanical Services Drawings for positions of equipment, in order to supply and install the necessary conduits/trunkings to contain wiring to be installed.

### **3.8.2 Main Control Panels & BMS Outstations**

These items will be supplied and installed in the locations shown on the drawings.

The Contractor shall include in the Tender for the supply and installation of all outgoing cables and containment systems for LV power and controls.

All the cables into these panels shall be top entry.

Final connection onto mechanical control panels shall be arranged direct on to the in-built isolators serving the item of plant.

### **3.8.3 Heating Pumps**

The Contractor shall wire from the mechanical plant control panels independently to each pump using PVC insulated cables in conduit/trunking to 16 amp rated socket outlets as isolators installed local to each pump set.

Plug and sockets shall be as manufactured by MK Ltd., 'Commando' IP44 splashproof range, or equal approved.

Cat. Ref. (one phase) plug 9001 BLU, socket outlet 9201 BLU.

Cat. Ref. (three phase) plug 9015 RED, socket outlet 9215 RED.

Flexible cables shall be terminated accordingly.

Control cables shall be installed in an independent conduit system.

### 3.8.4 Building Management System

The Contractor shall design, supply and install the control panel, BMS outstation and equipment controls and associated ELV BMS Wiring as required.

The Contractor shall supply and install an independent conduit system from the relevant section of the multi-compartment trunking to all items of equipment detailed on the drawings.

Conduits installed to items within the Plant Rooms and roof space shall terminate in galvanised conduit through boxes within 300mm of the equipment.

The Contractor shall supply and install the necessary wiring between the outstation and the control equipment using cables to be contained in conduits/trunkings to be supplied and installed by the Mechanical Contractor.

### 3.9 AUTOMATIC CONTROLS & BMS

#### 3.9.1 Design Philosophy

The Services Contractor shall design, supply, install, test and commission, the automatic controls installation to serve the plant & equipment.

The Services Contractor shall employ a specialist controls company, to carry out the works in accordance with this specification. The specialist controls company shall be an approved Trend Technology Centre and the equipment installed must be manufactured by Trend Controls Systems Ltd.

The Services Contractor and specialist controls contractor shall make all allowances for attendances required to enable the final commissioning to be undertaken by the appointed specialist commissioning company and final point to point testing and cause and effect testing that will be undertaken by the approved independent certifier on the contractor's behalf.

The Services Contractor shall ensure each meter is checked for accuracy and where sub meters are installed a check should be made against the main incoming meter.

The Services Contractor shall ensure their specialist sub-contractors for controls and utility metering, provide to the satisfaction of the clients representative, proof during commissioning that the system operates within agreed parameters. The specialist sub-contractor shall provide on demand prove any point on the system. The specialist sub-contractor shall commission the systems and provide O & M manuals.

The Services Contractor shall employ a Specialist Automatic Controls company to carry out this work.

The work generally comprises, but is not limited to, the following:-

- (i) Obtain all necessary wiring information, full load currents etc., for all plant being controlled.
- (ii) Prepare control panel wiring diagrams including front panel layouts, label details and back plate layouts to the Engineer for comment. Following comment the revised drawings and any subsequent revisions shall be issued to the Engineer and Electrical Contractor.

- (iii) Provide onsite assistance during the electrical wiring installation to advise on the positioning of sensors, thermostats, actuators, etc.
- (iv) Size all motorised valves and issue a schedule to the Engineer for comment.
- (v) Supply all sensors, thermostats, differential pressure switches, motorized valves, actuators and any other control items necessary to provide a fully working system. The underfloor heating manufacturer shall provide valves/actuators and room thermostats associated with manifolds free issue to the Control Specialist.
- (vi) Prepare a detailed description of operation when control switches are in both the 'auto' and 'hand' positions including:-
  - Proposed settings of all control hardware items such as thermostats, differential pressure switches, humidistats etc.
  - A list of software/strategy settings/knobs i.e. operating times, time zone allocation, set points etc., highlighting those knobs which will be provided for operator adjustment via the fascia mounted display panel.

The above description shall be issued to Engineer for comment prior to writing of the software/strategy programme.

- (vii) Manufacture and delivery to site of a purpose made and factory tested control panel housing all necessary control gear i.e. contactors, overloads, relays, switches, etc., and intelligent outstations/controllers.
- (viii) Testing and commissioning of the automatic controls and control panel.
- (ix) Provision of system documentation i.e. operation and maintenance manuals.
- (x) Operator on-site training.
- (xi) Allowance for fine tuning and all warranty work during twelve month defects period.

#### **3.9.2 Direct Digital Control**

The Installation shall be provided with a Direct Digital Control System (DDC) to provide Energy Management Control of Ventilation, LTHW Heating, and metering, where indicated.

The control system shall comprise a series of TREND IQ4X Digital Control Processors, interfacing with the plant via Digital and Analogue Inputs and Outputs as detailed. Local User interface shall be by panel mounted display. Each Controller shall be capable of 'stand alone' operation and shall contain a full set of energy management and control routines specifically designed for HVAC Control, Monitoring and Alarm. The Controls Specialist shall provide all necessary equipment and software to allow creation and modification of control strategies.

All DDC Controller configurations shall be stored in 'flash' eprom memory, to protect the program against power and/or battery failure.

All system data shall be battery backed for a minimum of 10 days. On restoration of Electrical Power the Processors shall resume their normal operating mode, automatically, and plant shall be re-started progressively, to minimise the start up current drawn.

Intercommunication between Controllers within the building shall occur via an Local Area Network (LAN) using I/P protocol. Parameters shall be able to be shared, or passed between processors as necessary.

The Control System Specialist may elect to install a dedicated network, connecting to the Clients system at or single I/P Point, or may liaise with the Client's IT Department to provide individual IP points for each controller.

The main plant controllers shall be arranged to continuously monitor the LAN and report loss of communication, identifying the controllers on and off line. During polling, the main plant controller shall synchronise the time and date of all other controllers on the network.

It shall be possible to access any controller from any other controller location.

The System shall be provided with facilities to give 'off-site' support either via Modem, or Internet.

The BMS Contractor shall supply the differential pressure switches, sensors, control valves, actuators, etc for the project. The BMS Contractor shall include for the supply of all the control valves for the on off control of the individual spaces. This shall be achieved using a time enabling signal from the BEMS, and a demand signal from the individual space temperature sensors. A manual override facility can be made available from the space touch screen PC. The number and size of equipment are indicated on the BMS point's schedule.

Valve sizes, sensor pressure ranges, etc are based on tender information provided to date and shall be subject to checking against construction issue design data and submitted for approval.

The Services contractor shall include for the engineering and commissioning of the new controls system into a Server Supervisor that can be accessed remotely by the site maintenance team..

The Server Supervisor shall be used to set time enabled zones for the building and for individual spaces. It shall also be used to monitor individual energy consumption, and wired into the BEMS by the controls specialist).

### **3.9.3 Password Security**

Each controller shall be protected by local passwords/ID allowing various levels of access.

### **3.9.4 Controller Configuration**

The control system specialist shall provide a backup copy of the controller configuration and shall provide all the necessary information to allow the user to create, and modify control strategies and parameters, if required.

### **3.9.5 Digital and Analogue Inputs**

Inputs to the controller shall be universal type accepting digital or analogue signals.

Analogue inputs shall be capable of accepting input from Resistance, d.c. Voltage, or 4- 20 ma signals in any mix.

Additionally the controller shall be capable of accepting the Inputs from pulse output meters to allow full energy monitoring.

### **3.9.6 Digital and Analogue Outputs**

Outputs from the controller shall be universal type, enabling any output to be selected for Digital (switched) output or Analogue (0 -10 volt). Control outputs, suitable for the raising and lowering of split phase reversing valve actuators shall be provided where appropriate.

### **3.9.7 Analogue and Digital History**

Each controller shall maintain a history table for each physical input.

Analogue inputs shall hold the time and date of the last 48 readings. The period of these readings shall be selectable, 1 minute to 999 minutes, on a point by point basis.

### **3.9.8 Calculations**

Each controller shall have the capability to apply mathematical calculations to analogue values within the controller.

The ability to Select Highest, Lowest, or Average Values shall be provided, as well as the ability to carry out addition, subtraction, multiplication and division within algebraic formulae.

It shall be possible to pass the result of one calculation, on to another, to implement complex results where necessary and to transfer these values to control loops or other controllers via the LAN.

### **3.9.9 Duty Sharing**

Each controller shall provide duty sharing and auto-changeover of duplicate plant e.g. Pump, Fans etc. Changeover shall be on both Hours Run/Time Elapsed or on Failure of the `Lead` Unit.

There shall be a means to advance the changeover manually, from the Keyboard, for maintenance and testing purposes.

### **3.9.10 Sequencing**

Each controller shall provide auto sequencing and auto-changeover of plant etc.

Changeover shall be on both Hours Run/Time Elapsed or on Failure of the `Lead` Unit.

There shall be a means to change the sequence manually, via the Keyboard/Display for maintenance and testing purposes.

### **3.9.11 System Alarms**

Each controller shall hold an alarm table, providing historical record of active and unacknowledged alarms.

Alarms may be viewed on the LCD Display, by Operator at the lowest authority level, but may be acknowledged only by operators having higher authority levels.

Alarms shall be categorised e.g. Critical, Maintenance, Fire, Security etc.

Alarms may be displayed locally, re-routed to other controllers on the network, printed and directed to the Central Facilities as appropriate.

The controller shall have the facility to suppress non-urgent alarms during `out of hours` periods.

Each alarm shall have the facility to delay activation, to prevent false operation and to allow the plant to stabilise after start up. The control systems specialist shall be responsible for the selection of appropriate grace times.

### **3.9.12 Programme Analysis and Documentation**

The Control Systems Specialist shall provide detailed flow charts showing the programming logic and configuration addresses, for each controller. The controller shall provide the facility to analyse any point and report on the active control functions operating on that point.

Digital Inputs/Outputs shall hold the time and date of the last 24 changes of state.

### **3.9.13 Control Loops**

Each controller shall provide Proportional plus Integral plus Derivative (PID) control loops as necessary to control the plant. Each Term shall be selectable and adjustable and shall be set by the controls specialist, to control the plant correctly.

The control point for each control loop shall be adjustable by the authorised operator.

### **3.9.14 Control Devices**

Wherever possible, control devices, and wiring shall be extra-low voltage e.g. 24v AC/DC.

All Digital Inputs, e.g. Filter Switches, Airflow Proving, Pressurisation etc. shall be interfaced by an interposing relay with a voltage separation rating not less than 500v.

All Digital Outputs shall be provided with an interposing driver relay, having a voltage separation of not less than 500V.

All interposing relays shall be equipped with an LED Indicator to assist with maintenance.

### **3.9.15 Valves and Actuators**

Valve and Damper Actuators may be either 24 volt Raise/Lower or 24v with 0 -10v positioner, as appropriate to the application.

Thermally operated Valve Actuators will not be considered.

Unless otherwise agreed, all motorised valves shall be of the plug and seat type, with a nominal pressure rating of not less than 10 bar.

Modulating Valves shall be selected to give control authorities in the order of 37% to 67%.

All 2 port control valves shall be of the pressure independent type with integral flow limiting settings to prevent the need for differential pressure control valves to maintain the modulating control characteristic of the valve.

Valve selections shall be submitted to the Clients Representative for final approval.

### **3.9.16 Variable Speed Drive Controllers (Inverters)**

Each variable speed drive controller shall be provided with an RF Choke compliant with the Harmonic Standards to provide EMC Protection at full and partial loads.

The Units shall be provided with operators keypad to allow the operation to be reviewed and parameters modified.

The following facilities are required.

- Over current Protection
- Single Phase Protection
- Maximum Speed
- Minimum Speed
- Acceleration Ramp Time
- Deceleration Ramp Time
- Start/Stop input
- 0-10 volt signal input
- Fault Signal
- 4-20ma Output for running current

### **3.9.17 Temperature Sensors**

Temperature sensors shall be either platinum resistance or military grade thermistor type sensors. Sensors shall be selected to provide accuracy over the full range to be controlled.

The elements shall be encapsulated to prevent the ingress of moisture, including the ground temperature sensors.

Where temperature sensors are used with chilled or chlorinated water the sensor pockets shall be stainless steel.

### **3.9.18 Pressure Transducers**

Pressure transducers shall be of the 4-20ma or 0 -10v DC type and shall be selected to provide accuracy over the full range to be controlled. Pressure transducers shall be selected to operate within the mid-range and to withstand an overpressure of 500% of the working pressure.

### 3.9.19 Central Management

The new controls system shall be fully integrated into the Central Management supervisory head end. This shall include the provision of any additional hardware to allow the new software package to be installed and the provision of new graphic simulations.

### 3.9.20 Local Area Network (LAN)

The new controls panels (outstations) shall be linked by connection into the site wide LAN.

### 3.9.21 Control Panels

#### 3.9.21.1 General Standard

The control panel shall be manufactured to the general requirements of BS.5486 Form 2.

#### 3.9.21.2 Enclosure

The sheet steel enclosure shall be IP55 protection and finished in light grey to RAL 7032.

The cubicle shall incorporate gland plate fitted with dust proof gaskets to enable cable entry.

#### 3.9.21.3 Doors

Access doors shall be sufficiently rigid and close fitting to exclude dust. Gaskets made of Neoprene or rubber may be used to provide close sealing but self-adhesive plastic foam will not be accepted. Doors shall be limited to 1200mm side and where they carry equipment should preferably be limited to 900mm wide.

#### 3.9.21.4 Panel Front

If necessary, the front panels shall be reinforced to carry the equipment mounted thereon and be sufficiently strong to withstand normal handling during transport and erection without distortion or damage. Provision shall be made for additional brackets and hangers for supporting very long controllers, heavy recorders etc.

Cut-outs in the panel front shall be accurate to the required size and finished edges shall be smooth, free from burrs and painted.

Equipment mounted on the panel front shall be at a height not exceeding 1800mm and not less than 450mm above floor level.

Control switches and lamps shall be logically grouped according to the plant they serve.

All access shall be from the front of the panel.

The sides and base of the panel shall not be used for mounting equipment.



### 3.9.21.5 Compartment

Extra low voltage control equipment shall be housed in a separate compartment from starter equipment.

The intelligent outstations/controllers shall be housed in this compartment.

The power supply to the outstation controllers shall originate from the live side of the panel mains isolator via a control circuit fuse mounted in the starter compartment. A metal clad fused connection unit shall be fitted on the back plate in the control compartment.

The control circuits shall be 24V ac fed from the red phase via a control fuse and double wound transformer.

### 3.9.21.6 Panel Wiring

The panel wiring shall be in accordance with the approved drawings and current edition of BS.7671 with amendments. Cables shall be sized to take account of the de-rating required for areas with limited or zero ventilation and for bunching of conductors.

All panel wiring shall be Tri-Rated except for analogue/digital signalling which shall be in screened cable to DEF standard 61-12 (Part 5). Screened cable shall be tinned copper stranded conductors covered by PVC with an overall tinned copper braided sheath with outer PVC sheath. All screened cables shall be rated for a maximum working voltage of 440V rms.

Wiring from panel to panel doors shall be sub-divided into reasonable sized bunches and run through proprietary flexible plastic tubing, such as that manufactured by insuloid. The tubing shall be supported at both ends and have sufficient loop to allow unrestricted opening of the panel door. The tubing shall be not more than 75% full. Wiring to components on the door shall be neatly cleated and supported to relieve the terminations of strain.

Voltages higher than 240V (nominal) shall never appear on the panel door, thus wiring from the yellow and blue phases is prohibited.

The panel shall be fitted with a main earth connection point of a size commensurate with the prospective earth fault current.

The cables shall be colour coded as follows:-

Three phase circuits	-	Brown, Black, Grey
Neutral	-	Blue
Earth	-	Green/Yellow
240V ac control circuits	-	Live Brown, Neutral Blue
110V ac control circuits	-	Grey
24V ac control circuits	-	Purple

24V dc control circuits - Blue

All extra low voltage wiring to input and output points on controllers shall be coloured brown or in the case of screened cable be multi-coloured.

All wires shall be ferruled or crimped and be identified with colour cable markers numbered in line with the schematic diagrams.

### **3.9.22 Panel Equipment**

#### **3.9.22.1 Mains Isolator**

The motor starter section of the panel shall be fitted with a switch disconnection mounted on the back plate in accordance with BS.5419 (IEC 408) having a quick make and break mechanism capable of making the prospective short circuit current as limited by the back-up fused in the distribution board feeding this panel. The isolator shall be rated to allow all equipment to be operational at the same time.

Adequate space shall be provided between the gland plat and the isolator terminals so that the cable can be terminated without undue difficulty.

#### **3.9.22.2 Terminals**

An individual terminal shall be provided for each wire entering the control panel (with the exception of the panel main supply).

No more than two wires shall be connected into any one terminal.

Circuits operating at different voltages shall be terminated at physically separate blocks of terminals. Each block shall be labelled with the voltage identification.

Terminals having connections which may still be 'live' when the panel mains isolator is in the 'Off' position shall be suitably shrouded and fitted with a warning label.

#### **3.9.22.3 Motor Starters**

The fuses, connector and overload relay shall be selected to ensure that the contactor is not called upon to break currents above its capabilities and at achieve type 'C' co-ordination to BS.4941 (IEC 292).

Two speed starters shall include a timer to provide a delay during the changeover from high speed to low speed so as to prevent a surge of current.

#### **3.9.22.4 MCB's**

Circuit protection shall be afforded by DIN rail mounted circuit breakers. The circuit breakers shall conform to IEC 898 (10ka fault rating).

Single pole breakers shall be used for single phase supplies and triple pole breakers for three phase supplies respectively. Triple pole breakers shall be modular in construction and incorporate a link handle for association of each fuse barrel.

Each circuit breaker shall be suitably labelled.

Correctly rated breakers shall be fitted to provide discrimination control and be of the appropriate type i.e. type b (general purpose) or type d (motor rated).

### 3.9.22.5 Contactors

Contactors shall be the block type suitable for uninterrupted duty with utilisation category appropriate to the type of load in accordance with BS.5424 Part 1 (IEC 158-1).

### 3.9.22.6 Overloads

Overloads shall comply with BS.4941 (IEC 292) and shall be of the adjustable thermal type having adequate time delay, single phasing protection and ambient temperature compensation.

Overload trip contacts shall be hand reset from within the panel and shall have one normally open and one normally closed contact (not a changeover contact).

### 3.9.22.7 Relays

Relays shall be of the plug in 14-pin type having UL and CSA approval incorporating either a LED or mechanical flag indication which activates when the coil is energised. The relays shall also incorporate a manual test button to assist in commissioning and fault finding. Coils shall be rated for continuous duty. Relays shall be 4 pole changeover but all relays having the same coil voltage shall be identical.

Relays shall have gold flashed silver nickel contacts with moulded arc barriers between contacts.

### 3.9.22.8 Control Switches

All control and selector switches shall be suitable for 22.5mm single hole mounting, shall have a rotary cam mechanism and shall conform to BS.4794 (IEC 337).

The control switches preferred are the type which allow the addition on site of further contact blocks.

### 3.9.22.9 Pushbuttons

All pushbuttons shall be suitable for 22.5mm single hole mounting and shall conform to BS.4794 (IEC 337). Each pushbutton shall have a minimum of one normally open and one normally closed contact.

### 3.9.22.10 Indicator Lamps

All indicator lamps shall be suitable for 22.5mm single hole mounting and shall conform with BS.4794 (IEC 337). All indicator lamps shall be fitted with good quality 24V, 7/8 cluster LED bulbs to suit the selected lamp holder which can be replaced from the front.

Each lamp shall be fitted with a flat coloured lens with chrome bezel with the following designation:-

Control Circuit	-	Amber
On/Run/Override	-	Green

Fault/Trip - Red

### 3.9.22.11 Transformers

Voltage transformers shall be of the double wound, vacuum varnish impregnated type complying with BS.3941 (IEC 186).

### 3.9.23 Labelling

#### 3.9.23.1 Type of Labels

All internal and external labels shall be engraved on plastic laminate, such as Traffolyte, secured with non-corrosive screws or with plastic rivets the same colour as the label. Adhesives shall not be used for securing labels.

Identification and information labels shall have black letters on a white background.

#### 3.9.23.2 External Labels

A label shall be provided for each item of plant so that the respective lamps and switches are mounted within the label and their function clearly identified.

### 3.9.24 Spare Capacity

The control panels shall be sized to give a minimum **of 30% spare capacity** to cater for the 2<sup>nd</sup> floor expansion area and also additional future expansion.

20No. spare terminals shall be provided on each terminal rail.

### 3.9.25 Preferred Equipment Manufacturers

Starters	-	Telemecanique LC1
Outgoing terminals	-	Telemecanique AB1 or Klippon SAC
Contactors	-	Telemecanique LC1 or Danfoss C1
Control Switches	-	Telemecanique ZB2
Indicators	-	Telemecanique ZB2
Plug-in Relays 14 pin	-	IMO, SHRACK, OMRON
Timer Relays	-	11 pin - Crouzet, Nortronics, Tele Controls
MCB's	-	Telemecanique or Merlin Gerin
Enclosure	-	Rittal/Eldon/Himel
Panel Finish	-	RAL 7032 light grey
Panel Protection	-	IP55

Cable	-	Tri-Rated/BS.6321
Screened Cable	-	DEF Standard 61-12 (Part 5)
External Labelling	-	3mm WBW Traffolyte
Internal Labelling	-	1mm WBW Traffolyte on cable duct

### 3.9.26 Panel Testing/Pre-Delivery Inspection

Before the panel is delivered to site it shall be tested in full accordance with BS.5486 Part 1 (IEC 439-1) and with the current edition of BS.7671 with amendments.

Upon completion of testing, the panel shall be fitted with a test label.

A pre-delivery inspection shall then be carried out to ensure the panel is fit for delivery. This shall include:-

- Clean, both inside/outside of panel.
- Check panel labelling.
- Ensure panel documentation is included i.e. MCB chart, relay chart, signed test sheet and 'As Built' drawings. These to be housed in a purpose made plastic drawing pocket fixed to the rear of the panel door. All charts and test sheets to be protected within clear plastic heat sealed covers.

### 3.9.27 Testing and Commissioning

The Controls Specialist shall be responsible for testing and commissioning of the automatic controls and control panels. The work shall be carried out by suitably qualified and trained personnel, in accordance with CIBSE Commissioning Code Series C, Automatic Controls and any other standard tests and procedures considered necessary.

The Controls Specialist shall prove the performance of the controls system to the satisfaction of the Engineer. All results are to be recorded and comply with the CIBSE Commissioning Code.

The Controls Specialist shall prepare a testing and commissioning programme compatible with the Mechanical Services commissioning programme for the works to the satisfaction of the Engineer. He shall also be responsible for the co-ordination of all other parties involved in the testing and commissioning.

### 3.9.28 System Documentation

The Controls Specialist, via the Mechanical Services Sub-Contractor shall provide the Engineer with three copies of maintenance manuals giving all necessary information for the systems operation and maintenance.

These shall include control panel diagrams 'As Commissioned', fuse charts, panel test certificate, control strategy drawings, system description, parts lists, maintenance requirements and schedules of all control devices/equipment including manufacturer's literature.

This documentation shall be provided at handover.

### 3.9.29 Operator Training

The Controls Specialist shall include for demonstration of the completed system to the satisfaction of the Engineer.

A further day shall be included for further training as deemed by the Engineer.

### 3.9.30 Fire Alarm System

The motor control panel shall be connected to the fire alarm via a set of volt free contacts and suitable contactor arrangement. An interface unit from the fire alarm systems will be provided locally by the electrical installer to connect this. In the event of a fire signal (non test condition) the panel shall switch off all plant and equipment.

### 3.9.31 Description of Operation

### 3.9.32 General Ventilation Strategy

The General Ventilation HRU's, and General Extract Fans, shall be controlled by a fixed time programme. The fans are to be provided with an inverter for commissioning purposes only. The HRUs shall be controlled via the AE200 controller.

### 3.9.33 VRF Systems

The VRF systems, shall be controlled via a Intelligent Touch DCM601B51 central controller complete with local controllers. The central controller shall be interfaced with the BMS via BACnet.

### 3.9.34 HEAT PUMP SYSTEM

#### 3.9.34.1 General

ASHP units shall be utilised to generate heat for the domestic water system.

#### 3.9.34.2 Pump Control

The LPHW pump sets consists of duty / standby pumps. Only one pump shall run at any time except during a changeover. The duty pump changeover shall be changed if required. During changeover both pumps shall run for 5 seconds to ensure continuous water flow to the users. In addition, if a failure of the running pump is detected through the pump starter or from a differential pressure switch across the pump, then the standby pump is to operate.

The pump speed is to be controlled to maintain a pump discharge pressure which shall be finally determined at the commissioning stage of the various heating circuits.

Minimum pump speed = 40% (adjustable)

Maximum pump speed = 100% (adjustable)

### 3.9.35 Cold Water System

Please refer to the Energy & Water Metering section.

### 3.9.36 Hot Water Service System

#### 3.9.36.1 General

The hot water system for each school shall be provided by an indirect calorifier.

The system shall incorporate a high level and low level indirect coil.

The low level coil shall be fed from the ASHP units. The upper coil shall be fed from the Electric boiler.

The calorifier shall be complete with their own safety controls to comply with the requirements for unvented hot water heaters.

The calorifier shall have 2 immersion temperature sensor, high limit stat and shall also include secondary flow and return immersion sensors.

The hot water secondary distribution system **shall** be a pumped return.

### 3.9.37 Energy and Water Metering

#### 3.9.37.1 General

Usage of the following utilities shall be displayed and logged as hourly, daily and weekly values.

#### 3.9.37.2 Energy Metering

Allowance shall be made for the recording and compilation by tables and graphs of the sub-metering of gas, water and electricity sub-meters as listed below.

#### Electricity

4No Electricity Meters serving

- GP Surgery
- 2<sup>nd</sup> Floor Demise
- Pharmacy
- Central Services Board

Sub meter for the Mechanical Control panel

Sub meter for the Air conditioning plant x 3

Pulsed or Modbus connection to monitor the energy generated by the PV System

#### Cold Water

Utility Meter

Sub meter on entry to the building

Sub meter to cold feed to DHWS calorifier

Sub meter to Pharmacy

Sub meter to 2<sup>nd</sup> Floor demise

#### 3.9.38 Fire Alarm Systems

Provide a fire alarm input from the fire alarm panel to control the fire alarm actions described in the preceding sections. Display this input as an alarm.

#### 3.9.39 Displays, Status and Monitoring

Provide schematic graphic screen displays representing all plant items together with building plans and detailed floor layouts giving location of sensors and equipment. Graphic displays shall indicate sensor values, damper and valve positions, alarm status, input and output status and any other condition required by the Engineer.

Building plans shall be fully detailed, generated from Architects general arrangement drawings and shall include a building elevation/section, overview of each floor plan and detailed part floor plans as required to present the information clearly. Facility shall be available from the floor plans to automatically link to the plant item serving a particular area and to the software logic diagrams for the controls shown on that floor plan.

Logic block diagrams shall be produced and presented as dynamic graphic images for every control routine of every plant or controlled item. For example, a main air handling unit shall have logic graphics for the entire damper control routine, for the heating valve routine, for the fan speed control, and for the smoke override logic. The logic diagrams shall show the block function together with the input and output values dynamically updated at regular intervals.

User adjustable set points shall be readily accessible via graphic screen displays connected to relevant plant schematic displays, for adjustment within pre-defined limits.

The BMS system shall have sufficient memory to enable all data to be monitored and recorded for a period of 12 months at 5 minute intervals and have the ability to be expanded at a later date if found necessary.

The main boiler house panel shall have connections for a laptop computer and shall enable the controls logic and plant room graphics to be displayed. The air handling unit interfaces shall have connections for a laptop but shall be capable of controlling and monitoring the AHU only.

#### 3.9.40 Typical Points Schedule

The following is a typical points schedule for development by the Services Contractor under the detailed design duties.

##### Main Boiler House Control Panel

DESCRIPTION OF PLANT	OUTPUTS		INPUTS		COMMENTS
	DO	AO	DI	AI	
<b>Heating Plant</b>					
Heat Pump enable	3				Sequence control
Heat Pump pressurisation unit			1		Fault VFC
Buffer Vessel temperature				1	Immersion sensor
Secondary pumps enable	1				No1/No2 select
Secondary pumps flow failed			1		DP switch



DESCRIPTION OF PLANT	OUTPUTS		INPUTS		COMMENTS
	DO	AO	DI	AI	
Electric Boiler Enable	1				
Calorifier Shunt Pump Enable	1				Time control
Calorifier Shunt Pump Fault			1		
DHWS Return Pump enable	1				Time control
DHWS Return Pump flow failed			1		Current switch
Cylinder Low level Dual High Limit/Control Thermostat - ASHP				1	Immersion sensor
Cylinder High Level Control Thermostat – Elec Boiler				1	Immersion sensor
High Limit Thermostat			1		Immersion stat
DHWS Flow temperature				1	Immersion sensor
DHWS Return temperature				1	Immersion sensor
Overdoor Heater Enable	1				
Overdoor Heater Fault			1		
<b>Utility Metering</b>					
Pulse meters			15		VFC
<b>Fire Alarm Interface</b>			1		VFC
<b>Ventilation</b>					
Extract Fan 1 Enable/Fault	1		1		VFC – Time Control
Extract Fan 1 Enable/Fault	1		1		VFC – Time Control
Extract Fan 1 Enable/Fault	1		1		VFC - Time Control
<b>Air Conditioning System and HRUs</b>					
AE200 integration					BACnet
ITouch DCM601B51 Integration					BACnet

#### 3.10 COMMISSIONING

All major items of equipment shall be commissioned by the equipment manufacturer or his appointed representative and set to work in the manner intended.

The entire Mechanical Installation shall be also commissioned in accordance with the follow CIBSE Commissioning Codes.

Code A      Air Distribution Systems  
 Code C      Automatic Controls  
 Code W      Water Distribution

##### 3.10.1 General Testing & Commissioning

###### BSRIA Applications Guides

AG 2/89	The commissioning of Water Systems in Buildings, excluding Part A
AG 3/89	The commissioning of Air Systems in Buildings, excluding Part A

### BSRIA Technical Note

TN 14/86

Instruments for Building Services Applications

### British Standards

All relevant British Standards and Codes of Practice expressed or implied in the above documents.

### Manufacturers Literature

All relevant manufacturers' literature containing recommendations for testing, regulating, setting to work etc.

In unusual cases where such recommendations are at variance with the basic principles of the documents above, the approval of the Engineer must be obtained in writing regarding the procedure to be employed.

In general, however, the manufacturer's literature and recommendations shall be considered complementary and/or supplementary and shall be incorporated into the basic methods set out in the above documentation.

### **3.10.2 Commissioning Sequence**

The Contractor shall commission the mechanical services in the following sequence:

- Visual inspection of each service installation (including within service ducts and suspended ceilings) and completion of the appropriate inspection certificates.
- Test all distribution systems in accordance with requirements of CIBSE Commissioning Codes, HVCA Guides, and British Standards applicable to the equipment in question.
- Commission the mechanical equipment and systems, making all necessary adjustments to achieve the design Particular requirements. Complete all completion certificates.
- The Contractor shall hand over all inspection, test and completion schedules/certificates to the Clerk of Works who will require the equipment/systems to be re-tested and commissioned in his presence. Once satisfied he will sign the certificates in the witness column. The Contractor shall then send copies immediately to the Engineer for approval/ comment.
- Snagging lists should be produced by the Clerk of Works and distributed to the Main Contractor, Contractor, Architect and the Engineer. Defects should be cleared at the earliest opportunity. Once complete, the Contractor shall send the defects list to the Engineer with the relevant items crossed off and signed. The Clerk of Works will then inspect the installation and, once satisfied, sign the snagging list and send a copy to the Engineer.
- As Fitted drawings should be passed to the Clerk of Works for inspection and signature and then sent to the Engineer, together with the Maintenance Manuals.

- On completion of the above, the agreed systems and equipment shall be demonstrated to the client. This will include instruction in accessibility, safe operation and maintenance procedures based on manufacturers' recommendations. If the Contractor cannot give a satisfactory demonstration he shall include within his tender for specialists to carry out the demonstration on his behalf.
- The Contractor shall produce a commissioning report detailing the services.

#### 3.10.3 Commissioning of the Systems

The Contractor shall include and make full allowance for carrying out the balancing, commissioning and setting to work all the installations as shown on the mechanical services drawings and described in the corresponding specification.

The Contractor shall obtain from the relevant manufacturers prior to commissioning on site all current wiring diagrams for all electrical equipment associated with the plants being commissioned, including motor control circuit details and interlock arrangements.

The design data for items of plant and equipment is summarised on the design drawings and in the specification. The Mechanical Contractor will develop, prior to the commencement of his work, a method statement detailing how he intends to commission the works. This method statement will be submitted to approval to the Engineer.

Equipment and commissioning schedules shall be completed by the Mechanical Contractor, during commissioning, indicating the design conditions, site test readings and observations.

Upon completion of final balancing and commissioning of the systems the Mechanical Contractor shall submit his test results in duplicate to the Engineer for approval, prior to witnessing.

The site test measurements shall not be approved by the Engineer until they concur with the design conditions.

Upon arrangement in writing by the Engineer of the test results, and observation that the systems are fully commissioned, the installation can only then be considered for acceptance and as being ready for handover.

The approved equipment and commissioning schedules shall then be incorporated into the Operating and Maintenance Instructions by the Mechanical Contractor.

The following tolerances shall be applied to site measurements of air flow:-

<b>Terminal/Unit</b>	<b>Branch</b>	<b>System</b>
97% to 123%	97% to 113%	97% to 108%

The following tolerances shall be applied to site measurements of water flow:-

<b>Main</b>	<b>Branch</b>	<b>Terminals</b>
-0% to + 5%	-0% to + 5%	-0% to + 5%

The Contractor must indicate of his working drawings the location of test holes in the ductwork.

Should any of the tests shown that the system or its components do not meet the specified

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requirements, then these shortcomings shall be reported to the Engineer together with a report on the action which the Contractor has taken to determine the cause of the problem. Reporting any shortcomings shall not relieve the Contractor of the responsibility of determining the source of the problem.

Should the Contractor consider that he cannot obtain repeatability or any test at Particular locations due to site constraints, he must inform the Engineer, in writing, prior to the commencement of any commissioning, of these positions. In the absence of any such notice it will be assumed that the Contractor has satisfied himself that the system can be regulated within the tolerances specified.

### 4 ELECTRICAL SERVICES

#### 4.1 SCOPE OF WORKS

The scope of works shall generally comprise of the production of co-ordination, installation drawings, supply, installation, testing, commissioning, setting to work and demonstration of the following:

- Main Incoming Electrical Supply and Liaison with Northern Power Grid
- Liaison With Clients Designated Energy Provider for Installation of Meters and Energisation
- Main Incoming Telecommunications and Internal Distribution
- Panelboard, Distribution Board And Meter Room Installation
- Containment Installation.
- LV Sub-Main Distribution Cabling
- Earthing Installation.
- Distribution Boards and Consumer Unit Installation
- Internal Lighting Installation.
- External Lighting Installation
- Emergency Lighting Installation.
- Small Power Installation.
- Electric Vehicle Charger
- Fire Alarm System and Monitoring
- Intercom System
- Access Control System.
- Voice and Data Installation.
- Intruder Alarm System and Monitoring
- CCTV System.
- Digital TV Installation.
- Electrical Services to Mechanical Plant Installation.
- Lift Power Supplies
- Lightning Protection
- Testing and Commissioning.
- Services Identification.
- Demonstration of Electrical Services.
- Testing and Commissioning of Systems.
- As Fitted Drawing Information and Operating and Maintenance Manuals.
- Provision of Co-Ordinated Installation Drawings.
- Provision of Builders Work Requirements and Information Required by Main Contractor Including Marking Out on Site.
- Attendance At All Necessary Site, Progress Meetings Etc.

The contract covers the production of installation drawings, supply, delivery, off-loading, installation, cabling, wiring, connecting, and making off, testing, commissioning, demonstration and handing over in a complete and satisfactory working order.

The Contractor wherever necessary shall pay all fees to manufacturers, suppliers, inspectors, etc. for attendance, commissioning and testing of any part of the electrical plant or items of equipment included in this Contract.

The Design shall be in accordance with all NHS Health Technical Memorandums and Health Bulletin Notes.

## 4 ELECTRICAL SERVICES



The installation shall comply with BS 7671:2018+A2:2022 18<sup>th</sup> Edition IET Wiring Regulations for Electrical Installations.

### 4.2 MAIN INCOMING ELECTRICAL SUPPLY

#### 4.2.1.1 General

The Contractor shall supply, install, test and commission all works as necessary to facilitate connection, distribution and metering of the electrical supply to serve the following:

- Landlord Area
- Medical Centre
- Pharmacy
- Dentist

The contractor shall do an application for (and include within their Tender for all associated application costs) a new electrical supply sizes as per the below:

Description	Quantity	Voltage/Frequency	kVA
Landlord Area	1	230/400V, 50Hz	69
Medical Centre	1	230/400V, 50Hz	60
Pharmacy	1	230/400V, 50Hz	11
Dentist	1	230/400V, 50Hz	40

A new supply's will be provided to each area to NPG's requirements.

The Contractor shall include for all liaison and attendance with the Clients Energy Supplier for installing the energy meters and therefore ensuring the supply is energised.

The Contractor shall install suitably rated tails / sub-mains from the incoming utility ISU/ MSDB to the adjacent retrospective panelboard.

The Contractor shall provide all cabling and terminations into meters etc, and include for coordinating all builders works and containment routes through-out the building associated with the electricity supply including sleeves, containment for the electricity supply from the basement up to the tenants consumer units.

The whole of the floor area in front of wall mounted electrical equipment shall be provided with a safety mat with a minimum width of 1metre. The mat shall be manufactured to the requirements of IEC EN61111: 2009 Class '0'.

### 4.3 MAIN INCOMING TELECOMMUNICATIONS

#### 4.3.1 General

The Contractor shall allow for all attendance and liaison for the external services telephony and broadband services as follows:

- Dual Path IP and GSM connection For Fire / Security System (For Connection to ARC – Alarm Receiving Centre)

- Landlords Broadband Line for CCTV, Access Control Remote Access/Maintenance
- Telephony and Broadband for Medical Centre, Pharmacy, Landlord, Dentist

The main incoming telecommunication ducts are to enter within the ground floor plant room. The main IT room is on level 1 at the opposite end of the building to the incoming plant room. The Contractor will run free issued Openreach internal grade fibre cable between the incoming position and the main IT room and terminate into the data cabinet.

Application and payment of the high speed broadband connection and telephony services shall be carried out and paid for by the Contractor. The contractor shall liaise with the client and the clients IT specialist in a timely manner (at beginning of the project) to complete this.

Emizon dual path monitoring (IP/LAN and GSM Sim Card) for the fire alarm. BT Redcare dual path monitoring (IP/LAN and GSM Sim Card) for the Security Alarm and for the passenger lift will be applied for by the Contractor on behalf of the Client.

Allow for 12 months line rental prepaid, 12 months off site monitoring to a nominated station and routine maintenance of the intruder and fire alarm system for 12 months.

### 4.3.2 Installation Philosophy

The Contractor shall allow for a containment system to be installed from the ground floor incoming external service provider location via the ceiling voids and electrical risers for installation of the telephony and broadband cabling.

## 4.4 MAIN LV PANELBOARD

### 4.4.1 General

The Services Contractor shall supply, install, test and commission a complete system of low voltage switchgear. This shall comprise of a wall mounted panelboards located within the ground floor plant room and throughout the building as identified on the schematic and drawing layouts.

The Services contractor shall allow for all cable tails between the utility ISU/ MSDB and the retrospective panel board as identified on the schematic and drawing layouts.

Floor Level	Description	Type/Size
Landlord	Main Panel Board (MPB)	Schneider Powerpact 4 / 400A TP & N 8Way
Medical Centre	Main Panel Board (MPB)	Schneider Powerpact 4 / 400A TP & N 8Way
Pharmacy	Distribution Board (DB)	Schneider Acti 9 125A TP & N 16Way
Dentist	Main Panel Board (MPB)	Schneider Powerpact 4 / 400A TP & N 8Way

### 4.4.2 Construction

The panelboard board shall comprise of a wall mounted front access arrangement constructed to BS EN 60439 Part 1 Form 3b Type 2 as follows:

- Busbars shall be separate from functional units

- Functional units shall be separated from each other
- Functional units shall be separate from incoming and outgoing terminals
- Busbar separation shall be by means of ridged barriers or partitions

Busbars shall be completely segregated via 2mm thick sheet metal partitions.

The panelboard board shall be rated for up to 36kA for 1 second fault rating to ASTA or approved certification.

The main panelboard shall be equipped with incoming/outgoing MCCB's and metering as necessary to provide a complete operating system. All circuit breakers shall be located in their own separate sections.

Stacking of outgoing devices shall ensure adequate cable space is allocated and there is no reduction in device capacity.

Moulded-case circuit breakers shall comply with BS60947 -2. Devices shall be triple or single pole plug in type with a separate, bolted, removable copper neutral link located within each compartment, unless detailed otherwise. They shall have the voltage and current ratings, rated duty, rated short-circuit breaking capacity and rated short-time withstand current as required.

Each MCCB shall have a facility for pad-locking in the 'OFF' position.

Copper work shall be provided as necessary to allow multiple single core or multi-core cables to be connected to each phase and neutral. For smaller outgoing services adequate cable fixings and bracing arrangements shall be provided within the rear cable ways within the panel. Spare/space devices shall not be infringed by the original cable installation.

Gland plates shall be provided throughout to allow termination of all cables.

All parts of the enclosure shall be bonded to the earth bar via flexible connections

Where applicable all meters shall be cabled back to one common marshalling section on the panel to assist in the connection/future maintenance of the control system. The marshalling section shall include all terminals, fuses, timers, relays together with wiring diagrams and directories. The marshalling section shall be lockable.

The main busbar to the panel board shall be electro-plated, fully braced. All neutral bars shall be full size as the phase bars.

All joints, cable connections, current transformer locations shall be fully accessible for maintenance and replacement.

The panel board and ways shall be identified by suitable engraved laminated labels that are secured by fixing screws.

Transient Voltage Surge Suppressor (TVSS) shall be connected to the panel board busbars with integrated display unit.

The surge protection units shall be sited integral to the switchgear and interconnected with as short as possible cable leads. The length shall not exceed the manufacturer's recommendations.



The unit shall be capable of handling a surge of 20KA on an 8/20 microsecond rise and clamp the circuit within less than 10 nanoseconds.

The unit shall have been tested and certified to BS EN 62305.

The unit shall have indicator lights for status purposes. The lights shall be a combination of red and green to indicate the status of the system protection.

The level of protection shall be to LPZ3 to give the highest level of protection possible.

### 4.5 DISTRIBUTION BOARDS & CONSUMER UNITS

#### 4.5.1 General

The Contractor shall supply, install, test and commission a distribution board and consumer unit installation throughout the building as detailed in this Particular Specification and on the accompanying layouts.

The distribution boards shall comply with BS EN 60439-3 and shall be supplied and installed complete with lockable MCB's/RCBOs, glanding pieces and integral isolating switch. External protection shall be to IP3X to BS EN 60529. They shall have a fault withstand capability fit for the characteristics of the supply.

Combined MCB / RCD's shall comply with BS EN 60898 and IEC 1008 and have 30mA sensitivity. These shall be provided as required by BS7671 to all required circuits.

A minimum of 25% spare capacity in both rating and ways shall be provided on the distribution boards. The distribution boards shall be provided with a lockable cover.

#### 4.5.2 Distribution Boards

Area Served	Description	Type/Size
Ground Floor	Medical Centre Plant Room - DB PLANT	Schneider Acti 9 / 125A, 8 Way TP & N DB
Ground Floor	Medical Centre Plant Room - DB EX	Schneider Acti 9 / 125A, 6 Way TP & N DB
Ground Floor	Medical Centre general areas Ltg/Pwr - DB OF	Schneider Acti 9 / 125A, 8 + 14 Way TP & N DB Split Metered
Ground Floor	Medical Centre clinical areas Ltg/Pwr - DB CL	Schneider Acti 9 / 125A, 8 + 8 Way TP & N DB Split Metered
First Floor	Medical Centre general areas Ltg/Pwr - DB OF1	Schneider Acti 9 / 125A, 8 + 14 Way TP & N DB Split Metered
First Floor	Medical Centre clinical areas Ltg/Pwr - DB CL1	Schneider Acti 9 / 125A, 8 + 8 Way TP & N DB Split Metered
First Floor	Medical Centre L0 and L1 - DB IT	Schneider Acti 9 / 125A, / 125A, 10 Way SP & N DB
Second Floor	Medical Centre general areas Ltg/Pwr - DB OF2	Schneider Acti 9 / 125A, 8 + 14 Way TP & N DB Split Metered

Second Floor	Medical Centre clinical areas Ltg/Pwr - DB CL2	Schneider Acti 9 / 125A, 8 + 14 Way TP & N DB Split Metered
Pharmacy	Pharmacy Ltg/Pwr - DB PH	Schneider Acti 9 / 125A, 8 + 8 Way TP & N DB Split Metered
Externals	Feeder pillar DB EVC	Schneider Acti 9 / 125A, 6 Way TP & N DB

The general lighting and power distribution board shall be from Schneider Electric Acti 9 PoN (plug on neutral) range complete with electronic surge protection for compliance with BS EN62305 and as detailed on the LV distribution schematic

Doors shall have adequate fastenings with provision for locking in the closed position.

A minimum of 25% spare capacity in both rating and ways shall be provided on the distribution boards.

A multi-terminal bar for the circuit protective conductors shall be provided in each distribution board, with one terminal for each outgoing circuit. It shall be directly connected to the earthing terminal without dependence on the exposed conductive parts of the enclosure. Extensions to the multi terminal bar shall be provided as required for duplicate high integrity earthing requirements.

Where multi-service units are required to house contactors, meters and timers etc, they shall be of the same size, colour and construction as the MCB distribution boards with lockable hinged doors and provided complete with the accessories required. All multi-service units shall be complete with marshalling terminals for outgoing cabling.

To facilitate circuit identification and testing, each cable core connected to an MCB, contactor, timer etc. and earth or neutral bar shall be fitted with slide-on identification sleeves i.e. 2/1L1, 3/2L1, L2,L3 etc.

### 4.5.3 Miniature Circuit Breakers

The time/current characteristics of the MCB's shall concur with the following:

Lighting	Type C
General Power	Type C
Mechanical Plant	Type D

MCB's shall comply with BS EN 60898 and BS EN 60439.

Combined MCB / RCD's shall comply with BS EN 60898 and IEC 1008 and have a type C characteristic and 30mA sensitivity. These shall be provided as required by BS7671 18<sup>th</sup> Edition IET Wiring Regulations.

### 4.5.4 Circuit Charts & Identification

Distribution circuit charts, produced to laser print quality, shall be provided in accordance with BS7671 18<sup>th</sup> Edition IET Wiring Regulations, and shall include actual room designations, which the Contractor shall obtain directly from the agreed room names with the Client.

The approved distribution charts shall be installed in a durable plastic sleeve and fixed permanently to the distribution board.

To facilitate circuit identification and testing, each cable core connected to an MCB, contactor, timer etc. and earth or neutral bar shall be fitted with slide-on identification sleeves i.e. 2/1L1, 3/2L1,L2,L3 etc.

Cable terminals shall be suitable for the number, size and type of cables. Adequate spacing shall be allowed for spreading of cable tails to avoid stress on the insulation or terminals; if necessary, extension boxes shall be fitted to standard enclosures. Terminals for neutral conductors for three phase and neutral circuits shall be the same size as for the phase conductor, except where reduced section neutral cable cores are indicated.

### 4.6 PHOTOVOLTAIC

#### 4.6.1 SYSTEM REQUIREMENTS

The Contractor shall design, supply, install, test and commission a Solar Photovoltaic (PV) Array system to meet 11,000kWhr per annum for Part L and BREEAM compliance.

The solar PV array area and quantities should be agreed with the client beforehand. A feasibility study should be undertaken to determine:

1. Agreed positioning on site.
2. Roof structure load strength is sufficient for proposal.
3. Payback to cost ratio.
4. Actual consumption of school compared to generation.

All works to be carried out by suitably qualified, experienced and accredited Contractors, whose works and responsibilities shall include the following for this project:

- a. Site surveys
- b. Financial and energy/CO2 saving assessment report via Solar PV Sol software or equal
- c. Whole life cycle assessment report
- d. Full technical submissions of the System and Product Guarantees
- e. System design (electrical, photovoltaic and structural)
- f. Design schematics, PV layouts, sections, elevations
- g. Distribution Network Operator/ROO-FIT application processing
- h. Design, installation and product warranties
- i. Installation, coordination and setting out drawings
- j. Supply and installation of all PV system equipment
- k. Scaffolding and safe access design/installation.
- l. Project Management, site supervision & co-ordination
- m. Testing and Commissioning
- n. O&M manuals and As Fitted drawings
- o. Metering and monitoring and post installation evaluation of forecast versus actual
- p. Maintenance

The works shall comprise of the design, supply, installation, testing, commissioning, demonstrations, metering and monitoring of all PV system equipment as part of a full turn-key package to include solar PV panels, roof mounting support/rails/fixings, inverters, DC string cabling and connectivity from inverters and between PV panels, containment, FIT generation meter, graphical displays, low voltage

AC cabling, isolation and circuit protection from PV distribution boards to inverters, G99 protection and fire / emergency power off interfacing.

The PV system shall be connected to the utility electric grid through adequately sized grid-interactive inverters. The PV system array configuration shall match the inverter input range.

All electrical wiring associated with the PV installation shall be carried out in accordance with this performance specification and BS 7671 Section 712.

The Contractor shall obtain a connection agreement from Northern Powergrid and place an order to provide connection of the PV system to the grid for parallel generation. The system shall be installed in accordance with relevant regulations and standards, in particular with G99/1.

The Contractor shall make all necessary applications and registrations for the ROO-FIT Feed In Tariff scheme and associated metering supplies, to provide a fully registered system on behalf of the Client.

The systems shall be designed for outdoor installation in the Yorkshire area and supplied equipment shall be rated and warranted to withstand and operate under the associated external and environmental conditions in this area.

All equipment shall comply with all the appropriate European and British standards that apply at the time of installation.

Shall be certified to IEC 60947 as a disconnection means and to VDE 2100-712, therefore Better suited for future insurance requirement.

The Contractor shall submit all details and working drawings prior to the installation to the Client and Engineer for comment.

The Contractor shall be fully responsible for all attendance and liaisons with Northern Powergrid.

### 4.6.2 SOLAR PV MODULES

The PV modules shall be of monocrystalline technology in order to provide enhanced efficiency of the PV system. In addition, MPPT Power Optimisers shall be provided individually to each module to provide higher efficiency of the system.

Module shall be tier one product with in-date Power Guard Insurance.

The modules shall be black with black trim to mitigate glare and glare and glint potential.

Modules shall comply with international standard IEC 61215. Modules shall carry a CE (European Conformity) mark. Not to be confused with CE (China Export).

Shall hold IEC 617011 Salt mist corrosion resistance and IEC62716 ammonia corrosion testing.

The arrays shall be positioned to maximize sunlight gain and have no or minimal shading.

Each PV module shall be warranted by the manufacturer for at least 90% of its rated power for 10 years and 80% of its rated power for 25 years from the date of system acceptance. All modules shall be selected from the MCS accredited list of products.

### 4.6.3 SOLAR PV INVERTERS

The Solar PV System shall use multiple inverter(s), designed specifically for utility grid interconnection of photovoltaic arrays, and be capable of automatic, continuous, and stable operation over the range of voltages, currents and power levels for the size and type of array used.

The inverters shall be located as close to the solar PV array as practically possible in order to minimise the lengths of DC cables required. Inverters shall have suitable IP protection for the installation location.

All DC electrical connections, both for series and parallel connections shall be made using multi-contact connectors and a minimum 6mm DC cable using the shortest practical cable lengths possible and supported using suitable containment.

Inverters shall be mounted as per the inverter's supplier installation instructions along with both the DC and AC electrical isolators, junction boxes and other safety equipment. All brackets, supports and containment shall be included.

The inverter locations shall be such that access can be easily made in order to reset the units after periods of mains failure and for maintenance.

Comply with G99/1 and hold a valid type test certificate of incorporate a DNO approved G99 Relay.

Have a minimum peak Euro weighed efficiency of 96%.

AC outputs from each inverter shall be connected together in a suitable manner and fed to the main distribution board in 3 phase configuration.

Inverters shall be provide module level monitoring therefore remote monitoring instead of diagnostics work at dangerous heights.

The inverters shall be connected to the local area network to enable access to the web based portal, a LAN connection shall be provided by others.

The inverters shall have No high DC voltage greater than 50V DC during installation or maintenance, as the power optimizers and DC cables automatically de-energize when inverter is disconnected or grid power is shut down.

The inverters shall have an automatic visual indicator showing whether the system is on-line or not.

The inverters, AC and DC devices and any other required electronics shall be installed within the external plant compound.

All electrical wiring associated with the PV installation shall be carried out in accordance with BS 7671 Section 712.

Voltage drop in array DC source circuits shall be limited to no more than four percent (4%) including losses in conductors and through all fuses blocking diodes and termination points.

A maximum of 3 No strings per inverter shall be provided with a maximum string current of 15A DC during operation.

Modules shall include blocking diodes to prevent reverse currents. These diodes shall have low voltage drop to meet the requirements above and have a voltage and current ratings (at temperature) at least twice the open-circuit voltage and short-circuit ratings of the source circuits.

Array ground-fault protection devices shall be included as part of the inverter packages. These devices shall be capable of detecting array ground faults, shunting the fault current to ground and disabling the array until the fault has been cleared.

Rotary DC isolators are to be incorporated in the design of the electrical installation regardless of the presence of an integrated DC switch/isolator on the inverter. DC isolators shall be tested to BS EN 60947-1 and BS EN 60947-3

The inverter shall be capable of withstanding the maximum array voltage and current. This shall include any initial overvoltage period.

The inverters shall be capable of completely automatic operation, including "wake-up," "sleep" mode and shutdown after loss of utility power. In the automatic mode, the inverters shall monitor the available PV array power and voltage, and when a predetermined amount of power threshold of 200 watts maximum is available and the array voltage is within the normal starting voltage, the wake-up sequence shall be initiated. The PCS shall monitor the AC line voltage and frequency and, when the AC voltage and frequency is within the normal operating range, the synchronization process shall be initiated prior to establishing line-tie. The shutdown sequence to place the PCS in "sleep" mode shall not be initiated above 200 watts of array power. The DC power source and/or the AC circuit may remain connected in the "sleep" mode to provide monitoring and instrumentation power during night time operation.

The system shall be labelled in accordance with G99/1.

All DC and AC equipment all cables shall be adequately labelled. All labels shall be clear, easily visible, constructed and affixed to last and remain legible for the lifetime of the system.

All PV system design shall be carried out by a qualified Electrical Design and Renewables Engineer.

### **4.6.4 EARTHING AND LIGHTNING PROTECTION**

If an existing lightning protection system (LPS) exists, then bonding the PV array to the lightning protection is required to comply with BS EN 62305 and BS7671. If an existing LPS does not exist, then bonding is not required. All metallic systems components shall be bonded to the earth system.

### **4.6.5 PV ARRAY MECHANICAL DESIGN**

The Contractor shall provide all supports and fixings required for assembling the photovoltaic modules as well as structurally attaching them to the roof.

The mounting system shall be compatible with the specific roofing system.

All mounting hardware shall hold a minimum of 10-year warranty.

The PV installation shall be designed to withstand wind loads as well as other site and environment considerations.

The arrays shall be mounted on stand-offs, to allow array ventilation. This shall prevent excessive temperatures that decrease output and increase module degradation.

Full detailed assessments and structural calculations shall be carried out by a Chartered Structural Engineer.

### **4.6.6 MONITORING AND METERING**

Metering at the inverter output shall be installed to display and record energy delivered by the PV system (kWh) and instantaneous power output (kW).

A kWh building export meter, approved by OFGEM, with appropriate reading shall be provided. The Contractor shall contact the Electricity supplier and to arrange for the installation of this meter.

Data logging system including irradiance and temperature shall be provided.

Performance based monitoring of the panels, sensors and inverters shall be provided, monitored and reported via web interface.

Access via a web-based portal to be provided and demonstrated, including monthly reports detailing actual versus predicted performance.

A graphical display shall also be provided in the main entrance to demonstrate the actual system performance since date of original installation. The visual display shall be agreed with the Client.

The generation meter shall Elster MT382 MID compliant (or equal) complete with current transformers and be enabled for remote reading.

### **4.6.7 G99 RELAY PROTECTION AND DISTRIBUTION PANEL**

#### **4.6.8 Design Philosophy**

The Contractor shall appoint the services of a specialist to design, supply, install, test and commission the G99/1 relay protection and inverter distribution panel in accordance with this Performance Specification.

This panel shall include the following as a minimum:

- a. Sheet Steel Enclosure (External protection shall be to IP54 and IP20 Internal to BS EN 60529)
- b. Suitably Rated 4-Pole Door Mounted Lockable Isolator
- c. Suitably Rated 4-Pole Contactor with Auxiliary Contacts
- d. Mains Pro ComAp G99/1 Relay

- e. Control Fuse Protection
- f. System Healthy Indicator Lamp
- g. System Fault Indicator Lamp c/w volt contact for connection to site wide BMS.
- h. 13A Test Engineer Test Socket
- i. MID Approved Generation Meter c/w CT's c/w pulse output for connection to side wide BMS
- j. Outgoing Ways Inverter Circuit Protection Devices
- k. G99/1 Relay interface with existing Standby Generator, Fire Alarm System and EPO.
- l. Surge Protection to BSEN62305

The whole of the floor area in front of panel shall be provided with a safety mat with a minimum width of 1 metre. The mat shall be manufactured to the requirements of IEC EN61111: 2009 Class '0'.

The Contractor shall ensure the walls are clean, dry and free from loose debris. The walls shall be provided with class 'O' fire retardant chipboard to BS 476, Part 6.

Prior to installation the exact layout shall be planned and detailed by the Contractor and submitted to NOVO Integration Ltd for comment / review.

### 4.7 METERING & MONITORING

#### 4.7.1 General

The Services Contractor shall supply, install, test and commission a metering and monitoring installation throughout the building as detailed in this Particular Specification and on the accompanying layouts.

All meters shall be linked to the BMS system which shall be used to record the energy usage for the various tenants and systems to enable billing information to be accurately split by tenant usage. The building services contractor shall liaise with the BMS provider at in a timely manner to ensure a fully compatible and functional system is installed. Meters shall be fully compatible with the BMS system

#### 4.7.2 Panelboard

The panel board shall be equipped with a Powerlogic PM5110 digital meter on the main incomer capable of displaying the following data:

- Voltage phase to neutral all phases
- Voltage phase to phase all phases
- Current all phases
- kWhr with pulse output
- kVA maximum demand
- kVAr maximum demand
- Frequency
- Harmonics

Allowance shall be made for all associated CT metering kits and extension enclosures as required to provide a fully operational system.



The metering communications protocol shall be matched to suit the monitoring / data logging equipment i.e. RS485, Modbus.

### 4.7.3 Distribution Board

Where split load metered lighting and power distribution boards are utilised Schneider iEM3255 meters shall be installed integral to the distribution boards, capable of displaying the following:

- Voltage phase to neutral all phases
- Voltage phase to phase all phases
- Current all phases
- kWhr with pulse output
- kVA maximum demand
- kVAr maximum demand
- Frequency

Allowance shall be made for all associated CT metering kits and extension enclosures as required to provide a fully operational system.

The metering communications protocol shall be matched to suit the monitoring / data logging equipment i.e. RS485, Modbus.

### 4.7.4 Energy Monitoring System

In addition to the above an energy monitoring system shall be installed which is easily identifiable and will enable the total annual energy consumption to be monitored and recorded to meet current BREEAM requirements. This shall integrate seamlessly with the proposed metering arrangement and be from the same manufacturer as the main panelboard in which it will be installed. Provide an integral data connection into the panelboard for this system. Allow for a power supply from the plant room distribution board.

## 4.8 EARTHING INSTALLATION

### 4.8.1 General

The Contractor shall supply, install, test and commission a complete earthing and bonding system throughout the building in accordance with BS7430, BS7671 as detailed in this Particular Specification and on the accompanying layouts.

All main CPC and equipotential bonding conductors shall be connected to the main earth bar adjacent the main landlord's panelboard and each shall be labelled accordingly.

Adjacent to the main earth bars a permanently fixed plastic label shall be provided, having a yellow background and bearing in black a warning triangle and wording "WARNING – SAFETY ELECTRICAL CONNECTIONS – DO NOT REMOVE".

### 4.8.2 Main Earth Bar

Adjacent to Distribution Board, the Electrical Contractor shall supply and install a copper earth bar of suitable fault current rating and size for the number of earth connections.

Earth bars shall be of solid section brass with pre drilled terminal holes for outgoing cables and terminal hole or clamps for main circuit protection cables. The bars shall be mounted on black phenolic moulded supports and be provided with earth disconnection links for the main earth.

A bolted link shall be provided in the earth bar to facilitate easy disconnection of the earthing lead from the equipotential conductors. The bar shall be provided with an engraved label screw fixed to the building fabric stating 'MAIN EARTH BAR' in black letters on a yellow background.

### 4.8.3 Main Equipotential Bonding

Main equipotential and supplementary bonding conductors shall be LSF insulated, coloured green and yellow. They shall be installed on cable tray when run in groups and fixed using LSF coated metal "saddle" clips. Where they are installed singly they shall be fixed using LSF coated "P" clips with brass screws and nylon plugs.

LSF/Cu main equipotential bonding conductors shall be installed between the earth bar and all extraneous and exposed conductive parts including, but not limited to, the following: -

- a. Mains cold water pipes
- b. Structural steelwork
- c. Distribution Boards
- d. Primary containment
- e. Ventilation ductwork
- f. Data Cabinets (clean earth and dedicated earth termination block)

A dedicated clean earth cable of 16mm<sup>2</sup> shall also be installed to the IT server cabinet (1 No) and terminated into a dedicated earth connection block adjacent to the cabinet.

The ends of the protective conductors which are to be connected to the earth bar shall be terminated in a crimped cable socket, and bolted separately to the earth bar using brass bolts, nuts, washers and locking arrangements. All connecting faces shall be tinned.

Where the cables are terminated at the agreed position associated with each service, it shall be via a commercially manufactured earthing clamp, the type used being suitable for the Particular application.

Permanent labels shall be provided at each termination of the type specified in IET Regulations.

Each earth, protective, main or supplementary bonding conductor connected to the earth bar shall be identified by having an engraved label fixed to the cable.

At each circuit protective, equipotential or supplementary earth termination, a permanent label of the type specified in the IEE Regulations shall be provided.

### 4.8.4 Supplementary Bonding

Supplementary bonding shall be provided as required, fully in accordance with BS7671 and Guidance Note 8.

### 4.9 CABLING & CONTAINMENT

#### 4.9.1 General

The Contractor shall supply, install; test and commission a complete cable and containment system in accordance with this Particular Specification and on the accompanying layouts.

#### 4.9.2 Installation

Generally outgoing sub main cables to serve the respective distribution boards shall be fed via XLPE/SWA/LSF sub-main cables installed on suitably sized cable tray within the building.

All primary containment shall be routed above the proposed new ceilings within the voids and selected riser locations between floors as required. Careful design planning and coordination is required due to reduced depth ceiling voids and coordination with other services.

A fully recessed and flush installation shall be provided, with the exception of plant rooms, external plant compounds and risers where a surface exposed installation is permitted.

Only cabling and containment routes which are parallel to, or at right angles to the external walls of the building will be accepted and which are fully supported and fixed to the building fabric throughout their length in accordance with manufacturers load and spacing tables.

The containment shall be designed to provide a cable management system for the various wiring systems. The primary back bone containment shall be routed and coordinated on each floor. All horizontal and vertical routes shall enable a safe and easy accessible cabling installation during the works and to permit future expansion/additions when required. As a minimum 20% spare capacity shall be left on all containment.

Appropriate segregation and separation distances between the various electrical systems shall be maintained throughout in accordance with EMC requirements.

All containment shall be installed strictly in accordance with the manufacturer's installation requirements. All bends, junctions, accessories, etc. shall be manufactured components and not altered on site.

The Contractor shall carry out cabling and containment in accordance with the following:

#### 4.9.3 Cabling

SUB MAINS	
Description	Cable Type
Distribution Boards	XLPE/SWA/LSF Cu
Items of Mechanical Plant (plant rooms)	XLPE/SWA/LSF or Single Core LSF Cu
Fire Alarm Panel	LSF Enhanced Soft Skin Multicore Cu

FINAL CIRCUITS	
Description	Cable Type

Internal Lighting	Single Core LSF Cu
Internal Small Power	Single Core LSF Cu
Internal Plant Areas	Single Core LSF Cu
Three Phase Equipment	XLPE/SWA/LSF Cu
External Circuits	XLPE/SWA/LSF Cu

<b>FIRE ALARM, SECURITY &amp; ANCILLARY WIRING (Internal)</b>	
<b>Description</b>	<b>Cable Type</b>
Fire Alarm	LSF Enhanced Soft Skin Multicore Cu
Access Control	LSF Multicore Cu/ LSOH Cat 6 LSF 4 pair Cu
CCTV	LSOH Cat 6 LSF 4 pair Cu
Voice/Data	LSOH Cat 6a UTP
BMS/Metering	LSF Belden

### 4.9.4 Containment

The primary and secondary containment shall be as follows:

LV Sub Mains – Medium Duty hot dipped galvanised steel cable tray

LV Final Circuits – Hot dipped galvanised steel cable trunking

Voice/Data – Medium Duty hot dipped galvanised steel cable basket

Ancillary – Medium Duty hot dipped galvanised steel cable basket

Fire Alarm – Medium Duty hot dipped galvanised steel wire cable basket

CCTV/Access/Intercom – Medium Duty hot dipped galvanised steel wire cable basket

### 4.9.5 Cable Tray/Baskets

Only hot dipped galvanised cable tray / baskets shall be used throughout the installation.

All cable trays shall be complete with 45° gusseted corner pieces at tee junctions, crossovers and changes of direction. This is a requirement to achieve minimum bending radii of cables.

Within the ceiling void areas the cable tray shall be supported from purpose made hangers using Unistrut and threaded rod.

All cable tray, cable basket and trunking systems including accessories, bends, junctions, etc. shall be by the same manufacturer. All bends, junctions, accessories, etc. shall be manufactured components and not altered on site. The Contractor shall ensure that all containment lengths, bends, junctions, accessories, etc. are fit for purpose.

Cable basket shall be manufactured from electro plated zinc steel wire and shall be supplied with all associated accessories.

Cuts in cable tray / basket shall be carried out with the manufacturers recommended tools. Cut sections to create bends, tees etc., shall be bolted together such that the structural rigidity shall be the same as for a manufactured section.

### 4.9.6 Cable Trunking

Cable trunking where noted shall be Galvanised Steel.

All tee joints shall be flanged and, where tee or crossover bridge accessories are required, the Contractor shall ensure the same effective wiring space per compartment as the main trunking run is maintained, or alternatively provide single cable trunking to bridge between each cable trunking compartment.

Where cable trunking passes through fire compartment walling a fixed section of lid shall be installed extending 300mm either side of wall.

Partitions shall be of the same material as the trunking. The gap between partitions and trunking covers shall be a minimum to ensure that segregation of circuits is maintained.

Standard fittings shall be used and only where these are inadequate will site fabricated fittings be accepted. Fittings fabricated on site shall be comparable in construction and finish with the rest of the trunking system.

Ends of runs shall be fitted with removable covers to permit future extension.

Unless otherwise indicated, the size of trunking and ducting shall be a minimum allowing for easy drawing in of all conductors with 20 percent spare capacity and taking account of space and grouping factors.

Trunking with the cover on the side or bottom shall be fitted with removable cable retaining straps at intervals not exceeding 1000mm. Where trunking runs vertically cables shall be supported at intervals not exceeding 2m; the method of support shall allow for future easy removal of or addition to the cables and shall be submitted for the approval of the Engineer.

Factory made connectors shall be used at joints.

Trunking shall be positioned so that adequate clearance is provided for access to the wiring. It is preferred that the covers shall be on the top or sides of the trunking, but where this is impracticable covers may be on the bottom, subject to the approval of the Engineer.

Holes in trunking shall be drilled, punches or cut by ring-saw. Trunking shall be free from sharp edges and burrs.

Connections between trunking and equipment shall be by screwed couplers and bushes, flange couplings or specially fabricated connectors. Direct attachment of trunking to equipment will be permitted only if cable entries are provided with bushes or grommets or other lining methods approved by the Engineer. Cutting and bending the material or trunking to form flanges for connections to equipment will not be permitted.

### 4.9.7 PVC Conduits & Accessories

The secondary containment shall generally be carried out in high impact PVC complying with BS 4607, BS EN 50086 and BS EN 61386.

The minimum size of conduit shall be 20mm external diameter.

PVC conduit which has manufacturers or distributors codes, marks or other information either stamped or printed on it shall not be used.

Bends and sets in conduit will be made in accordance with the manufacturer's instructions. The radius of the bend shall not be less than 2.5 times the outside diameter of the conduit or such greater radius that will facilitate easy drawing-in of cables.

PVC conduits shall not be used in situations where ambient temperatures are likely to exceed 70°C or where the normal working temperature of conduits and fittings will exceed 60 °C. Conduits shall not be installed adjacent to steam or hot water pipes.

### PVC Conduit Boxes

PVC adaptable boxes shall be of moulded or fabricated PVC of square or oblong shape complete with PVC lids secured by two M4 round or pan headed screws. All adaptable boxes and lids of the same size shall be interchangeable. No adaptable box smaller than 75 x 50mm or larger than 300 x 300mm shall be employed. Boxes shall be of adequate depth in relation to the size of conduit entering them.

Conduit shall be terminated at adaptable boxes, fuse boards, switches, socket-outlet or other equipment not possessing push-in or threaded spouts by means of the appropriate size adaptors. All cemented joints are to be made to a depth not less than the diameter of the conduit being used.

### Protective Conductors

A separate circuit protective conductor shall be provided within non-metallic conduits and trunking. The conductor shall have green/yellow LSF insulation and shall be sized in accordance with the requirements of BS 7671.

An earthing terminal shall be provided at every switch and outlet position for connection of a circuit protective conductor as required.

#### **4.9.8 Galvanised Steel Conduit**

All galvanised steel conduits installed to external areas, plant rooms and risers shall be carried out in heavy gauge galvanised screwed conduit complying the BS 4568 Parts 1, BS EN 50086 and BS EN 61386.

Resistance to ingress of water and against ingress of solid foreign bodies shall be to the stated rating to BS EN 60529.

Ensure fittings are the same class and finish as associated conduit system

No conduit less than 20mm diameter or larger than 32mm diameter will be permitted.

The end of conduits shall be cut square and the length of screw threads shall be sufficient only to allow the ends of the conduit to butt solidly in all couplings and against the shoulders provided in conduit boxes.

The ends of all conduits shall be carefully reamed to remove all burrs or sharp edges after the screw threads have been cut. All dirt, paint or oil on the screwed threads of the conduit and accessories shall be carefully removed immediately prior to erection.

All conduits shall be concealed unless specifically indicated otherwise, i.e. in roof spaces, above suspended ceilings, under floors, in flooring screeds, cast in situ, and in chases cut or cast into walls and/or concrete ceilings.

Conduits installed in chases shall be fixed by means of crampets and painted 2 coats bitumastic paint prior to the chases being filled in.

### **4.9.9 Fire Stopping**

The Contractor shall allow for fire stopping which shall be provided to all penetrations through fire rated compartments. All risers shall be treated as fire compartments and shall be sealed with fire stopping material between each structural slab and any entry into the riser or exit out of the riser.

## **4.10 LV DISTRIBUTION CABLING**

### **4.10.1 General**

The Contractor shall supply, install, test and commission all necessary main distribution cabling throughout the building as detailed in this Particular Specification and on the accompanying layouts.

### **4.10.2 Installation**

XLPE / SWA / LSF / Cu multicore cables shall be used for outgoing sub mains cabling and double insulated XLPE / LSF /Cu single core cables were installed within trunking.

All mains and sub-mains cables shall be BS6724, suitable for use on voltages up to and including 600/1000V and comply with BS5467, IEC 502 and be BASEC approved.

All internal and external cables shall be supplied and installed in accordance with the Particular requirements of the cable manufacturer.

Glands shall be composite units comprising of shroud, gland, earth tag and brass locknuts, and shall be suitably IP rated for external areas.

All cables shall be fully labelled at both ends to a unique reference to be agreed.

The cables shall be labelled at every 20 meters along their length e.g."DB1 First Floor / 35mm<sup>2</sup> 4c XLPE/SWA/LSF"

Separate CPC conductors single core green/yellow LSF shall be provided and sized to withstand the full fault current.

Cables installed on the surface shall be parallel with the lines of the building construction and properly aligned.

No stacking of cables on cable tray will be permitted.

Space shall be allowed along cable routes for future additions, where indicated, and cable supports shall be of adequately sized for the ultimate load.

Cables shall be adequately supported, throughout their length except where they run through cable ducts or are buried direct in the ground. Fixing direct to the building fabric by cable cleats may be adopted for single runs subject to the approval of the Engineer.

### 4.11 INTERNAL LIGHTING

#### 4.11.1 General

The Contractor shall supply, install, test and commission a complete lighting installation throughout the building as detailed in this Particular specification and on the accompanying layouts.

#### 4.11.2 Luminaires

Luminaires throughout the installation are to be in the form of recessed, surface LED luminaires or recessed down lights.

Physical samples of each luminaire shall be presented to the client and architect for approval prior to placement of the full order. This shall be carried out early in the so as not to adversely affect the program of works.

Please refer to the luminaire schedule on the lighting drawings for further details.

#### 4.11.3 Terminations

For Luminaires mounted in non-accessible ceilings, final connection to the luminaire shall be made direct into the luminaire, and shall be protected by a heat resistant sleeving rated at 150°C. Similarly, luminaires with a high operating temperature shall incorporate heat resistant sleeving to cables.

For luminaires mounted in accessible ceilings, final connection to the luminaires shall be made via a plug in connections to facilitate local isolation and easy removal for maintenance if required.

The connections to single luminaires shall be via single way plug in ceiling roses (PCR's) with a maximum flexible cable length of 3 meters.

The connections to multiple luminaires shall be via multiway way Lighting Control Marshalling (LCM's) boxes with a maximum flexible cable length of 3 metres.

Allow for LCM's within the following (but not limited to) these areas:

- Consultation, 1No. per room
- Treatment, 1No. per room
- Clean and Dirty Utility, 1 No. per room



- Waiting Areas, 4No. per room
- Staff Room, 1No.
- Offices, 1 No. per room

Where luminaires are to be controlled in groups; multi channel LCM's shall be utilised.

Flexible cables shall be of 1.5mm<sup>2</sup> minimum size, with maximum length of 3m. Any surplus length shall comprise of a neat coil of cable so as not to lay on the back of ceilings or be clipped to the soffit.

Flexible cable security/cord grips shall be used and adequately tightened in all instances.

Where required, a permanent live shall be provided for connection of the emergency luminaires.

Where cables terminate into joint boxes then these shall be suitable rated and accessible.

#### **4.11.4 Flexible Cables & Cords**

All flexible cables and cords shall comply with BS 6500 and BS 6004. Cables shall be 300/500V grade LSF insulated and sheathed as appropriate.

The application of the temperature and constructional features of cables shall be to suit the relevant item of electrical equipment and its operational temperature.

#### **4.11.5 Mounting**

The precise setting out of all luminaires shall be carried out by the Contractor in line with the Architects setting out layouts.

All cut outs and apertures for the luminaires which require performing by the ceiling contractor shall be clearly indicated on a reflected ceiling plan.

Recessed down-lighter type luminaires shall be fixed to the ceiling by purpose made bezels and pattresses as required.

Where luminaires penetrate fire rated ceilings of the building they shall be provided with fire hoods to match the fire rating of the ceiling.

Within suspended ceiling areas all luminaires shall be directly supported from the suspended ceiling. The Main Contractor shall ensure that sufficient supports are installed by the ceiling contractor.

Recessed luminaires shall be attached directly to the suspended ceiling where permitted. Where the ceilings are plaster, the installer shall install suitable flanged trims to the openings prior to plastering.

External luminaires and vapour-proof luminaires shall be installed with suitable gaskets on all openings to ensure the integrity of the installation. All fixings and supports in these situations shall be zinc plated, brass, or stainless steel.

Reflectors, attachments and louvres shall only be installed when all dirty trades work is completed and the Trade Contractor shall take care not to get fingerprints, marks, etc. on the reflective surface (gloves may be required).

At the time of practical completion, the installer shall clean all luminaires thoroughly to remove dust and fingerprints and ensure all lamps are in working order and of the correct wattage and type specified.

### 4.11.6 Lighting Control & Switching

Switches shall be single pole unless otherwise indicated. Their current ratings shall be 20A or as indicated, allowance being made for any inductive or capacitive load.

All switches shall be 1 way, 2 way, intermediate, momentary and/or centre retractable as required, and in cases where they are grouped together and connected to the same phase, they shall be ganged together and mounted in a multi-gang box with a common switch plate.

The finishes of the accessories shall be as follows:

Area	Manufacturer/Type	Finish
All Areas	MK Logic Plus	White
Plant /Switch Rooms	MK Metal Clad	Metal Clad
External	MK Masterseal	Grey

For all exterior situations, and in roof plant rooms, watertight switches shall be used.

All switch plates shall be positioned from finished floor level in accordance with the mounting heights stated elsewhere.

Accessory boxes shall be suitable for recess or surface mounting, as indicated. Unless otherwise indicated, metal boxes for general use inside building shall be of steel with medium category of protection against corrosion.

Accessory boxes shall be of adequate depth to accommodate the accessories without causing compression of the cables. Generally boxes shall be 35mm deep. Back boxes shall not be installed back to back.

Where multi-functional automatic detectors are to be provided then these shall be of an appropriate current rating for the switching load. Positions shall be carefully selected to provide optimum coverage and to avoid any detection "dead spots" installed strictly in accordance with the manufacturers spacing and height recommendations.

Where absence detection is provided then 20A centre retractable switches shall be provided to turn the luminaires on/off or to dim up/down as required.

The multi use room/staff room shall be capable of providing a minimum of 4 pre-set scenes via 3 No scene setting plate including manual raise/lower to permit presentations, viewing of TV / Projection Screen and for future flexibility.

All luminaires shall be DALI dimmable.

The luminaires shall be connected via Lighting Control Modules (LCM's) so that no luminaire is further than 2m. All flexible cables shall be fully supported independent of the ceiling grid via all round band or 50mm cable tray.

Manual lighting controls shall be provided to switch room, plantrooms, risers and IT rooms. Otherwise, automatic lighting controls shall be provided throughout the installation. Where there is daylight luminaires shall automatically dim according to levels present.

Common circulation areas on the ground floor shall have an override switch at reception. Luminaires shall operate by presence detection. Luminaires shall dim to a pre-set level when no presence is detected prior to switching off. Common circulation areas on the first floor shall have an override switch at the lift lobby entrance within the demise. Luminaires shall operate by presence detection. Luminaires shall dim to a pre-set level when no presence is detected prior to switching off.

Lighting controls shall meet current BREEAM requirements. Local manual control shall be provided to offices and examination rooms: on/off/raise/lower. Consultation rooms, treatment and conference rooms shall operate on absence detection and admin offices shall operate on presence detection. Stairwells shall operate by presence detection. Luminaires shall dim to a pre-set level when no presence is detected prior to switching off. Manual override shall be provided. In a position to be agreed.

External lighting shall be controlled by time clock and photocell (position tba) with manual override from the plant room.

### 4.11.7 LEDS & Control Gear

All internal luminaires shall have an LED light source.

All LED's shall be colour 4000°K (Cool White) to exceed 95 lumens per circuit watt and 90 CRI.

An average life 50,000 hours for LED is required at L70/B10.

## 4.12 EMERGENCY LIGHTING

### 4.12.1 General

The Contractor shall supply, install, test, commission and complete an emergency lighting installation throughout the building as detailed in this Particular specification and on the accompanying layouts.

The emergency lighting installation shall be in accordance with Draft European Standards PREN50171/PREN50172, BS 5266: Part 1, 2011, BS EN 1838:2013, the recommendations of Building Control and this Particular specification.

To assist escape routes to be used at all times, the horizontal illuminance on the floor along the centre line of an escape route up to 2 m in width should be not less than 1 lx.

Rooms larger than 60 m<sup>2</sup> floor area, or those having been risk assessed as needing emergency lighting, should be provided with horizontal illuminance of not less than 0.5 lx at the floor level of the area, excluding a border of 0.5 m around the perimeter.

High risk areas such as treatment rooms shall be illuminated to 50 Lux to the task area and this shall be achieved via self contained battery back up within the examination lamps.

### 4.12.2 Emergency Luminaires

The installation shall comprise 3-hour non-maintained, self-contained luminaires for exit signage and a combination of integral charger/inverter units with the conventional luminaires operating as non-maintained for a 3-hour duration emergency luminaires. Category shall be X0A180.

All emergency luminaires / inverter units must be BSI approved. All exit and final exit luminaires shall be complete with the International Standard form of Pictograms to BS 5499 Part 1 1990.

The response time for the emergency lighting system shall be no more than five seconds on loss of power supply.

Batteries shall be nickel cadmium with sealed cells and they shall be within the luminaire. Batteries shall be maintained in good condition on site with all necessary precautions being taken to prevent deterioration. On completion of the contract, they shall be handed over fully charged. Batteries shall have an expected useful life in excess of 5 years.

All exit signs shall be aesthetically pleasing i.e. the edge lit type.

Physical samples of each luminaire shall be presented to the client and architect for approval prior to placement of the full order. This shall be carried out early in the so as not to adversely affect the program of works.

The installation shall comply with BS 7671 Requirements for Electrical Installations.

### **4.12.3 Installation**

The installation shall comprise 3-hour non-maintained self-contained luminaires complete with driver/charger/inverters for all escape route, open plan and exit signage.

Where mains luminaires are converted to emergency operation using inverter and battery packs, they shall be fitted in accordance with ICEL recommendations and the manufacturer's requirements and testing procedures.

In particular, attention shall be paid to the location of the batteries with regard to the effects of high temperatures from luminaire control gear, etc., and that indicator LED's are clearly visible with the luminaire in position.

Where remote mounted batteries or inverter packs are used; these shall preferably be mounted within 500mm of the luminaire within steel enclosures fixed to the soffit or walls, or on a suitable bracket.

Inverter/battery packs shall not be laid unfixed on the back of ceilings. A readily removable access opening shall be provided for local access to battery packs mounted remotely in voids.

Wiring to self-contained luminaires shall be the same standard as the local normal lighting circuits.

Batteries shall be nickel cadmium with sealed cells and they shall be within the luminaire. Batteries shall be maintained in good condition on site with all necessary precautions being taken to prevent deterioration. On completion of the contract, they shall be handed over fully charged. Batteries shall have an expected useful life in excess of 5 years.

All exit signs shall be aesthetically pleasing i.e. the edge lit LED type with white trim.

All emergency luminaires shall be approved by the Client and Architect prior to ordering and installation.

The emergency lighting installation shall operate in the result of the loss of the total electrical power supply, together with individual local lighting final circuit failure. On failure of the electrical supply, the lamp or lamps of the luminaire shall automatically be connected to the emergency conversion unit.

All luminaires shall be complete with all necessary suspensions, accessories, lamp holders, lamps, diffusers, etc.

All external luminaires shall be IP65 rated, decorative and non-industrial.

Each emergency luminaire shall be wired from the un-switched side of the local lighting circuit to ensure the provision of a maintained supply at the luminaire.

The general lighting shall not be extinguished during testing purposes, so that testing if required can be carried out during normal business hours.

The Contractor shall include for a final test and commissioning in the presence of the Engineer and for giving appropriate instruction upon the operation of the system together with issuing a completion certificate.

All relevant certificates in accordance with BS5266 Part 1 Appendix A, will be duly completed and signed by the Contractor and handed to the Client at contract completion.

### 4.13 EXTERNAL LIGHTING

#### 4.13.1 General

The Contractor shall supply install, test and commission a complete external lighting installation as detailed in this Particular specification and on the accompanying layouts.

External lighting shall be installed to the following areas:

- Main entrance doors.
- Cycle racks
- Main site access.
- Car parking areas.
- All other access doors / fire exit doors.
- Building perimeter

The installation shall consist of IP65 rated external luminaires, refer to Luminaire Schedule for proposed new luminaire details.

Illumination to the external areas shall be provided by soffit and wall mounted LED luminaires. The luminaires shall be vandal resistant, IP65 rated and complete with polycarbonate diffusers.

Car parking and main site entrance luminaires shall be column mounted luminaires.

Particular consideration shall be given so as not to introduce any glare or light pollution and to consider any Local Authority requirements and the ILE Guidance on Reduction of Obtrusive Light. Glare / spill shields and control optics shall be provided to control and reduce any horizontal overspill from the site.

All luminaires shall be approved by the client, architect and design team and shall be of a "decorative" design.

### 4.13.2 Installation Philosophy

The external circuit shall be supplied via a digital timeclock, with photocell to the north facing elevation complete with manual override (auto/on/off) switch located in the ground floor plant room.

Cabling shall be XLPE / LSF / T&E Cu multicore where run internal to feedback entry to the building mounted luminaires i.e. front elevation.

The Contractor shall ensure that the ingress protection is not jeopardised during installation. All cables terminating direct into the luminaires shall be protected by a heat resistant sleeving rated at 150°C. Similarly, luminaires with a high operating temperature shall incorporate heat resistant sleeving to cables.

Flexible cables shall be of 1.5mm<sup>2</sup> minimum size, with maximum length of 3m.

Where required, a permanent live shall be provided for connection of the emergency luminaires.

## 4.14 SMALL POWER INSTALLATION

### 4.14.1 General

The Contractor shall supply install, test and commission a complete and functional small power installation throughout the building as detailed in this Particular Specification and on the accompanying layouts.

### 4.14.2 Installation Philosophy

The Contractor shall ensure that within office areas where PC's are used, the small power installation complies fully with BS 7671 Regulation 543.7 in relation to earthing requirements for the installation of equipment having high protective conductor currents.

It is assumed that all ring mains in office areas will have a leakage to earth of greater than 10mA. Dual earth socket outlets shall be used throughout; dual earth terminals shall also be provided at distribution boards.

All accessories, including socket outlets, shall be suitable for flush mounting except for the areas indicated elsewhere in this specification, where surface mounted accessories may be used.

The final location and height of all outlets shall be subject to final co-ordination with the furniture and equipment layouts in full agreement with the Architect.

The Contractor shall ensure there is no physical or electrical damage to accessories when they are removed from their packaging and during installation. Provide masking covers for surface mounted accessories to protect surface from paint.

Where accessories are flush mounted install front plate after painting is finished.

Align accessories horizontally and vertically. Where accessories are grouped, mount horizontally in line and parallel to each other and equidistant.

Flush mounted accessories shall generally be mounted in steel boxes and shall have adjustable grids.

Cable entry points shall be provided with appropriately sized grommets. Boxes shall be complete with brass earth connection points and shall be recessed to a depth which allows standard accessory screws to be used without extension pieces.

Appropriately sized boxes shall be used in all instances such that cables and terminations are not put under strain when the accessory is screwed back to the box.

The small power and data requirements are as follows for tender purposes:

### **i. Reception Desks**

The Contractor shall provide a dedicated switched fused connection unit to the desk mounted induction loops.

The Contractor shall provide a 3 compartment PVC dado trunking complete with twin switched socket outlets and Cat6 RJ45 voice/data outlets as per the layouts.

The reception desk services shall be carefully integrated with the reception desk joinery supplier and not adapted on site to accommodate the electrical services.

### **ii. Admin Islanded Desks**

The Contractor shall provide dedicated desk electrics to each work station which shall consist of but not limited to:

- 16A feed module length to suite desk position & 13A plug
- 4 socket MOD rotatable 3.15A
- Blank end cap

The Contractor shall liaise with all relevant parties to ensure that the requirements for desk containment are known prior to the client ordering and that the power and data to desk solution is compatible with the desks.

### **iii. CCTV Control, Monitoring and Recording Equipment**

The Services Contractor shall install a multi 3 compartment PVC dado trunking complete with 3 No dedicated twin switched socket outlets and 2 no dual Cat6 RJ45 Outlets at the landlords CCTV head end location within the first floor IT room

### **iv. Network Printers**

The Contractor shall install provide 1 No dedicated twin switched socket outlets and 2 no Cat6

RJ45 Outlets behind designated network printer locations.

**v. WiFi**

The Contractor shall install Dual Cat6 RJ45 Outlets for connectivity of WiFi Access Points to the positions as indicated.

**vi. Bedhead Trunking**

Bedhead trunking shall be designed and provided in accordance with HTM 08-03 and the BS EN standard for Medical Supply Units.

**vii. Patient Area Sockets**

The Contractor shall provide twin switched socket outlets with outboard rockers protected via RCBS within the local distribution boards.

**viii. Cleaners Sockets**

The Contractor shall provide twin switched socket outlets for cleaner's purposes at regular intervals around the perimeter and protected via RCBS within the local distribution boards. No point shall be more than 6 metres from a cleaner's socket, and every room shall be provided with 1 No general cleaners socket as a minimum.

**ix. Fire Alarm Panel**

The Contractor shall supply and install 1 No. fused connection units complete with key switch and neon indicator adjacent the panel.

The Contractor shall install 1 No Cat6 RJ45 outlet for the intruder alarm panel, terminated internally for security of connection purposes.

**x. Automatic Power Assisted Door**

The Contractor shall supply and install 1 No fused connection units for each automatic/power assisted doors.

**xi. Comms Cabinets**

The Services Contractor shall install a 1 No dedicated 16 Amp unswitched socket industrial socket outlet to allow connection to an internal power strip within each a full size (42U) comms cabinet for the Medical Practice and 1 no 24U comms cabinet for the Pharmacy Area. These shall be provided with local wall mounted isolators.

The Services Contractor shall install 1 No dual Cat6 RJ45 outlet adjacent to each comms cabinet.

**xii. Intruder Alarm Panel**

The Contractor shall install a 1 No unswitched fused connection unit complete with key switch and neon indicator for the intruder alarm panel. In addition, for tender purposes 6 No unswitched fused connection units shall be allowed for remote input/output devices i.e. RIO's.



The Contractor shall install 1 No Cat6 RJ45 outlet for the intruder alarm panel, terminated internally for security of connection purposes.

### **xiii. Access Control**

The Contractor shall supply and install 1 No unswitched fused connection units at each access controlled doors.

### **xiv. Mechanical Systems Wiring**

The Contractor shall provide and connect suitably selected and rated isolators adjacent to all mechanical items of equipment, including but not limited to:

- Outdoor AC condenser Units
- Indoor AC cassette units
- Overdoor heaters
- Heat Recovery Units
- HVAC /AC Controllers
- Extract Fans
- Electric Water Heaters/Tea Boilers
- Boilers/Pumps/Pressurisation Units

The Contractor shall allow for providing a suitable supply for the BMS control panel.

Overdoor heaters will be installed by others for wiring/connection by the Electrical Contractor. The Controls installation will be by the mechanical contractors appointed specialist.

External Mechanical equipment supplies shall be terminated in weatherproof isolators (IP65) complete with weather proof cable glands.

### **xv. Staff Room / Kitchenette Socket Outlets**

Each staff room / kitchenette shall be provided with, as a minimum:

- 2 No. twin socket outlets above the worktop.
- 2 No switched fused connection units to isolate low level single socket outlets for fridge and dishwasher.
- 2 No general twin socket outlets around perimeter of room
- 1 No. switched fused connection unit for water heater

The socket outlets shall be fed from their own dedicated 32A ring circuit complete with 30mA RCD protection.

### **xvi. Ancillary**

Ancillary small power supplies shall be provided as required including but not limited to the following items i.e. security, fire alarm, CCTV, interfaces, mechanical services, access control, intercom, TV Systems etc.

These shall be fully coordinated as required with the overall design by the Contractor.

### 4.14.3 Socket Outlets – 13amp General Purpose

All wall mounted socket outlets throughout the building shall be of 13-amp rating fitted with switches. Full sample boards of the full accessory range proposed shall be submitted to the Client for final approval

All wall mounted socket outlets throughout the building shall be of 13-amp rating fitted with switches. With the exception of plant areas, all fixed socket outlets shall be flush mounted and plant areas surface mounted.

The finishes of the accessories shall be as follows:

Area	Manufacturer/Type	Finish
All Areas	MK Logic Plus	White
Plant rooms/Vaults	MK Metal Clad	Metal Clad
External	MK Masterseal	Grey

13 amp socket-outlets shall comply with BS 1363 and, unless otherwise specified, shall be switched.

They shall be of the three-pin shuttered type mounted in appropriate boxes. The moulding shall possess high track-resisting qualities and conform to BS 1322.

Socket outlets for specific purposes shall be engraved with their use i.e. "Computer Equipment". The engraving shall be clearly visible when a plug top is inserted.

Where adhesive labels are used (for circuit references only) the adhesive shall not degrade over time or exposure to sunlight, water or extremes of temperature. The labels shall be clear transparent with black text denoting the circuit reference.

Dual earth terminal socket outlets shall be installed for all dedicated supplies to computer equipment for compliance with high integrity earthing requirements.

### 4.14.4 Fused Connection Units

Connection units shall comply with BS 5733 and unless otherwise specified shall be double-pole switched and incorporate a BS 1362 fuse. They shall be mounted as required in the appropriate box.

All outlets shall incorporate red pilot lights. The pilot lights shall be recessed into the front plate of the outlets and shall comprise red lens, neon tubes and resistors in completely sealed units.

Connections for use with flexible cord shall have a cord outlet hole in the front or side of the front plate, with suitable flexi-grip enclosing for the cord.

## 4.15 PUBLIC ADDRESS SYSTEM

### 4.15.1 General

The Contractor shall engage the services of a public address system specialist to design, supply, install, test and commission a multi-zone public address audio system to the ground and first floor waiting area in accordance with the manufacturer's recommendations, this Particular Specification, accompanying layouts and BS6259, BS 6840, BS EN 60298.

### 4.15.2 Installation Philosophy

The public-address system will have the facility to make announcements to ground or first floor independently or if required ground and first floor combined. The final arrangement shall be confirmed with the Client.

The public-address system will have the facility to make announcements and play background music.

Ensure all equipment and systems are supplied and installed to provide electromagnetic compatibility within the system and with any other systems installed in the same locations.

Demonstrate that the system meets all specified requirements and provides quality and impairment of sound reproduction as required.

The public-address system zones shall be configured so that it may be called or addressed together with or entirely separately from any other zone or combination of zones.

These shall have individual zone and volume control to comply with the following specification:

1. Paging Microphone and area announcement selection complete with zone and volume control.
2. Amplifier to receive with DAB/FM/AM/MP3 source inputs and required number of loudspeaker circuits.
3. Amplifier/s to have input/output connections to induction loop systems.
4. Ceiling mounted circular white loudspeakers with suitable frequency response/distribution and appropriate wattage to generate the correct audibility.
5. Local Volume controls

The public-address amplifier shall be installed within 19" rack and labelled accordingly. Link to induction loops in waiting areas.

Upon completion of the installation of the equipment the installer shall thoroughly test and commission the completed installation and adjust the equipment to provide the optimum performance.

## 4.16 INDUCTION LOOPS

### 4.16.1 General

The Contractor shall engage the services of an Induction Loop specialist to design, supply, install; test and commission AFILS (Audio Frequency Induction Loop Systems) in accordance with BS7594 and EN60118-4 within:

- Ground and first floor waiting areas
- Ground floor reception desk locations (2 No)
- Interview room
- Staff Room

- Bookable Room 101 c/w fused spur from local circuit
- Meeting Room 103 c/w fused spur from local circuit

All systems shall be compatible with the majority of commonly used hearing aids.

Upon completion of the installation of all induction loops the equipment manufacturer/installer shall thoroughly test and commission the completed installation and adjust the equipment to provide the optimum performance.

Take into account, during the design and site assessment:

- The use of the premises.
- Location and size of the working area.
- Whether the installation is to be permanent or subject to change.
- Construction of the building.
- Presence or planned introduction of equipment, which may produce magnetic interference.
- Presence or planned introduction of equipment, which may be affected by the AFILS.
- Mains supply type to BS 7671.
- Location and storage of AFILS equipment.
- Requirement or otherwise for a trial loop installation.
- Location of control point.
- Whether the operator is to be a hearing aid user or a person of normal hearing.

Ensure that all necessary remedial action and corrective measures required to reduce the effect of interference by nearby systems are taken to enable the performance requirements of the AFILS to be achieved. Provide such advice, as necessary, so that the effect of any such interference can be minimized.

Ensure all equipment and systems are designed and installed to provide electromagnetic compatibility within the system and with any other systems installed in the same locations

Demonstrate that the system meets all specified requirements and provides quality and impairment of sound reproduction as required.

Install commission and set to work audio-frequency induction loop systems in accordance with BS7594.

- Install loop cable in rigid plastic tube or a hardwired copper tape induction loop (installed on floor slab under floor finish). Reception to be installed to underside of desk.
- Earth metallic sheaths of loop cables in one position only. Ensure metallic sheaths of loop cables do not form a continuous circuit. Provide labelling to prohibit the use of the metallic sheaths of loop cables as bonding or protective conductors.
- Provide a permanent notice giving instructions on the use and operating of the system at the control point.
- Provide a permanent record of the control settings of the system at the control point.
- Provide signs in accordance with BS 7594 to indicate areas where an AFILS is installed and where AFILS reception is not satisfactory.
- Provide complete record of commissioning measurements of performance data.
- Verify performance of AFILS by; Instrument measurements. Subjective tests. By persons with normal hearing. By hearing aid users.

### 4.16.2 Installation

This shall include all power supplies, cabling, containment, power supplies/amplifiers, and microphones as necessary to provide a complete system.

All works shall be carefully integrated into the construction programme.

## 4.17 FIRE ALARM INSTALLATION

### 4.17.1 General

The Contractor shall engage a Fire Alarm Specialist to design, supply, install, test and commission an intelligent digital addressable automatic fire alarm system throughout the building as detailed in this Particular Specification, accompanying layouts and in accordance with BS5839: Part 1: 2017, BS EN 54 and in accordance with HTM 05.

The system shall be a Category L1.

The Doctors Surgery Fire Alarm Panel loops shall be split as follows:

- Loop 1 – Ground Floor
- Loop 2 – First Floor
- Loop 3 – Second
- Loop 4 – Spare

The Pharmacy Fire Alarm Panel loops shall be split as follows:

- Loop 1 – Pharmacy
- Loop 2 – Spare

Two way fire alarm interfaces shall be provided to provide fire / fault status between the Doctors Surgery fire alarm panel, Pharmacy Fire Alarm Panel and Landlords Fire Alarm Panel so that a fire and or fault in any area of the building is notified on each of the panels within the respective demise.

Void detection shall be provided where ceiling voids exceed 800mm including remote indication.

### 4.17.2 System Requirements

The main fire alarm system shall consist of the following main components:

The fire alarm system shall be fully Open Protocol i.e. Advanced Fire Alarm Controls Panels and Apollo XP95 /Hochiki range of detectors or equal/approved.

The main fire alarm panel shall be located at the main entrance to the Ground Floor Reception and shall be fully recessed with a stainless steel finish.

Given the nature of the building the detector types shall be carefully selected to avoid any false alarms.

Additional conduits (2 no 25mm diameter) shall be provided down to the fire alarm panels to allow the installation of future cabling if required.

The fire alarm panels shall derive their power supply from the Medical Centre and Pharmacy Panel /main distribution boards.

The system shall operate at 24 volts dc, unless otherwise indicated.

All components in a system shall be compatible with each other.

Systems involving detectors shall be so designed that removal of one detector indicates a fault but does not render other detectors inoperative.

The standby power supply shall comprise a secondary battery with automatic charger. Batteries shall be lead acid or nickel cadmium with sealed cells as indicated. The standby power supply shall have a duration as required for a monitored system for compliance with BS5839.

All devices shall be mounted on the proprietary back boxes for the associated device.

Manual call points shall be of the frangible cover type, with a protective cover of plastic. Call points shall be provided at all final exits and to meet the spacing requirements of BS 5839.

Door hold open devices shall be provided along with associated interfaces and power supply units.

Fire Alarm Interface units shall be provided to interface with the necessary plant/equipment.

Fire alarm interfaces shall be provided to, but not limited to the following:

- Mechanical ventilation systems – shut down in the event of the fire alarm being activated
- Mechanical Plant MCC's - shut down in the event of the fire alarm being activated
- Incoming gas valve – gas supply to be isolated in the event of a fire alarm
- Access control system – access control system to be turned off in the event of a full evacuation to allow all escape routes to be available in both directions
- Lighting Control Systems – any dimmed lighting to be returned to full intensity in the event of the fire alarm being activated
- Audio presentation systems – audio systems to be muted in the fire of the fire alarm being activated
- Lift Motors

A plant override switch shall be provided to bypass associated interface units during testing. This shall be clearly labelled.

Short circuit isolators shall be provided as required.

The Designer / Contractor shall provide a suitable cause and effect schedule as part of the design strategy reflective of the stage of design.

Audible alarms shall be equipped with a volume control to reduce the maximum output by at least 15%. Care in location and intensity of sounders is required in each facility. Alarm sounders shall be integral to detectors on all new systems.

Visual alarms shall be installed in all areas adjacent to audible alarms (may be a combined audio/visual alarm unit), where audible alarms may be considered inappropriate.

Zenon beacons shall be provided in all plant areas.

The fire alarm system shall be of the Analogue Addressable type. Wiring for the fire alarm system shall be red sheathed soft skin enhanced fire resisting cables such as Draka Fire Tuf Plus Enhanced (or other cables approved by NHSPS In writing). All fire alarm cabling should be mechanically secured with metal clips at centres in accordance with current guidelines.

The fire alarm installation should incorporate EMIZON monitoring system.

The fire detection system is to be addressable and the system programmed to the final room name and numbering system as agreed with the NHSPS PM for the wayfinding design and NOT to the original architectural room references which will not be used when the building becomes operational.

### 4.17.3 Installation

All wiring shall be carried out in FP200 fire rated cabling with red outer covering i.e. Prysmian FP200 / Drake FP120 cable or equal and approved. The cabling shall be fully supported throughout its entire length via a combination of the following:

- i. Installed on the cable tray/basket system where installed in groups (more than two) steel tywraps to be provided.
- ii. Fixed direct to the building fabric via "P" type red PVC coated clips (2 cables max) Plant rooms only with drops to call points and sounders in galvanised steel conduit from the high level containment.

### 4.17.4 Testing & Commissioning

The whole of the fire alarm system shall be 100% tested and commissioned by the fire alarm specialist including a complete audibility test and verification of all plant interfaces at completion of the project.

A colour building plan enclosed in stainless steel frame with perspex cover shall be provided. This shall indicate all fire alarm equipment locations and zones. The finish is to be agreed with the Architect e.g. stainless steel.

A log book shall be provided to enable records to be kept of inspections and tests of the system and of incidents, together with their cause and the action taken.

## 4.18 REFUGE ALARM SYSTEM

### 4.18.1 Design Philosophy

The Services Contractor shall engage a Refuge Alarm Specialist to design, supply, install, test and commission a disabled refuge system within the front stairwell as detailed in this Particular Specification,

the accompanying drawings and in accordance with ADPM of the Building Regulations. BS 5588 Part 8 and BS 5839 Part 9.

### 4.18.2 Installation Philosophy

The Refuge Alarm system shall consist of a refuge alarm panel adjacent the main fire alarm panel, and refuge call points at the levels adjacent exit stairs as denoted on L1 and L2. The refuge alarm panel shall have a finish to match the fire alarm panel finish.

The Contractor shall install a dedicated power supply from the main panelboard, in fire rated cable (see DB Schedules for cable details). With containment from the panel to the refuge call points. An additional recessed blank conduit drop shall be installed from the ceiling void to the panel as a spare way for future cabling.

A two-way hands-free intercom system shall be provided in the disabled refuge for communication with the evacuation control location in the event of a fire evacuation. This evacuation control location will be sited adjacent to the main fire alarm panel within the main entrance at ground floor and will consist of the central digital voice master station.

The disabled refuge intercom unit shall consist of a two-way hands-free speech unit and call button. The refuge alarm panel shall be recessed flush with finish to match the fire alarm panel finish both of which shall have stainless steel fascia.

The refuge call point stations shall be wall recessed flush finish.

## 4.19 DISABLED WC ALARM EMERGENCY CALL SYSTEMS

### 4.19.1 General

The Services Contractor shall, supply, install, test and commission a disabled WC alarm/emergency call system in accordance with this Particular Specification, the accompanying layouts, ADPM, ADPB of the Building Regulations.

### 4.19.2 Installation

The Services Contractor shall supply and install all local 230V supplies comprising unswitched fused connection units and ELV cabling, as necessary, to serve the disabled WC's to provide a complete and functional disabled call system.

The call system shall include the following equipment:

- Overdoor audible/visual indicator
- Pull cord
- Reset / reassurance unit
- Power supply unit located in the ceiling void or at high level
- Disabled Alarm Indicator Panel

Power supply unit located in the suspended ceiling void.

The Disabled Alarm Indicator Panel shall be installed in the Administration Office and a repeater panel



in the Staff Room.

### 4.20 VOICE & DATA

#### 4.20.1 General

The Contractor shall engage the services of a Voice/Data Network Specialist Contractor to design, supply, install, test and commission a complete voice and data network throughout the building as detailed in this Particular Specification and on the accompanying layouts.

Generally, the network capabilities shall be distributed through the building utilising Category 6a, 4 pair Unshielded Twisted Pair (UTP) LSOH cabling radiating from the distribution cabinet, located within the first floor communications room inclusive of all associated fibre optic/copper backbone cabling and horizontal cabling.

To achieve this, the Contractor shall engage the Voice/Data Network Specialist to design, supply, install, terminate, test and commission the data and communications cabling from the main external service provider distribution point, distribution cabinets, patch panels and final outlet locations. The cabling shall be installed on / within the designated cable baskets / trunkings / conduits / back-boxes as designed and installed by the Contractor to current installation standards as outlined below.

Certification shall be provided to demonstrate the installers can offer the required cabling warranty underwritten by the manufacturer i.e. 25 years.

#### 4.20.2 Installation Philosophy

The Contractors appointed Voice/Data Network Specialist shall design, supply, install, test and commission a complete functional system as detailed in this Particular Specification. The installation shall accord with the following standards in so far as they apply to this work:

- ANSI/EIA/TIA-568-A-1995, Commercial Building Telecommunications Cabling Standard.
- BS EN 50173 Information Technology - Generic Cabling Systems
- TIA/EIA-TSB-67 Transmission Performance Specifications For Field Testing of Unshielded Twisted-pair Cabling Systems.
- ANSI/TIA/EIA TSB95. Field tester accuracy requirements
- ANSI/EIA/TIA-569-1990 Commercial Building Standard for Telecommunications Pathways and Spaces.
- BS 6701: 1994 Code of practice for Installation of apparatus intended for connection to certain telecommunication systems.
- The NEC's infrastructure Standards Document

The system shall be capable of interconnecting to Category 6a Standard the following as a minimum:

- a. Telephone
- b. Asynchronous Transfer Mode (ATM) Networks
- c. Integrated Services Digital Networks (ISDN)
- a. Ethernet - Fast Ethernet, Thick Ethernet etc

### b. Video Conferencing

The Contractor shall engage the services of a Voice/Data Network Specialist Contractor to design, supply, install, test and commission a complete voice and data network throughout the building as detailed in this Particular Specification.

The Contractors appointed Voice/Data Network Specialist Contractor shall install all wiring necessary to provide a fully functional system inclusive of all vertical back bone cabling, horizontal structured cabling, RJ45 Cat 6a outlets, patch panels and data cabinets for the L1 and L2 Health Centre facility.

Where applicable, all components shall be Category 6a compliant from the same manufacturers to ensure characteristic impedance compatibility.

The backbone cabling works shall comprise of:

#### 1. Fibre between entrance and IT Room Data cabinet

The IT data cabinet design shall incorporate the necessary components for future connection by others of fibre optic and copper back bone cabling to a data cabinets on Level 2 and the Pharmacy.

It is anticipated that the cabling to each area will consist of the following but shall be confirmed by the IT specialist and therefore allowance shall be made in the data cabinet for the following future cable connections:

- 8 core fibre OM4 optic cable to be 50\125 microns
- The termination at both ends need to be SC

The copper backbone cabling specification requirements are as follows:

- 24 No Cat 6a cables
- All cores need to be terminated between cabinets on high density patch panels

The patch cables should be from the same range and covered by the same warranty as the rest of the cabling system. All patch cables shall have two labels on them 100mm from each end. Each label shall display a serial number and the cable length. The cables shall also be fitted with boots. The following colours are to be used

Colour	Use
Blue	Connection of PCs
Red	Data Patching
Green	Voice Patching

The preferred manufacturer and range for all cabling components is the BICC BrandRex Millennium Gigaplus range of products. (Or equal and approved)

Alternative cabling systems maybe approved with the written agreement of the Engineer during the tender period only. Any proposed alternative system shall be backed by a manufacturer 25 year guarantee that the Installation Company can honour. The cabling system installation shall be carried out with regards to the relevant standards, particularly the selection of routes to ensure compliance with maximum allowed cable runs and segregation.

The Contractor shall supply and install lockable enclosed cabinets within the buildings as below;

Location	Data Cabinet Ref	Size	Quantity
First Floor	Cab 1	2200H x 800W x 800D Retex cabinets	1 No

The above is for Tender purposes only. The final number and specification to be confirmed to suit equipment requirements plus spare capacity in agreement with the Client's IT Consultant.

For Tender purposes, the cabinets shall be:

- Complete with a smoked glass lockable door
- Black Finish
- Mounted on a plinth
- Complete with a fan tray
- 48 way high density data patch panels (to suit number of outlets)
- 48 way high density voice patch panels (to suit number of outlets)
- Complete with vertical cable management cable hoops large enough to accommodate 100 patch cables
- Complete with 1 No 12way multi way PDUs (Power Distribution Units)
- Complete with 2 No cable trays.
- Complete with 1 No 16A SP & N Industrial socket outlets per cabinet.

Personal Computers, File Servers, Network printers, switches, routers, telephone system and peripherals etc, will be provided and installed by the Clients appointed IT Networking Specialist.

Cable connection to sockets shall conform to the ANSI/EIA/TIA-568-A-1995. The twist (and twist rate) in each pair of conductors shall be maintained as close as possible to the IDC connector. The minimum length possible of the cable outer sheath should be removed to expose the conductors. If the outer sheath is damaged the whole cable should be replaced as a result. After a conductor has been terminated, excess free conductor length shall be cut as close as practicable to the IDC connection block and the cable adequately secured. The cable conductors shall be directly terminated at each end on the RJ45 8 pin keyed sockets as defined by EIA/TIA 568 destination T568B. Within the cabinet all cables should be tied to the cabinet cable management system using Velcro reusable cable ties and terminated on Category 6a 48 port patch panels. UTP cables should be terminated on patch panels and outlets to the 258A/EIA 568B schedule.

The maximum length of runs to each individual outlet shall not exceed 90 metres. A five metre coil of cabling shall be left as spare, from the extremity of the Server room, for each cable leg.

The cables shall have LSOH over sheath and be run on / within the dedicated cable basket/trays/trunkings/conduits/backboxes etc.

The cables shall be loomed into groups of not more than 24 cables by means of Velcro tie wraps.

These shall be tie wrapped every 1500mm to the containment and every 500mm bundled.

These looms shall have floor level identification labels fitted at 10m intervals.

Due cognisance shall be taken with regard to minimum bending radii requirements, with particular regard to vertical risers and the problems caused by weight.

Suitable slack shall be left for re-termination of cables without compromising the minimum bend radii, in addition a small amount of cabling shall be left near each and (approximately 250mm) for relocation of the outlet.

Outlets generally shall be flush wall mounted dual RJ45 jack units unless mounted on trunking.

RJ45 sockets shall be certified to conform to the relevant Category of the EIA/TIA 568 standard. RJ45 sockets shall contain a locking feature that ensures secure connection of RJ45 patch or drop cables plugged into it. RJ45 sockets shall have the capability to accommodate a label on the connector socket or face plate. Sockets shall meet or shall be better than the performance detailed in the EIA/TIA 568A.

Testing shall utilise Level 2 compliant Category 6a cable testers. Testing shall be to 100 MHz using a Penta scanner or approved equivalent, with a current valid calibration certificate.

All test results shall be supplied in both paper and an electronic format compatible with MS Excel.

As fitted drawings shall be provided detailing the outlet identification number to aid port migration and overall system setup.

All characters on labels should be a minimum of 5mm high. The labelling method shall be permanent, water proof and of good quality and be positioned to allow easy reading. Hands written labels are not permissible. All Category 6a outlets shall be labelled according to the following consistent scheme.

The cabling shall be labelled at both ends.

The test reports should clearly indicate:

1. socket numbers
2. test parameters
3. type of tester used to certify the cabling.

All paper copies shall be signed by the person performing the test to certify that they are true and accurate. A copy of the Tester calibration certificate shall be provided along with the test results.

All outlets are to be RJ45/CAT6a type mounted on deep back boxes. Particular attention is to be cable termination practices with proprietary I.D.C. Tools being utilised throughout.

### **4.21 DIGITAL TV SYSTEM**

#### **4.21.1 General**

The Contractor shall supply, install, test and commission a digital TV System, to serve the building as detailed in this Particular Specification and accompanying layouts,

To achieve this, the Contractor shall engage a TV specialist who is accredited by the "The Confederation of Aerials Industries" to supply, install, test and commission a digital TV system to the positions as identified on the drawings.

The digital Aerial arrays and head end installed by the specialist Contractor will conform to the following standards and codes of practice as a minimum:

CAI Standards

CENELEC BS EN 50083 all relevant parts

CENELEC BS EN 50117 for coaxial cables

CENELEC BS EN 60966 for connecting cables

IEE regulations (latest edition)

### 4.21.2 Installation Philosophy

The TV specialist shall test for the best location to install a digital aerial, this shall be agreed with the Client.

Trunk main cabling shall be installed down the riser via the cable tray system to an individual multi input/output splitter amplifier on each floor.

Cabling shall then be distributed to each TV point location cabled back to each floors splitter located in the riser

Power supplies shall be provided as required to suit the final system design.

## 4.22 CLOSED CIRCUIT TELEVISION

### 4.22.1 General

The Contractor shall engage the services of a CCTV specialist to design, supply, install, test and commission a digital TV System, to serve the building as detailed in this Particular Specification and accompanying layouts,

All cameras and hardware are to be Internet Protocol (IP) compatible and be of the POE (Power Over Ethernet) type.

All Cat6 cabling shall be wired back to the landlord's data cabinet No 1 located in the first floor IT room (Room 130) by the Security Specialist.

For tender purposes the Services Contractor shall allow for the following locations/areas to be covered

Internal colour C.C.T.V smoked dome white cameras shall be provided to cover areas as shown on the layout drawings.

External colour C.C.T.V building mounted cameras shall be provided to cover the following areas detailed on the layout drawings

The C.C.T.V system will be monitored via on site security, and accessible via a remote web based browser by authorised users only.

A 32 Channel Network Disk Recorder shall be provided as a minimum to accommodate any future expansion.

A dedicated PC and 2 No 22" Monitors shall be included for by the CCTV Security Specialist for the CCTV system, to enable the system to be fully commissioned and set to work.

A CCTV Controller complete keyboard, joystick controller and integral HD screen shall be provided and installed on the reception desk.

The specification of the PC shall have specific operating requirements as advised by the CCTV manufacturers. This shall be initially located adjacent the main data cabinet in the first floor IT Room or other location agreed with the Client.

### **4.23 ACCESS CONTROL**

#### **4.23.1 Design Philosophy**

The Contractor shall engage the Clients preferred Specialist Security Contractor to design, supply, install, test and commission a Video Intercom System.

This shall be in accordance with the requirements of BS EN 50132 and NSI Code of Practice NACP30.

This shall provide digital video and audio Intercom for communication and remote release between the entrance door and L0 Reception Desk as detailed within this Particular specification and on the accompanying layouts.

#### **4.23.2 Installation Philosophy**

The video intercom system shall be manufactured by Comlit (or equal and approved) with hands combined free receiver to control each entrance door to the reception.

The proposals are to provide secure authorised access at the 2 No entrance doors, therefore enabling staff to obtain entry via a personal fob when presented to the proximity reader.

Visitors shall press the call button of the video intercom system, when identification has been verified, the secure entrance doors shall be capable of remote release from reception.

For tender purposes 30 No fobs shall be included for, however this is to be confirmed by the Client.

The external call unit complete with audio intercom and proximity card reader shall be integrated into one slim line unit and shall have a brushed stainless-steel finish and be installed flush within the building fabric. This shall be installed within the stainless-steel root mounted podium set back from the building to enable free and unrestricted access by wheelchair users from DDA compliance.

The maglock at the main entrance doors shall be of the heavy duty type, which will withstand "forced entry" and be agreed with the door provider and architect.

All magnetic locking devices shall be coordinated with the architects ironmongery schedule.

### 4.23.3 General

The Contractor shall also engage the Specialist Security Contractor to supply, install, test and commission an Access Control System.

This shall be in accordance with the requirements of BS EN 50132 and NSI Code of Practice NACP30.

### 4.23.4 System Requirements

This access control system shall be of the SALTO XS4 or equal/approved to the doors as detailed on the electrical layout drawings

A flush mounted magnetic lock/electric strike is to be fitted into the door. Where necessary suitable brackets will be provided to allow the correct alignment of the lock and armature. The final electronic lock type shall be carefully selected designed in conjunction with the door/ironmongery suppliers.

These locks are to be of the fail safe type and will fail secure in the event of a total power failure and fail open via a signal from the fire alarm system. As access control locks are not all designed for physical security at the perimeter of the building, it is recommended that a suitable security lock is also installed.

In the event of an emergency the access control lock may be overridden from the non-secure side by means of a green emergency break-glass, which will disconnect the power to the electric magnetic lock. This is to be located adjacent the request to exit button on the non-secure side of the door.

Egress from the area is to be by a request to exit button sited adjacent the door emergency break glass unit on the non-secure side of the door and also via the disabled push pad.

Override key switches for each door shall be located at the reception with the facility for timed operation override shall also be provided to assist deliveries and to de-energise door operation as and when required by the Client.

The access controlled doors shall be provided with individual power/control units. Each power/control unit shall be hard wired using Cat6 cable to the communications converter located in the reception desk to facilitate connectivity to the head end PC provided by the Client for installation of the respective access control software.

### 4.23.5 Power & Fire Alarm Interface

An unswitched fused connection unit shall be provided for the power supply unit including all necessary containment etc.

The door shall be provided with a fire alarm interface to de-energise the doors upon activation of the fire alarm. In addition to this an internal press to exit button and green emergency break glass is to be provided to override the doors, plus override key switch at reception for each access controlled door with timed operation facility.

## 4.24 INTRUDER ALARM SYSTEM

### 4.24.1 General

The Contractor shall engage the services of the Security Specialist to design, supply, install, test and commission a complete and functional intruder alarm system in accordance with EN 50131, ACPO, NSI NACOSS and as detailed in this specification and on the accompanying layouts.

### 4.24.2 Installation

This shall include the intruder alarm system to Grade 3, however the final grade is to be confirmed by the Clients insurers.

The Services Contractor shall include for all power supplies and containment as required.

The standby power supply shall comprise a secondary battery with automatic charger. Batteries shall be lead acid or nickel cadmium with sealed cells as indicated. The standby power supply shall have a duration as required for a monitored system for compliance with relevant standards.

Remote point modules, RIO's and expanders shall be provided as required. For the purposes of Tender 4 No unswitched fused connection units shall be allowed of which the exact positions are to be agreed with the security specialist.

The Dual Passive/Microwave detectors shall be either surface or recessed mounted in the rooms to provide total coverage of the required area. Exact mounting heights and locations shall be in accordance with the manufacturer's recommendations for optimum detection coverage.

Setting and unsetting of the systems shall be keypad/keyprox readers incorporating a 2 line, 16 character LCD display, numerical keypad and integral proximity reader. For tender purposes these shall be at each of entrance locations as detailed on the layout drawings.

Door contacts shall be of the magnetic reed Grade II type and be located in door/door frames. Where double leaf doors are shown, two sets of door contacts shall be provided.

Internally 3 No Grade 3 High Security Sounder and tamper/attack shall be provided.

Cabling shall be LSF multicore installed on cable basket / tray where run in groups and clipped direct where run singly within suspended ceilings void areas etc. Drops to low level outlets shall be via conduits, flush mounted within the building fabric.

The Services Contractor shall provide the containment system for use by the Security Services Contractor. However, the Services Contractor shall agree all routes with the Security Contractor before installation.

The Services Contractor shall provide all 240V power supplies required by the Security Contractor, which shall be agreed before installation.

All devices on the system should be suitably marked with their zone list number and the existing drawings and zones shall be updated as required and included in the O & M Manuals.

The system shall be a monitored therefore connections shall be made as required to the LAN including provision of a GSM auto dialler.



The intruder alarm system shall be fully tested, commissioned and set to work including end user demonstrations.

Zones are as follows:

- Pharmacy
- L0 & L1
- L2
- Main Stair Core
- Escape Stair Core

### 4.25 ELECTRIC VEHICLE CHARGING POINT

The Contractor shall allow for the supply, testing and commissioning of EVC charging points as detailed on the drawings and as follows:

- 2No Dual 7.2kW single phase pedestal chargers
- 1No Dual 7.2kW single phase pedestal chargers

The supply shall be derived from a dedicated EVC distribution board located within an IP65 rated Lucy external feeder pillar.

Electric vehicle chargers shall come complete with GSM sim card and facility for billing via a third party billing application.

All works inclusive of concrete foundations, ducting to the existing manholes and associated ground works shall be included. A vehicle barrier to protect the EVC charging point from vehicular damage shall also be provided.

The whole of the installation shall be tested during construction and at completion in the manner prescribed in the IET Regulations and EVC charging Guidance Notes and relevant British Standards and European Norms, as applicable to the particular installation concerned.

### 4.26 LIFT POWER SUPPLIES

#### 4.26.1 General

The Services Contractor shall supply, install, test and commission all the electrical services associated with the 1 No passenger lifts including:

Lift power supplies and consumer units  
Integration of CCTV and Access Control.  
Containment for data connection  
Dual path monitoring requirements

The Services Contractor should make reference to the lift manufacturer's quotation and for all specific requirements to ensure all elements are fully included.

### 4.27 LIGHTNING PROTECTION

### 4.27.1 General Description

The Services Contractor shall appoint a Lightning Protection Specialist to design, supply install, test and commission a complete lightning protection system as detailed in this performance specification and in compliance with BS EN62305.

### 4.27.2 Installation

A conventional air termination system shall be provided.

PVC covered 25mm x 3mm aluminium down conductors shall be installed around the building, and shall be positioned in as discrete locations as possible. These shall terminate to earth via 25mm x 3mm stainless steel bimetallic connectors.

The exact colour of the PVC covered tapes to be agreed with the Architect.

The down conductor shall run out to the earth pit from the building facades, refer to Earth Terminations below.

PVC tape colours, clamps fixing, etc., intended for use on this contract, shall be issued for comment. This shall take place prior to ordering material for commencement installation.

All metalwork external and within the building fabric shall be bonded to the lightning protection system to eliminate risk of a direct strike or side flashing.

The earth terminations shall generally be positioned as near as practical to the building line. At each of these terminations 2400mm minimum extensible 16mm diameter molecularly bonded steel cored copper clad earth rods shall be driven into the ground until the required system resistance is achieved.

At each termination point, the lightning protection contractor shall include for the supply and installation of a purpose made inspection housings.

The Lightning Protection Contractor shall produce a maintenance manual incorporating all test results, completion certificates and drawings required by BS EN 62305.

In addition, the resistance of each earth termination, the resistance across joints, bonds etc., shall also be recorded. The location of joints, bonds, etc., shall be identified on the as fitted drawing by letter and number, i.e. B1, B2 for bonds J1, J2, for joints, E1, E2 for earth terminations etc. The resistance of a joint shall not exceed 0.5 milliohms.

The Services Contractor shall provide 2No.complete sets of drawings indicating the proposed lightning conductor scheme in plan and elevation showing full details of bonding arrangements, types of equipment.

### 4.28 TESTING & COMMISSIONING

The whole of the installation shall be tested during construction and at completion in the manner prescribed in the IET Regulations and relevant British Standards and European Norms, as applicable to the installation concerned.

### 4.28.1 Inspection, Test & Electrical Installation Certificates

Inspection and test certificates shall be dated, numbered and clearly referenced to the item tested by means of serial, chassis or other manufacturer's reference number permanently marked in a conspicuous position on the item concerned.

The Installer shall issue an electrical installation certificate as required in BS 7671 at the practical completion of the works.

### 4.28.2 Periodic Inspection & Testing

Include recommendations within the operating and maintenance manuals that the installation be inspected and tested in accordance with BS 7671 and include a recommended maximum period before re test based on the advice given in BS 7671 guidance notes.

## 4.29 SERVICES IDENTIFICATION

The following service identification requirements are in addition to those described elsewhere in the Particular Specification and are for guidance only.

- SWA Cables

A non-corrosive metallic or substantial plastic label shall be securely fixed to the cable adjacent to the cable glands at each end of the cable. The label shall be engraved to indicate the size and type of cable and the origin, i.e.:

"70mm<sup>2</sup> core XLPE/SWA/LSF/Cu cable from fuse switch ref. F1 (Rm. No. 321)" at load end.

"70mm<sup>2</sup> core XLPE/SWA/LSF/Cu cable to DIS BD LP (Lift Room)" at supply end.

- Accessories

All multi-gang switches, isolator switches, 13A fused connection units and double pole switches shall be engraved to indicate the equipment they serve.

Escape lighting test and isolation switches shall be engraved "Escape Lighting".

- Notices and Schematics

The following notices and schematics shall be provided by the Contractor in the Ground Floor plantroom:

- i) Treatment for electric shock notice
- ii) Electricity at Work Regulations
- iii) Distribution Schematic

Each electrical switchroom door shall be labelled.

- Switchgear and Distribution Boards

## 4 ELECTRICAL SERVICES



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All switchgear and distribution boards rated at 400V shall be labelled with purpose made "DANGER 400V" labels and periodic inspection interval.

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### 5 TENDER RETURN DOCUMENTATION

The tender return documents as provided in the Project Quantity Surveyors documentation should be completed in their entirety and returned to accord with the requirements of the tender enquiry letter to meet the return tender date.

In addition to completing the tender summary a full schedule of rates shall be provided by the Mechanical and Electrical Contractor as required in the preliminaries of this Particular specification.

**Failure to satisfactorily complete all the return tender documentation in this section will render the tender invalid.**

## HAREHILLS MEDICAL CENTRE

MECHANICAL SERVICES TENDER BREAKDOWN		Cost £
1.0	Preliminaries and Conditions of Contract	
2.0	Mechanical Services Design and Production of Working Drawings	
3.0	Incoming Water Supply Installation	
4.0	ASHP, Buffer, Calorifier and Elec Boiler Installation	
5.0	Domestic Water Services Installation	
6.0	Electric Heating Installations	
7.0	Ventilation Systems Installation	
8.0	Air Conditioning Systems Installation	
9.0	Sanitary Pipework Systems Installation	
10.0	Mechanical Wiring Installation	
11.0	Automatic Controls & BMS Installation	
12.0	Services Identification	
13.0	Testing and Commissioning	
14.0	Demonstrations and Training	
15.0	As Fitted Drawing & Operating & Maintenance Manuals	
16.0	Any other items (identify) a) b) c) d)	
	<b>Sub Total</b>	

**All sections to be completed and detailed as the sections above with the tender return.**

## HAREHILLS MEDICAL CENTRE

ELECTRICAL SERVICES TENDER BREAKDOWN		Cost £
1.0	Preliminaries and Conditions of Contract	
2.0	Electrical Services Design and Production of Working Drawings	
3.0	Liaison and attendance with NPG and Meter Provider	
4.0	Liaison and attendance with Telecoms Provider	
5.0	Main Supply Installation	
6.0	Distribution Board and Consumer Unit Installation	
7.0	Sub Mains Cabling	
8.0	Earthing and Bonding	
9.0	Containment Installation	
10.0	Lighting & Emergency Lighting Installation	
11.0	External Lighting Installation	
12.0	Small Power Installation	
13.0	Supplies to Mechanical Services Installation	
14.0	Voice / Data and TV Installation	
15.0	Fire Alarm Installation	
16.0	Access Control System/ Intercom Installation	
17.0	CCTV Installation	
18.0	Intruder Alarm Installation	
19.0	TV Installation	
20.0	Disabled WC Alarm Installation	
21.0	Disabled Refuge System Installation	
22.0	Lighting Controls Installation	

<b>ELECTRICAL SERVICES TENDER BREAKDOWN</b>		<b>Cost £</b>
23.0	Lightning Protection Installation	
24.0	Energy Monitoring System	
25.0	Services Identification	
26.0	Testing and Commissioning	
27.0	Demonstrations and Training	
28.0	As Fitted Drawing & Operating & Maintenance Manuals	
29.0	Any other items (identify) a) Induction Loops b) Electric Vehicle Charging Point c) d)	
	<b>Sub Total</b>	

**All sections to be completed and detailed as the sections above with the tender return.**





HAREHILLS MEDICAL CENTRE

	<b>Mechanical and Electrical Services Total</b>	<b>Cost £</b>
	Mechanical Services	
	Electrical Services	
	<b>Total</b>	

Signed.....

Designation.....

For and on behalf of .....

Date .....



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**SUB-CONTRACT**

**SCHEDULE OF SPECIALIST SUB-CONTRACTORS**

The Tenderer must list the names of the Specialist Sub-Contractors he proposes to employ for the specified works, together with any additional sub-contractors, and the nature of the work which they will undertake.

Work or Service

Name and Address

Signed:.....

Designation.....

For and on Behalf of:.....

Date: .....

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### **SCHEDULE OF BUILDERS WORK REQUIREMENTS - MECHANICAL**

The Contractor shall itemise individual items complete with a full description and quantities of all Builders Work required to be carried out in association with the mechanical services installations described in the enquiry documents.

The Contractor should note that where possible all services are to be concealed by utilising the rising ducts/ceiling voids/raised floor spaces. Services "boxing in" shall be used with the agreement of the Architect and utilised where there is no other alternative available to conceal the service.

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### **SCHEDULE OF BUILDERS WORK REQUIREMENTS - ELECTRICAL**

The Contractor shall itemise individual items complete with a full description and quantities of all Builders Work required to be carried out in association with the electrical services installations described in the enquiry documents.

The Contractor should note that where possible all services are to be concealed by utilising the rising ducts/ceiling voids/raised floor spaces. Services "boxing in" shall be used with the agreement of the Architect and utilised where there is no other alternative available to conceal the service.



**CERTIFICATE**

**in connection with:**

**Mechanical & Electrical Engineering Sub Contract Works Tender for:-**

**HAREHILLS MEDICAL CENTRE**

The essence of selective tendering is that the client shall receive bona fide competitive tenders from all firms tendering. In recognition of this principle, we certify that this is a bona fide tender, intended to be competitive, and that we have not fixed or adjusted the amount of the tender by or under or in accordance with any agreement or arrangement with any other person. We also certify that we have not done and we undertake that we will not do at any time before the hour and date specified for the return of this tender any of the following acts:

- a. communicating to a person other than the person calling for these tenders the amount or approximate amount of the proposed tender, except where the disclosure, in confidence, of the approximate amount of the tender was necessary to obtain insurance premium quotations required for the preparation of the tender:
- b. entering into any agreement with any other person that he shall refrain from tendering or as to the amount of any tender to be submitted:
- c. offering or paying or giving or agreeing to pay or give any sum of money or valuable consideration directly or indirectly to any person for doing or having done or causing or having caused to be done in relation to any other tender or proposed tender for the said work any act or thing of the sort described above.

In this certificate, the work "person" includes any persons and anybody or association, corporate or unincorporated; and "any agreement or arrangement" includes any such transaction, formal or informal, and whether legally binding or not.

Signature of Authorised Person.....

Designation.....

For and on behalf of.....

Date: .....

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## APPENDICES

- Appendix A - Mechanical Services Schedule of Manufacturers
- Appendix B - Mechanical Services Equipment Schedules
- Appendix C - Electrical Services Schedule of Manufacturers
- Appendix D - Electrical Services Equipment Schedules
- Appendix E - Pre-Handover Commissioning Demonstration Checklist
- Appendix F - Handover Testing and Commissioning Certification Checklist
- Appendix G - Demonstration & Training Schedule
- Appendix H - O & Manual Checklist and Requirements

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**Appendix A**

Mechanical Services Schedule Of Manufacturers

**MECHANICAL SERVICES SCHEDULE OF MANUFACTURERS**

The tender shall be based on the following manufacturers or equal/approved.

<b>Product</b>	<b>Manufacturer</b>
Grilles / Diffuser	Gilberts
Fire Dampers	Actionair
Valves	Oventrop
Attenuators	Allaway
AAV's	Flamco
Ventilation Fans	Nuaire
Electric Water Cylinders	Kingspan
Indirect Calorifier	AOSmith
Radiator	Stelrad
Overdoor Air Curtains	Diffusion
LTHW Boilers	Ideal
AC Units	Daikin
Heat Recovery Units	Mitsubishi Electric
Dirt & Air Separators	Flamco
Pumps/ Pressurisation Units	Grundfos
BMS Controls	Trend

This Particular Specification has been prepared on the basis of the above equipment or service.



**Appendix B**

Mechanical Services Equipment Schedules

# AIR CURTAIN SCHEDULE



<b>Project Name:</b>	Harehills Medical Centre
<b>Project No.</b>	P1371
<b>Revision:</b>	T02
<b>Revision Date:</b>	13.04.23

REF	LOCATION	MODEL / REFERENCE	WIDTH (mm)	LENGTH (mm)	HEIGHT (mm)	Elec COIL DUTY (kW)	AIR VOLUME (l/s)	ELECTRICAL SUPPLY	NR RATING	CONTROLLER	NOTES
ODH/01	Lobby	Envirotec Airscren	400	900	270	6	200	1 phase	50	Enetec 18 Controller	

**ASHP SCHEDULE**

<b>Project Name</b>	Harehills Medical Centre
<b>Project Number</b>	P1371
<b>Current Revision</b>	T01
<b>Revision Date</b>	13.04.23

Ref	Model	Location	Heating Capacity (kw)	Dimensions			Notes
				Height (mm)	Width (mm)	Depth (mm)	
ASHP 01	AOSmith/Adveco FPi32-12	East façade	12.0	882	1165	371	Integral Pump
ASHP 02	AOSmith/Adveco FPi32-12	East façade	12.0	882	1165	371	Integral Pump
ASHP 03	AOSmith/Adveco FPi32-12	East façade	12.0	882	1165	371	Integral Pump

# ATTENUATOR SCHEDULE



<b>Project Name:</b>	Harehills Medical Centre
<b>Project No.</b>	P1371
<b>Revision:</b>	T01
<b>Revision Date:</b>	13.04.23

REF	SYSTEM REFERENCE	MANUFACTURER & TYPE	LENGTH (mm)	DIAMETER (mm)	VOLUME RATE (m <sup>3</sup> /s)	WEIGHT (Kg)
AT/00/01	HRU/00/01 EXH	ALLOWAY	TBC	TBC	0.16	TBC
AT/00/02	HRU/00/01 FAI	ALLOWAY	TBC	TBC	0.16	TBC
AT/00/03	HRU/00/01 EXT	ALLOWAY	TBC	TBC	0.16	TBC
AT/00/04	HRU/00/01 SUP	ALLOWAY	TBC	TBC	0.16	TBC
AT/00/05	HRU/00/02 EXH	ALLOWAY	TBC	TBC	0.16	TBC
AT/00/06	HRU/00/02 FAI	ALLOWAY	TBC	TBC	0.16	TBC
AT/00/07	HRU/00/02 EXT	ALLOWAY	TBC	TBC	0.16	TBC
AT/00/08	HRU/00/02 SUP	ALLOWAY	TBC	TBC	0.16	TBC
AT/00/09	HRU/00/04 EXH	ALLOWAY	TBC	TBC	0.097	TBC
AT/00/10	HRU/00/04 FAI	ALLOWAY	TBC	TBC	0.097	TBC
AT/00/11	HRU/00/04 EXT	ALLOWAY	TBC	TBC	0.097	TBC
AT/00/12	HRU/00/04 SUP	ALLOWAY	TBC	TBC	0.097	TBC
AT/00/13	HRU/00/03 EXH	ALLOWAY	TBC	TBC	0.14	TBC
AT/00/14	HRU/00/03 FAI	ALLOWAY	TBC	TBC	0.14	TBC
AT/00/15	HRU/00/03 EXT	ALLOWAY	TBC	TBC	0.14	TBC
AT/00/16	HRU/00/03 SUP	ALLOWAY	TBC	TBC	0.14	TBC
AT/00/17	EF/00/01 EXT	ALLOWAY	TBC	TBC	0.117	TBC
AT/00/18	EF/00/01 EXH	ALLOWAY	TBC	TBC	0.117	TBC
AT/01/01	HRU/01/01 EXH	ALLOWAY	TBC	TBC	0.28	TBC
AT/01/02	HRU/01/01 FAI	ALLOWAY	TBC	TBC	0.28	TBC
AT/01/03	HRU/01/01 EXT	ALLOWAY	TBC	TBC	0.28	TBC
AT/01/04	HRU/01/01 SUP	ALLOWAY	TBC	TBC	0.28	TBC
AT/01/05	HRU/01/02 EXH	ALLOWAY	TBC	TBC	0.098	TBC
AT/01/06	HRU/01/02 FAI	ALLOWAY	TBC	TBC	0.098	TBC
AT/01/07	HRU/01/02 EXT	ALLOWAY	TBC	TBC	0.098	TBC

# ATTENUATOR SCHEDULE



<b>Project Name:</b>	Harehills Medical Centre
<b>Project No.</b>	P1371
<b>Revision:</b>	T01
<b>Revision Date:</b>	13.04.23

REF	SYSTEM REFERENCE	MANUFACTURER & TYPE	LENGTH (mm)	DIAMETER (mm)	VOLUME RATE (m <sup>3</sup> /s)	WEIGHT (Kg)
AT/01/08	HRU/01/02 SUP	ALLOWAY	TBC	TBC	0.098	TBC
AT/01/09	HRU/01/03 EXH	ALLOWAY	TBC	TBC	0.28	TBC
AT/01/10	HRU/01/03 FAI	ALLOWAY	TBC	TBC	0.28	TBC
AT/01/11	HRU/01/03 EXT	ALLOWAY	TBC	TBC	0.28	TBC
AT/01/12	HRU/01/03 SUP	ALLOWAY	TBC	TBC	0.28	TBC
AT/01/13	HRU/01/04 EXH	ALLOWAY	TBC	TBC	0.184	TBC
AT/01/14	HRU/01/04 FAI	ALLOWAY	TBC	TBC	0.184	TBC
AT/01/15	HRU/01/04 EXT	ALLOWAY	TBC	TBC	0.184	TBC
AT/01/16	HRU/01/04 SUP	ALLOWAY	TBC	TBC	0.184	TBC
AT/01/17	HRU/01/05 EXH	ALLOWAY	TBC	TBC	0.157	TBC
AT/01/18	HRU/01/05 FAI	ALLOWAY	TBC	TBC	0.157	TBC
AT/01/19	HRU/01/05 EXT	ALLOWAY	TBC	TBC	0.157	TBC
AT/01/20	HRU/01/05 SUP	ALLOWAY	TBC	TBC	0.157	TBC
AT/01/21	EF/01/01 EXT	ALLOWAY	TBC	TBC	0.133	TBC
AT/01/22	EF/01/01 EXH	ALLOWAY	TBC	TBC	0.133	TBC

## BOILER SCHEDULE



<b>Project Name</b>	Harehills Medical Centre
<b>Project No.</b>	P1371
<b>Revision</b>	T02
<b>Revision Date</b>	13.04.23

<b>Reference</b>	<b>B01</b>		
Manufacturer	AOSmith/Adveco		
Model	Ardent P24 Electric Boiler		
Maximum heat output (kW)	24		
Element Configuration	3x8kW 3 Phase		
Length (mm)	450		
Width (mm)	162		
Height (mm)	600		
Water temperature (Flow & Return)	80/60		
Pump	Integral Pump		
Additional Auxillaries	Filling loop with IVs & double check valve		

## CALORIFIER AND BUFFER VESSEL SCHEDULE



<b>Project Name:</b>	Harehills Medical Centre
<b>Project No.</b>	P1371
<b>Revision:</b>	T02
<b>Revision Date:</b>	13.04.23

REF	LOCATION	MODEL REF	STORAGE VOL	DIMENSIONS (mm)	NOTES
CAL/01	Plantroom	AOSmith/Adveco GLT500	447	750 dia x 1950H	Twin coil calorifier.
BV/01	Plantroom	AOSmith/Adveco FS-100	107	500 dia x 950H	ASHP Buffer Vessel

### NOTES

1. All units to be AOSmiths or equal and approved.
2. The Hot Water Storage Calorifer shall include manufacturers unvented kit and standard insulation.
- 3. The expansion vessel shall be a flow through type unit.**



## DX COOLING SCHEDULE

<b>Project Name:</b>	Harehills Medical Centre
<b>Project No.</b>	P1371
<b>Current Revision:</b>	T02
<b>Revision Date:</b>	13.04.23

REF	MODEL	LOCATION	SENS HTG CAPACITY (kW)	SENS CLG CAPACITY (kW)	DIMENSIONS			WEIGHT (Kg)	SERVED FROM CONDENSER REF:	NOTES
					HEIGHT (mm)	WIDTH (mm)	DEPTH (mm)			
AC/00/01	FXZQ50A	021 Consult Exam	1.0	1.0	260	575	575	19	OU/01 - REYQ8U	
AC/00/02	FXZQ15A	020 Treatment	1.8	2.7	260	575	575	16		
AC/00/03	FXZQ15A	019 Training Consult Exam	0.9	1.0	260	575	575	16		
AC/00/04	FXZQ15A	018 Consult Exam	0.9	1.0	260	575	575	16		
AC/00/05	FXZQ15A	017 Consult Exam	0.9	1.0	260	575	575	16		
AC/00/06	FXZQ15A	016 Consult Exam	1.0	1.0	260	575	575	16		
AC/00/07	FXZQ15A	022 Consult Exam	1.1	1.0	260	575	575	16		
AC/00/08	FXZQ50A	002 Waiting	2.6	3.1	260	575	575	19		
AC/00/09	FXZQ50A	002 Waiting	2.6	3.1	260	575	575	19		
AC/00/10	FXZQ15A	004 Interview	0.6	0.7	260	575	575	16		
AC/01/01	FXZQ50A	125 Large Treatment	2.1	3.3	260	575	575	19	OU/02 - REYQ14U	
AC/01/02	FXZQ15A	120 Recovery Bay	1.2	1.0	260	575	575	16		
AC/01/03	FXZQ40A	124 Treatment	1.7	2.7	260	575	575	17		
AC/01/04	FXZQ15A	129 Consult Exam	0.9	1.0	260	575	575	16		
AC/01/05	FXZQ15A	126 Consult Exam	0.9	1.0	260	575	575	16		
AC/01/06	FXZQ15A	128 Consult Exam	0.9	1.0	260	575	575	16		
AC/01/07	FXZQ15A	119 Consult Exam	1.0	1.0	260	575	575	16		
AC/01/08	FXZQ25A	131 Waiting	2.1	1.7	260	575	575	16		
AC/01/09	FXZQ25A	131 Waiting	2.1	1.7	260	575	575	16		
AC/01/10	FXZQ40A	101 Bookable Room	1.3	2.2	260	575	575	17		
AC/01/11	FXZQ40A	103 Meeting Room	1.7	2.2	260	575	575	17		
AC/01/12	FXZQ40A	106 Admin Office	1.7	2.2	260	575	575	17		
AC/01/13	FXZQ25A	107 Manager	0.8	1.4	260	575	575	16		
AC/01/14	FXZQ40A	114 Admin	2.2	2.6	260	575	575	17		
AC/01/15	FXZQ25A	115 Staff Room	1.2	1.6	260	575	575	16		
AC/01/16	FAA71B	Server	-	5 (est)	290	1050	269	14	OU/03 - RZAG71NY1	

**Notes**

The above units shall be supplied by Daikin



# HRU & FAN SCHEDULE



<b>Project Name:</b>	Harehills Medical Centre
<b>Project No.</b>	P1371
<b>Revision:</b>	T02
<b>Revision Date:</b>	13.04.23

REF	LOCATION	SYSTEM	MANUFACTURER MODEL REF	AIR FLOW RATE m3/s	EXTERNAL STATIC PRESSURE Pa	TYPE	ELECTRICAL SUPPLY PHASES	DIMENSIONS LxWxH (mm)	dBA	CONTROL
HRU/00/01	Waiting Area	S+E	LGH-80RVX-E	0.16	85	HRU	1	1144x1004x404	30	AE200
HRU/00/02	Waiting Area	S+E	LGH-80RVX-E	0.16	85	HRU	1	1144x1004x404	30	AE200
HRU/00/03	Consult Exam	S+E	LGH-80RVX-E	0.14	80	HRU	1	1144x1004x404	30	AE200
HRU/00/04	Clean Utility	S+E	LGH-50RVX-E	0.097	70	HRU	1	888x874x331	28	AE200
EF/00/01	Circulation	E	Nuaire DE2-ES	0.117	75	Inline	1	605x703x310	20	Timeclock
HRU/01/01	Staff Room	S+E	LGH-100RVX-E	0.28	100	HRU	1	1144x1231x404	37	AE200
HRU/01/02	Store	S+E	LGH-50RVX-E	0.098	80	HRU	1	888x874x331	28	AE200
HRU/01/03	Waiting	S+E	LGH-100RVX-E	0.28	100	HRU	1	1144x1231x404	37	AE200
HRU/01/04	Corridor	S+E	LGH-100RVX-E	0.184	80	HRU	1	1144x1231x404	31	AE200
HRU/01/05	Treatment	S+E	LGH-100RVX-E	0.157	90	HRU	1	1144x1231x404	37	AE200
EF/01/01	Records	E	Nuaire DE2-ES	0.133	80	Inline	1	605x703x310	20	Timeclock

## PRESSURISATION UNITS SCHEDULE



<b>Project Name:</b>	Harehills Medical Centre
<b>Project No.</b>	P1371
<b>Revision:</b>	T02
<b>Revision Date:</b>	13.04.23

REF	LOCATION	SYSTEM	SYSTEM WATER CONTENT	MODEL / TYPE	BOILER / CHILLER RATING (kW)	SYSTEM FLOW TEMP (°C)	SYSTEM PRESSURE (BAR)	STATIC PRESSURE (kPa)	MIN. VESSEL QTY / SIZE	NOTES
PU/01	Plantroom	ASHP	200	Flamco Digifiller	120	55	2.7	0.3	25	

### Expansion Vessel to be supplied by AOSmith/Adveco - FC SOLAR 25 Unit

#### Additional Extras

- High and low pressure switches.
- Control equipment to comply with HSE Guidance.
- Audible alarm operated by control circuit fuse failure, or high system pressure.
- Facility for remote monitoring of a common alarm signal (by the BMS).
- Safety valve.

In addition to the pressurisation unit pressure vessel the unit shall be complete with a suitably sized buffer vessel to limit the number of starts per hour that the pump has to make, in order to comply with the manufacturer's requirements.

## PUMP SCHEDULE



<b>Project Name:</b>	Harehills Medical Centre
<b>Project No.</b>	P1371
<b>Revision:</b>	T02
<b>Revision Date:</b>	13.04.23

REF	LOCATION	SYSTEM	FLOW (l/s)	HEAD (kPa)	PUMP TYPE	VARIABLE SPEED DRIVE?	NOTES
P01	Plantroom	HWS Low Temp Circuit	0.86	60	inline	Y	Supplied by AOSmith/Advecco. Enable via BMS
P02	Plantroom	HWS Shunt Pump	0.10	40	inline	N	Supplied by AOSmith/Advecco Enable via BMS. To operate out of hours
P03	Plantroom	HWSR	0.20	40	Grundfos Alpha 2 25-80 N 180	Y	

# RADIATOR SCHEDULE



<b>Project Name:</b>	Harehills Medical Centre
<b>Project No.</b>	P1371
<b>Revision:</b>	T02
<b>Revision Date:</b>	13.04.23

REF	LOCATION	MODEL	OVERALL HEIGHT (mm)	OVERALL LENGTH (mm)	OUTPUT (kW)	LTHW FLOW / RETURN °C	ROOM TEMP °C	NOTES
R/001	005 Reception	Dimplex PLXE050	470	490	0.5	70/50	21	
RP/00/01	Corridor 011	Solray CT Tile	1200	600	0.6	N/A	18	
RP/00/02	Corridor 011	Solray CT Tile	1200	600	0.6	N/A	18	
RP/00/03	Corridor 011	Solray CT Tile	1200	600	0.6	N/A	18	
RP/00/04	010 Clean Utility	Solray CT Tile	1200	600	0.6	N/A	18	
RP/00/05	010 Clean Utility	Solray CT Tile	1200	600	0.6	N/A	18	
RP/00/06	007 Acc WC	Solray PB Strip	600	600	0.3	N/A	21	
RP/00/07	024 Stair 1	Solray PB Strip	1800	600	0.9	N/A	18	
RP/00/08	012 Corridor	Solray CT Tile	1200	600	0.6	N/A	18	
RP/00/09	014 Stair 2	Solray PB Strip	1200	600	0.6	N/A	18	
RP/01/01	102 Stair 1	Solray PB Strip	1800	600	0.9	N/A	18	
RP/01/02	133 Acc WC	Solray PB Strip	600	600	0.3	N/A	21	
RP/01/03	105 Clean Utility	Solray CT Tile	1200	600	0.6	N/A	18	
RP/01/04	105 Clean Utility	Solray CT Tile	1200	600	0.6	N/A	18	
RP/01/05	108 Lockers	Solray PB Strip	600	600	0.3	N/A	21	
RP/02/01	201 Stair 1	Solray PB Strip	1800	600	0.9	N/A	18	
RP/02/02	202 Stair 2	Solray PB Strip	1200	600	0.6	N/A	18	
Notes	All Radiant panels to be controlled on a room by room basis via local tamperproof thermostat.							

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**Appendix C**

Electrical Services Schedule of Manufacturers

**ELECTRICAL SERVICES SCHEDULE OF MANUFACTURERS**

The tender shall be based on the following manufacturers or equal/approved.

<b>Product</b>	<b>Manufacturer</b>
Internal Lighting	Whitecroft Lighting
Automatic Lighting Controls	Whitecroft Lighting
External Lighting	Kingfisher
Panel Boards/Distribution Boards/Consumer Units/MCB's	Schneider Electric: Merlin Gerin
Energy Monitoring System	Schneider Electric
Cables	AEI, BICC, Prysmian - BASEC Approved
Containment	Pemsa/Legrand/MK / Marshall Tufflex
Bracket works / Supports/Suspensions/Fixings	Unistrut /Legrand / Hilti
Fire Alarm System	Advanced Fire Alarm Controls Panels and Apollo XP95 /Hochiki range of detectors Nick Drake Rosse Systems Ltd 4 Peel House, 2 Taunton Street, Shipley, BD18 3N Email: <a href="mailto:nick@rosse-systems.co.uk">nick@rosse-systems.co.uk</a> Telephone: 01274 595015 Facsimile: 01274 580804
Disabled Refuge System	Baldwin Boxall
Disabled WC Alarm	C-Tec
Induction Loops	Ampetronic
Electric Vehicle Charger	Podpoint, Ropec
Access Control, Video Intercom	Salto Systems, Comlit James Baird Dynamic Networks Group Airedale House 423 Kirkstall Road Leeds LS4 2EW Telephone: <a href="tel:0113 347 1231">0113 347 1231</a> <a href="mailto:info@dynamicnet.works">info@dynamicnet.works</a>
Voice & Data (Leviton "Brand Rex"), CCTV (Hickvision), Intruder Alarm (Honeywell Galaxy), Intercom (PAC, Honeywell)	James Baird Dynamic Networks Group Airedale House 423 Kirkstall Road Leeds LS4 2EW Telephone: <a href="tel:0113 347 1231">0113 347 1231</a> <a href="mailto:info@dynamicnet.works">info@dynamicnet.works</a>
Surge Protection	Schneider Electric
Lightning Protection	Furse Products George Drake Steeple Jacks Ltd, 8 New Park Place Farsley

	Pudsey West Yorkshire LS28 5TX Tel: 0113 257 3020 Contact: Mick Jackson
Accessories	MK
Floor-boxes/Screeded Trunking System	MK / Legrand
TV System	Marc Dale Dale Communications (UK) Ltd Tel/Fax: 0113 2690961 Mobile: 07711 796985 Website: <a href="http://www.dalecomm.co.uk/">http://www.dalecomm.co.uk/</a>
External Feeder Pillars	Lucy Zodion

This Particular Specification has been prepared on the basis of the above equipment or service.

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**Appendix D**

Electrical Services Equipment Schedules



# Distribution Board Schedule



Project Reference: Harehills Medical Centre

Job Number: P1371

Created By: Joe Veale

Rev Date:

Document No:

Created On: 11/04/2022

Revised By:

Revision:

## Board Data

Id No: BMS PANEL

ModelNo:

L1 L2 L3

Name:

No. of Ways: 6 Spare: 50

Total Connected Load (A): 20.00 20.00 30.00

Board Rating (A): 125

Fault Rating (kA): 25 Ze (Ω): 0.06321

Total Diversified Load (A): 20.00 20.00 30.00

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A)			Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length
1	L1	BOILER 1	10.0 10.0	1.00	0.00	20	N/A	MCB	0.45	1.00	N/A	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	10.00
1	L2	PUMP 1	10.0 10.0	1.00	0.00	20	N/A	MCB	0.45	1.00	N/A	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	10.00
1	L3	PU	10.0 10.0	1.00	0.00	20	N/A	MCB	0.45	1.00	N/A	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	10.00
2	L1	BOILER 2	10.0 10.0	1.00	0.00	20	N/A	MCB	0.45	1.00	N/A	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	10.00
2	L2	PUMP 2	10.0 10.0	1.00	0.00	20	N/A	MCB	0.45	1.00	N/A	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	10.00
2	L3	CALORIFIER	10.0 10.0	1.00	0.00	32	N/A	MCB	0.45	1.00	N/A	N/A	6 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	6	10.00

[u] = User Defined

# Distribution Board Schedule



Project Reference: Harehills Medical Centre

Job Number: P1371

Created By: Joe Veale

Rev Date:

Document No:

Created On: 11/04/2022

Revised By:

Revision:

## Board Data

Id No: BMS PANEL

ModelNo:

L1 L2 L3

Name:

No. of Ways: 6

Spare: 50

Total Connected Load (A): 20.00 20.00 30.00

Board Rating (A): 125

Fault Rating (kA): 25

Ze (Ω): 0.06321

Total Diversified Load (A): 20.00 20.00 30.00

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	3rd Pf Harmonic	Protective Device (A) In Ir Type	Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length
3	L3	PUMP 3	10.0 10.0	1.00 0.00	20 N/A MCB	0.45	1.00	N/A	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	10.00

[u] = User Defined

# Distribution Board Schedule



Project Reference: Harehills Medical Centre

Job Number: P1371

Created By: Joe Veale

Rev Date:

Document No:

Created On: 11/04/2022

Revised By:

Revision:

## Board Data

Id No: DB/CL1/L

ModelNo:

L1 L2 L3

Name:

No. of Ways: 8

Spare: 62.5

Total Connected Load (A): 15.00 15.00 15.00

Board Rating (A): 125

Fault Rating (kA): 25

Ze (Ω): 0.07306

Total Diversified Load (A): 15.00 15.00 15.00

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A)			Cg	Ca	RCD	AFDD	Cable	Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length
1	L1	120 RECOVERY BAY & 125 TREATMENT LIGHT	2.0 2.0	0.95	10.00	10	N/A	MCB	0.45	1.00	N/A	N/A	1.5	1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	1.5	40.00
1	L2	129 CONSULTING & 124 TREATMENT LIGHT	2.0 2.0	0.95	10.00	10	N/A	MCB	0.45	1.00	N/A	N/A	1.5	1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	1.5	40.00
1	L3	126 & 128 CONSULTATION LIGHTI	2.0 2.0	0.95	10.00	10	N/A	MCB	0.45	1.00	N/A	N/A	1.5	1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	1.5	40.00
2	L1	119 CONSULTATION LIGHTING	2.0 2.0	0.95	10.00	10	N/A	MCB	0.45	1.00	N/A	N/A	1.5	1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	1.5	40.00
2	L2	127 CORRIDOR LIGHTING	2.0 2.0	0.95	10.00	10	N/A	MCB	0.45	1.00	N/A	N/A	1.5	1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	1.5	40.00

[u] = User Defined

# Distribution Board Schedule



Project Reference: Harehills Medical Centre

Job Number: P1371

Created By: Joe Veale

Rev Date:

Document No:

Created On: 11/04/2022

Revised By:

Revision:

## Board Data

Id No: DB/CL1/L

ModelNo:

L1 L2 L3

Name:

No. of Ways: 8

Spare: 62.5

Total Connected Load (A): 15.00 15.00 15.00

Board Rating (A): 125

Fault Rating (kA): 25

Ze (Ω): 0.07306

Total Diversified Load (A): 15.00 15.00 15.00

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A) In	Ir	Type	Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length
2	L3	136 & 122 CORRIDOR LIGHTING	2.0 2.0	0.95	10.00	10	N/A	MCB	0.45	1.00	N/A	N/A	1.5 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	1.5	40.00
3	L1	CLEAN & DIRTY UTILITY LIGHTING	2.0 2.0	0.95	10.00	10	N/A	MCB	0.45	1.00	N/A	N/A	1.5 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	1.5	40.00

[u] = User Defined

# Distribution Board Schedule



Project Reference: Harehills Medical Centre

Job Number: P1371

Created By: Joe Veale

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Revision:

## Board Data

Id No: DB/CL1/P

ModelNo:

L1 L2 L3

Name:

No. of Ways: 8

Spare: 25

Total Connected Load (A): 60.00 60.00 60.00

Board Rating (A): 125

Fault Rating (kA): 25

Ze (Ω): 0.07306

Total Diversified Load (A): 60.00 60.00 60.00

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A) In Ir Type	Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length
1	L1	120 RECOVERY BAY & 125 TREATMENT SKTS	10.0 10.0	1.00	0.00	32 N/A RCBO	0.45	1.00	30	N/A	2.5 2 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	2.5	100.00
1	L2	124 TREATMENT & 129 CONSULTATION SKTS	10.0 10.0	1.00	0.00	32 N/A RCBO	0.45	1.00	30	N/A	2.5 2 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	2.5	100.00
1	L3	126 & 128 CONSULTATION SKTS	10.0 10.0	1.00	0.00	32 N/A RCBO	0.45	1.00	30	N/A	2.5 2 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	2.5	100.00
2	L1	119 CONSULTATION SKTS	10.0 10.0	1.00	0.00	32 N/A RCBO	0.45	1.00	30	N/A	2.5 2 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	2.5	100.00
2	L2	LHS CLEANERS SKTS	8.0 8.0	1.00	0.00	32 N/A RCBO	0.45	1.00	30	N/A	2.5 2 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	2.5	100.00

[u] = User Defined

# Distribution Board Schedule



Project Reference: Harehills Medical Centre

Job Number: P1371

Created By: Joe Veale

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Revision:

## Board Data

Id No: DB/CL1/P

ModelNo:

L1 L2 L3

Name:

No. of Ways: 8

Spare: 25

Total Connected Load (A): 60.00 60.00 60.00

Board Rating (A): 125

Fault Rating (kA): 25

Ze (Ω): 0.07306

Total Diversified Load (A): 60.00 60.00 60.00

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A) In Ir Type	Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length
2	L3	RHS CLEANERS SKTS	8.0 8.0	1.00	0.00	32 N/A RCBO	0.45	1.00	30	N/A	2.5 2 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	2.5	100.00
3	L1	125 AIR CONDITIONING	4.0 4.0	1.00	0.00	20 N/A MCB	0.45	1.00	N/A	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00
3	L2	124 & 127 HRU'S	4.0 4.0	1.00	0.00	20 N/A MCB	0.45	1.00	N/A	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00
3	L3	122 BC BOX	4.0 4.0	1.00	0.00	20 N/A MCB	0.45	1.00	N/A	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00
4	L1	DOOR HOLD OPEN PSU	4.0 4.0	1.00	0.00	20 N/A RCBO	0.45	1.00	30	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00
4	L2	STAIR 2 ACCESS CONTROL	4.0 4.0	1.00	0.00	20 N/A RCBO	0.45	1.00	30	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00

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# Distribution Board Schedule



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Revision:

## Board Data

Id No: DB/CL1/P

ModelNo:

L1 L2 L3

Name:

No. of Ways: 8

Spare: 25

Total Connected Load (A): 60.00 60.00 60.00

Board Rating (A): 125

Fault Rating (kA): 25

Ze (Ω): 0.07306

Total Diversified Load (A): 60.00 60.00 60.00

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A) In Ir Type	Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length
4	L3	125 AIR CONDITIONING	4.0 4.0	1.00	0.00	20 N/A MCB	0.45	1.00	N/A	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00
5	L1	CLEAN & DIRTY UTILITY SKTS	8.0 8.0	1.00	0.00	32 N/A RCBO	0.45	1.00	30	N/A	2.5 2 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	2.5	60.00
5	L2	125 AIR CONDITIONING	4.0 4.0	1.00	0.00	20 N/A MCB	0.45	1.00	N/A	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00
5	L3	125 AIR CONDITIONING	4.0 4.0	1.00	0.00	20 N/A MCB	0.45	1.00	N/A	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00
6	L1	005 DISABLED & DRUGS FRIDGE ALARM PANEL PANEL	4.0 4.0	1.00	0.00	20 N/A RCBO	0.45	1.00	30	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00

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# Distribution Board Schedule



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## Board Data

Id No: DB/CL1/P

ModelNo:

L1 L2 L3

Name:

No. of Ways: 8

Spare: 25

Total Connected Load (A): 60.00 60.00 60.00

Board Rating (A): 125

Fault Rating (kA): 25

Ze (Ω): 0.07306

Total Diversified Load (A): 60.00 60.00 60.00

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A) In Ir Type		Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length	
6	L2	125 AIR CONDITIONING	4.0 4.0	1.00	0.00	20	N/A	MCB	0.45	1.00	N/A	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00
6	L3	125 AIR CONDITIONING	4.0 4.0	1.00	0.00	20	N/A	MCB	0.45	1.00	N/A	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00

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# Distribution Board Schedule



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## Board Data

Id No: DB/CL/L

ModelNo:

L1 L2 L3

Name:

No. of Ways: 8

Spare: 62.5

Total Connected Load (A): 15.00 15.00 15.00

Board Rating (A): 125

Fault Rating (kA): 25

Ze (Ω): 0.08335

Total Diversified Load (A): 15.00 15.00 15.00

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A) In Ir Type	Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length
1	L1	021 CONSULTATION & 020 TREATMENT LIGHT	2.0 2.0	0.95	10.00	10 N/A MCB	0.45	1.00	N/A	N/A	1.5 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	1.5	40.00
1	L2	019 & 018 CONSULTATION LIGHTI	2.0 2.0	0.95	10.00	10 N/A MCB	0.45	1.00	N/A	N/A	1.5 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	1.5	40.00
1	L3	017 & 016 CONSULTATION LIGHTI	2.0 2.0	0.95	10.00	10 N/A MCB	0.45	1.00	N/A	N/A	1.5 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	1.5	40.00
2	L1	L0 011 CORRIDOR LIGHTING	2.0 2.0	0.95	10.00	10 N/A MCB	0.45	1.00	N/A	N/A	1.5 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	1.5	40.00
2	L2	L0 027 012 CORRIDOR LIGHTING	2.0 2.0	0.95	10.00	10 N/A MCB	0.45	1.00	N/A	N/A	1.5 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	1.5	40.00

[u] = User Defined

# Distribution Board Schedule



**Project Reference:** Harehills Medical Centre     
 **Job Number:** P1371     
 **Created By:** Joe Veale     
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 **Created On:** 11/04/2022     
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 **Revision:**

## Board Data

**Id No:** DB/CL/L     
 **ModelNo:**     
 **L1**     
 **L2**     
 **L3**

**Name:**     
 **No. of Ways:** 8     
 **Spare:** 62.5     
 **Total Connected Load (A):** 15.00     
 15.00     
 15.00

**Board Rating (A):** 125     
 **Fault Rating (kA):** 25     
 **Ze (Ω):** 0.08335     
 **Total Diversified Load (A):** 15.00     
 15.00     
 15.00

## Incomer Details

**Device Manufacturer:** N/A     
 **Device Type:** Isolating Switch     
 **Device Rating (A):** 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A)			Cg	Ca	RCD	AFDD	Cable	Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length
2	L3	022 CONSULTATION LIGHTING	2.0 2.0	0.95	10.00	10	N/A	MCB	0.45	1.00	N/A	N/A	1.5	1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	1.5	40.00
3	L3	CLEAN & DIRTY UTILITY LIGHTING	2.0 2.0	0.95	10.00	10	N/A	MCB	0.45	1.00	N/A	N/A	1.5	1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	1.5	40.00

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# Distribution Board Schedule



Project Reference: Harehills Medical Centre

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## Board Data

Id No: DB/CL/P

ModelNo:

L1 L2 L3

Name:

No. of Ways: 8

Spare: 25

Total Connected Load (A): 60.00 60.00 60.00

Board Rating (A): 125

Fault Rating (kA): 25

Ze (Ω): 0.08335

Total Diversified Load (A): 60.00 60.00 60.00

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A) In Ir Type	Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length
1	L1	021 CONSULTATION & 020 TREATMENT SKTS	10.0 10.0	1.00	0.00	32 N/A RCBO	0.45	1.00	30	N/A	2.5 2 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	2.5	100.00
1	L2	018 & 019 CONSULTATION SKTS	10.0 10.0	1.00	0.00	32 N/A RCBO	0.45	1.00	30	N/A	2.5 2 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	2.5	100.00
1	L3	017 & 016 CONSULTATION SKTS	10.0 10.0	1.00	0.00	32 N/A RCBO	0.45	1.00	30	N/A	2.5 2 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	2.5	100.00
2	L1	LHS CLEANERS SKTS	8.0 8.0	1.00	0.00	32 N/A RCBO	0.45	1.00	30	N/A	2.5 2 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	2.5	100.00
2	L2	RHS CLEANERS SKTS	8.0 8.0	1.00	0.00	32 N/A RCBO	0.45	1.00	30	N/A	2.5 2 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	2.5	100.00

[u] = User Defined

# Distribution Board Schedule



Project Reference: Harehills Medical Centre

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Created By: Joe Veale

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## Board Data

Id No: DB/CL/P

ModelNo:

L1 L2 L3

Name:

No. of Ways: 8

Spare: 25

Total Connected Load (A): 60.00 60.00 60.00

Board Rating (A): 125

Fault Rating (kA): 25

Ze (Ω): 0.08335

Total Diversified Load (A): 60.00 60.00 60.00

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A) In Ir Type	Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length
2	L3	022 CONSULTATION SKTS	10.0 10.0	1.00	0.00	32 N/A RCBO	0.45	1.00	30	N/A	2.5 2 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	2.5	100.00
3	L1	020 AIR CONDITIONING	4.0 4.0	1.00	0.00	20 N/A MCB	0.45	1.00	N/A	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00
3	L2	011, 012 & 014 ACCESS CONTROL	4.0 4.0	1.00	0.00	20 N/A RCBO	0.45	1.00	30	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00
3	L3	CLEAN & DIRTY UTILITY SKTS	8.0 8.0	1.00	0.00	32 N/A RCBO	0.45	1.00	30	N/A	2.5 2 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	2.5	60.00
4	L1	010 & 011 HRU	4.0 4.0	1.00	0.00	20 N/A MCB	0.45	1.00	N/A	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00

[u] = User Defined

# Distribution Board Schedule



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## Board Data

Id No: DB/CL/P

ModelNo:

L1 L2 L3

Name:

No. of Ways: 8

Spare: 25

Total Connected Load (A): 60.00 60.00 60.00

Board Rating (A): 125

Fault Rating (kA): 25

Ze (Ω): 0.08335

Total Diversified Load (A): 60.00 60.00 60.00

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A) In Ir Type	Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length
4	L2	020 AIR CONDITIONING	4.0 4.0	1.00	0.00	20 N/A MCB	0.45	1.00	N/A	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00
4	L3	UTILITY DRUGS FRIDGES	4.0 4.0	1.00	0.00	20 N/A RCBO	0.45	1.00	30	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00
5	L1	Radiant panels	4.0 4.0	1.00	0.00	20 N/A MCB	0.45	1.00	N/A	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00
5	L2	DOOR HOLD OPEN PSU	4.0 4.0	1.00	0.00	20 N/A RCBO	0.45	1.00	30	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00
5	L3	020 AIR CONDITIONING	4.0 4.0	1.00	0.00	20 N/A MCB	0.45	1.00	N/A	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00

[u] = User Defined

# Distribution Board Schedule



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## Board Data

**Id No:** DB/CL/P     
 **ModelNo:**     
 **L1**     
 **L2**     
 **L3**

**Name:**     
 **No. of Ways:** 8     
 **Spare:** 25     
 **Total Connected Load (A):** 60.00     
 60.00     
 60.00

**Board Rating (A):** 125     
 **Fault Rating (kA):** 25     
 **Ze (Ω):** 0.08335     
 **Total Diversified Load (A):** 60.00     
 60.00     
 60.00

## Incomer Details

**Device Manufacturer:** N/A     
 **Device Type:** Isolating Switch     
 **Device Rating (A):** 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A) In	Ir	Type	Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length	
6	L1	Radiant panels	4.0 4.0	1.00	0.00	20	N/A	MCB	0.45	1.00	N/A	N/A	4	1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00
6	L2	Radiant panels	4.0 4.0	1.00	0.00	20	N/A	MCB	0.45	1.00	N/A	N/A	4	1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00

[u] = User Defined

# Distribution Board Schedule



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## Board Data

Id No: DB/COM

ModelNo:

L1 L2 L3

Name:

No. of Ways: 10

Spare: 80

Total Connected Load (A): 30.00 0.00 0.00

Board Rating (A): 125

Fault Rating (kA): 25

Ze (Ω): 0.23935

Total Diversified Load (A): 30.00 0.00 0.00

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A) In Ir Type		Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length	
1	L1	DATA CABINET	5.0 5.0	1.00	0.00	16	N/A	RCBO	0.52	1.00	30	N/A	2.5 1 x 2 x 1c	Single-core 70°C thermoplastic non-arm Cu	7	2.5	5.00
2	L1	IT ROOM SKTS	5.0 5.0	1.00	0.00	20	N/A	RCBO	0.80	1.00	30	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	1	4	10.00

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Project Reference: Harehills Medical Centre

Job Number: P1371

Created By: Joe Veale

Rev Date:

Document No:

Created On: 11/04/2022

Revised By:

Revision:

## Board Data

Id No: DB/EVC

ModelNo:

L1 L2 L3

Name:

No. of Ways: 6

Spare: 66.7

Total Connected Load (A): 62.90 64.90 64.90

Board Rating (A): 125

Fault Rating (kA): 25

Ze (Ω): 0.09628

Total Diversified Load (A): 62.90 64.90 64.90

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 160

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A) In Ir Type	Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length
1	L1	DUAL EVC CHARGER	62.9 62.9	1.00	0.00	63 N/A MCB	0.78	1.00	N/A	N/A	25 1 x 1 x 3c	Multicore 90°C thermosetting armoured	5	N/A	40.00
1	L2	DUAL EVC CHARGER	62.9 62.9	1.00	0.00	63 N/A MCB	0.78	1.00	N/A	N/A	25 1 x 1 x 3c	Multicore 90°C thermosetting armoured	5	N/A	40.00
1	L3	DUAL EVC CHARGER	62.9 62.9	1.00	0.00	63 N/A MCB	0.78	1.00	N/A	N/A	25 1 x 1 x 3c	Multicore 90°C thermosetting armoured	5	N/A	40.00
2	L2	EXTERNAL COLUMN LIGHTING	2.0 2.0	1.00	0.00	6 N/A MCB	0.64	1.00	N/A	N/A	4 1 x 1 x 3c	Multicore 90°C thermosetting armoured	11	N/A	120.00
2	L3	EXTERNAL COLUMN LIGHTING	2.0 2.0	1.00	0.00	6 N/A MCB	0.64	1.00	N/A	N/A	4 1 x 1 x 3c	Multicore 90°C thermosetting armoured	11	N/A	120.00

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# Distribution Board Schedule



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## Board Data

Id No: DB/LL

ModelNo:

L1 L2 L3

Name:

No. of Ways: 6

Spare: 83.3

Total Connected Load (A):

2.00 2.00 2.00

Board Rating (A): 125

Fault Rating (kA): 25

Ze (Ω): 0.06321

Total Diversified Load (A):

2.00 2.00 2.00

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A) In	Ir	Type	Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length
2	L1	EXTERNAL BUILDING MOUNTED LIGHTING	2.0 2.0	1.00	0.00	6	N/A	MCB	0.73	1.00	N/A	N/A	2.5 1 x 1 x 3c	Multicore 90°C thermosetting armoured	11	N/A	80.00
2	L2	EXTERNAL COLUMN LIGHTING	2.0 2.0	1.00	0.00	6	N/A	MCB	0.64	1.00	N/A	N/A	4 1 x 1 x 3c	Multicore 90°C thermosetting armoured	11	N/A	120.00
2	L3	EXTERNAL COLUMN LIGHTING	2.0 2.0	1.00	0.00	6	N/A	MCB	0.64	1.00	N/A	N/A	4 1 x 1 x 3c	Multicore 90°C thermosetting armoured	11	N/A	120.00

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## Board Data

Id No: DB/LP0/L

ModelNo:

L1 L2 L3

Name:

No. of Ways: 16

Spare: 81.3

Total Connected Load (A): 25.00 25.00 25.00

Board Rating (A): 125

Fault Rating (kA): 25

Ze (Ω): 0.14648

Total Diversified Load (A): 25.00 25.00 25.00

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A) In Ir Type	Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length
1	L1	L0 011 CORRIDOR LIGHTING	2.0 2.0	0.95	10.00	10 N/A MCB	0.45	1.00	N/A	N/A	1.5 1 x 1 x 3c	Multicore 90°C thermosetting LSF Flat T	11	N/A	40.00
1	L2	L0 027 CORRIDOR LIGHTING	2.0 2.0	0.95	10.00	10 N/A MCB	0.45	1.00	N/A	N/A	1.5 1 x 1 x 3c	Multicore 90°C thermosetting LSF Flat T	11	N/A	40.00
1	L3	L0 UTILITY & STORE LIGHTING	2.0 2.0	0.95	10.00	10 N/A MCB	0.45	1.00	N/A	N/A	1.5 1 x 1 x 3c	Multicore 90°C thermosetting LSF Flat T	11	N/A	40.00
2	L1	L0 WC'S LIGHTING	2.0 2.0	0.95	10.00	10 N/A MCB	0.45	1.00	N/A	N/A	1.5 1 x 1 x 3c	Multicore 90°C thermosetting LSF Flat T	11	N/A	40.00
2	L2	L0 RECEPTION, INTERVIEW & CLEAN	2.0 2.0	0.95	10.00	10 N/A MCB	0.45	1.00	N/A	N/A	1.5 1 x 1 x 3c	Multicore 90°C thermosetting LSF Flat T	11	N/A	40.00

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# Distribution Board Schedule



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Job Number: P1371

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Revision:

## Board Data

Id No: DB/LP0/L

ModelNo:

L1 L2 L3

Name:

No. of Ways: 16

Spare: 81.3

Total Connected Load (A): 25.00 25.00 25.00

Board Rating (A): 125

Fault Rating (kA): 25

Ze (Ω): 0.14648

Total Diversified Load (A): 25.00 25.00 25.00

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A) In Ir Type	Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length
2	L3	L0 WAITING AREA LIGHTING	2.0 2.0	0.95	10.00	10 N/A MCB	0.45	1.00	N/A	N/A	2.5 1 x 1 x 3c	Multicore 90°C thermosetting LSF Flat T	11	N/A	80.00
3	L1	L0 LOBBY LIGHTING	2.0 2.0	0.95	10.00	10 N/A MCB	0.45	1.00	N/A	N/A	1.5 1 x 1 x 3c	Multicore 90°C thermosetting LSF Flat T	11	N/A	40.00
3	L2	L0-L2 024 STAIR LIGHTING	2.0 2.0	0.95	10.00	10 N/A MCB	0.45	1.00	N/A	N/A	1.5 1 x 1 x 3c	Multicore 90°C thermosetting LSF Flat T	11	N/A	40.00
3	L3	L0-L2 028 STAIR LIGHTING	2.0 2.0	0.95	10.00	10 N/A MCB	0.45	1.00	N/A	N/A	1.5 1 x 1 x 3c	Multicore 90°C thermosetting LSF Flat T	11	N/A	40.00

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# Distribution Board Schedule



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## Board Data

Id No: DB/LP0/P

ModelNo:

L1 L2 L3

Name:

No. of Ways: 14

Spare: 28.6

Total Connected Load (A): 65.32 67.32 58.81

Board Rating (A): 125

Fault Rating (kA): 25

Ze (Ω): 0.14648

Total Diversified Load (A): 65.32 67.32 58.81

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A) In Ir Type	Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length
1	L1	LHS CLEANERS SKTS	8.0 8.0	1.00	0.00	32 N/A RCBO	0.72	1.00	30	N/A	2.5 2 x 1 x 3c	Multicore 90°C thermosetting LSF Flat T	11	N/A	90.00
1	L2	RHS CLEANERS SKTS	8.0 8.0	1.00	0.00	32 N/A RCBO	0.72	1.00	30	N/A	2.5 2 x 1 x 3c	Multicore 90°C thermosetting LSF Flat T	11	N/A	90.00
1	L3	CLEAN & DIRTY UTILITY SKTS	8.0 8.0	1.00	0.00	32 N/A RCBO	0.72	1.00	30	N/A	2.5 2 x 1 x 3c	Multicore 90°C thermosetting LSF Flat T	11	N/A	60.00
2	L1	ACC WC DISABLED ALARM	2.0 2.0	1.00	0.00	16 N/A RCBO	0.72	1.00	30	N/A	2.5 1 x 1 x 3c	Multicore 90°C thermosetting LSF Flat T	11	N/A	40.00
2	L2	011 POWERED DOORS	8.0 8.0	1.00	0.00	20 N/A RCBO	0.72	1.00	30	N/A	4 1 x 1 x 3c	Multicore 90°C thermosetting LSF Flat T	11	N/A	40.00
2	L3	UTILITY DRUGS FRIDGES	8.0 8.0	1.00	0.00	20 N/A RCBO	0.72	1.00	30	N/A	4 1 x 1 x 3c	Multicore 90°C thermosetting LSF Flat T	11	N/A	40.00

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## Board Data

Id No: DB/LP0/P

ModelNo:

L1 L2 L3

Name:

No. of Ways: 14

Spare: 28.6

Total Connected Load (A): 65.32 67.32 58.81

Board Rating (A): 125

Fault Rating (kA): 25

Ze (Ω): 0.14648

Total Diversified Load (A): 65.32 67.32 58.81

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A) In Ir Type	Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length
3	L1	011 & 014 ACCESS CONTROL	4.0 4.0	1.00	0.00	20 N/A RCBO	0.72	1.00	30	N/A	4 1 x 1 x 3c	Multicore 90°C thermosetting LSF Flat T	11	N/A	40.00
3	L2	001 ACCESS CONTROL	4.0 4.0	1.00	0.00	20 N/A RCBO	0.72	1.00	30	N/A	4 1 x 1 x 3c	Multicore 90°C thermosetting LSF Flat T	11	N/A	40.00
4	L1	WAITING AREA CLEANERS SKTS	8.0 8.0	1.00	0.00	32 N/A RCBO	0.72	1.00	30	N/A	2.5 2 x 1 x 3c	Multicore 90°C thermosetting LSF Flat T	11	N/A	90.00
4	L2	024 POWERED DOORS	8.0 8.0	1.00	0.00	20 N/A RCBO	0.72	1.00	30	N/A	4 1 x 1 x 3c	Multicore 90°C thermosetting LSF Flat T	11	N/A	40.00
5	L1	WAITING GENERAL SKTS	8.0 8.0	1.00	0.00	32 N/A RCBO	0.72	1.00	30	N/A	2.5 2 x 1 x 3c	Multicore 90°C thermosetting LSF Flat T	11	N/A	90.00

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Revision:

## Board Data

Id No: DB/LP0/P

ModelNo:

L1 L2 L3

Name:

No. of Ways: 14

Spare: 28.6

Total Connected Load (A): 65.32 67.32 58.81

Board Rating (A): 125

Fault Rating (kA): 25

Ze (Ω): 0.14648

Total Diversified Load (A): 65.32 67.32 58.81

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A) In Ir Type	Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length
10	L2	L04 CLEANERS	4.0 4.0	0.90	0.00	32 N/A RCBO	0.45	1.00	30	N/A	2.5 2 x 1 x 3c	Multicore 90°C thermosetting LSF Flat T	11	N/A	80.00
10	L3	L01 - L4 IRS	10.0 10.0	0.90	0.00	16 N/A MCB	0.45	1.00	N/A	N/A	2.5 1 x 1 x 3c	Multicore 90°C thermosetting LSF Flat T	11	N/A	40.00
11	L1	L01 EPH's	10.0 10.0	0.90	0.00	16 N/A MCB	0.45	1.00	N/A	N/A	2.5 1 x 1 x 3c	Multicore 90°C thermosetting LSF Flat T	11	N/A	40.00
11	L2	L02 EPH's	10.0 10.0	0.90	0.00	16 N/A MCB	0.45	1.00	N/A	N/A	2.5 1 x 1 x 3c	Multicore 90°C thermosetting LSF Flat T	11	N/A	40.00
11	L3	L03 EPH's	10.0 10.0	0.90	0.00	16 N/A MCB	0.45	1.00	N/A	N/A	2.5 1 x 1 x 3c	Multicore 90°C thermosetting LSF Flat T	11	N/A	40.00
12	L1	L01 CLEANERS	4.0 4.0	0.90	0.00	32 N/A RCBO	0.45	1.00	30	N/A	2.5 2 x 1 x 3c	Multicore 90°C thermosetting LSF Flat T	11	N/A	93.00

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## Board Data

Id No: DB/LP0/P

ModelNo:

L1 L2 L3

Name:

No. of Ways: 14

Spare: 28.6

Total Connected Load (A): 65.32 67.32 58.81

Board Rating (A): 125

Fault Rating (kA): 25

Ze (Ω): 0.14648

Total Diversified Load (A): 65.32 67.32 58.81

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A) In Ir Type	Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length
12	L2	L02 CLEANERS	4.0 4.0	0.90	0.00	32 N/A RCBO	0.45	1.00	30	N/A	2.5 2 x 1 x 3c	Multicore 90°C thermosetting LSF Flat T	11	N/A	80.00
12	L3	L03 CLEANERS	4.0 4.0	0.90	0.00	32 N/A RCBO	0.45	1.00	30	N/A	2.5 2 x 1 x 3c	Multicore 90°C thermosetting LSF Flat T	11	N/A	80.00
13	L1	L01 WATER HEATER	13.0 13.0	0.90	0.00	20 N/A MCB	0.45	1.00	N/A	N/A	4 1 x 1 x 3c	Multicore 90°C thermosetting LSF Flat T	11	N/A	30.00
13	L2	L04 WATER HEATER	13.0 13.0	0.90	0.00	20 N/A MCB	0.45	1.00	N/A	N/A	4 1 x 1 x 3c	Multicore 90°C thermosetting LSF Flat T	11	N/A	30.00
13	L3	L04 EPH's	10.0 10.0	0.90	0.00	16 N/A MCB	0.45	1.00	N/A	N/A	2.5 1 x 1 x 3c	Multicore 90°C thermosetting LSF Flat T	11	N/A	40.00
14	L1	L01 ACCESS CONTROL	10.0 10.0	0.90	0.00	16 N/A MCB	0.45	1.00	N/A	N/A	2.5 1 x 1 x 3c	Multicore 90°C thermosetting LSF Flat T	11	N/A	40.00

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## Board Data

Id No: DB/LP0/P

ModelNo:

L1 L2 L3

Name:

No. of Ways: 14

Spare: 28.6

Total Connected Load (A): 65.32 67.32 58.81

Board Rating (A): 125

Fault Rating (kA): 25

Ze (Ω): 0.14648

Total Diversified Load (A): 65.32 67.32 58.81

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A) In Ir Type		Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length
14	L2	L02 ACCESS CONTROL	10.0 10.0	0.90	0.00	16	N/A	MCB	0.45	1.00	N/A	N/A	2.5 1 x 1 x 3c Multicore 90°C thermosetting LSF Flat T	11	N/A	40.00
14	L3	L03 - L04 ACCESS CONTROL	10.0 10.0	0.90	0.00	16	N/A	MCB	0.45	1.00	N/A	N/A	2.5 1 x 1 x 3c Multicore 90°C thermosetting LSF Flat T	11	N/A	40.00

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## Board Data

Id No: DB/OF1/L

ModelNo:

L1 L2 L3

Name:

No. of Ways: 8

Spare: 75

Total Connected Load (A): 15.00 15.00 15.00

Board Rating (A): 125

Fault Rating (kA): 25

Ze (Ω): 0.07306

Total Diversified Load (A): 15.00 15.00 15.00

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A) In Ir Type	Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length
1	L1	WAITING AREA LIGHTING	2.0 2.0	0.95	10.00	10 N/A MCB	0.45	1.00	N/A	N/A	1.5 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	1.5	40.00
1	L2	RECORDS & LOCKERS LIGHTING	2.0 2.0	0.95	10.00	10 N/A RCBO	0.45	1.00	30	N/A	1.5 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	1.5	40.00
1	L3	118 & 135 CORRIDOR LIGHTING	2.0 2.0	0.95	10.00	10 N/A MCB	0.45	1.00	N/A	N/A	1.5 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	1.5	40.00
2	L1	BOOKABLE & MEETING LIGHTING	2.0 2.0	0.95	10.00	10 N/A MCB	0.45	1.00	N/A	N/A	1.5 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	1.5	40.00
2	L2	ADMIN 106 & MANAGER LIGHTING	2.0 2.0	0.95	10.00	10 N/A MCB	0.45	1.00	N/A	N/A	1.5 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	1.5	40.00

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## Board Data

Id No: DB/OF1/L

ModelNo:

L1	L2	L3
----	----	----

Name:

No. of Ways: 8

Spare: 75

Total Connected Load (A):	L1	L2	L3
15.00	15.00	15.00	15.00

Board Rating (A): 125

Fault Rating (kA): 25

Ze (Ω): 0.07306

Total Diversified Load (A):	L1	L2	L3
15.00	15.00	15.00	15.00

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A)			Cg	Ca	RCD	AFDD	Cable	Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length
2	L3	STAFF & ADMIN 104 LIGHTING	2.0 2.0	0.95	10.00	10	N/A	MCB	0.45	1.00	N/A	N/A	1.5	1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	1.5	40.00

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## Board Data

Id No: DB/OF1/P

ModelNo:

L1 L2 L3

Name:

No. of Ways: 14

Spare: 42.9

Total Connected Load (A): 46.00 36.00 36.00

Board Rating (A): 125

Fault Rating (kA): 25

Ze (Ω): 0.07306

Total Diversified Load (A): 46.00 36.00 36.00

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A) In Ir Type	Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length
1	L1	WAITING & BOOKABLE CLEANERS SKTS	8.0 8.0	1.00	0.00	32 N/A RCBO	0.45	1.00	30	N/A	2.5 2 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	2.5	100.00
1	L2	LOCKER & RECORDS SKTS	8.0 8.0	1.00	0.00	32 N/A RCBO	0.45	1.00	30	N/A	2.5 2 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	2.5	100.00
1	L3	CORRIDOR & OFFICECLEANERS SKT	8.0 8.0	1.00	0.00	32 N/A RCBO	0.45	1.00	30	N/A	2.5 2 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	2.5	100.00
2	L1	WAITING GENERAL SKTS	8.0 8.0	1.00	0.00	32 N/A RCBO	0.45	1.00	30	N/A	2.5 2 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	2.5	100.00
2	L2	ADMIN 106 GENERAL SKTS	8.0 8.0	1.00	0.00	32 N/A RCBO	0.45	1.00	30	N/A	2.5 2 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	2.5	100.00

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## Board Data

Id No: DB/OF1/P

ModelNo:

L1 L2 L3

Name:

No. of Ways: 14

Spare: 42.9

Total Connected Load (A): 46.00 36.00 36.00

Board Rating (A): 125

Fault Rating (kA): 25

Ze (Ω): 0.07306

Total Diversified Load (A): 46.00 36.00 36.00

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A) In Ir Type	Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length
2	L3	ADMIN 114 GENERAL SKTS	8.0 8.0	1.00	0.00	32 N/A RCBO	0.45	1.00	30	N/A	2.5 2 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	2.5	100.00
3	L1	WAITING AREA & STORE 104 HRU'S	4.0 4.0	1.00	0.00	20 N/A MCB	0.45	1.00	N/A	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00
3	L2	ADMIN 106 & MANAGER GENERAL S	8.0 8.0	1.00	0.00	32 N/A RCBO	0.45	1.00	30	N/A	2.5 2 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	2.5	100.00
3	L3	ADMIN 114 GENERAL SKTS	8.0 8.0	1.00	0.00	32 N/A RCBO	0.45	1.00	30	N/A	2.5 2 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	2.5	100.00
4	L1	ACC WC DISABLED ALARM & REPEATER P	2.0 2.0	1.00	0.00	16 N/A RCBO	0.45	1.00	30	N/A	2.5 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	2.5	40.00

[u] = User Defined

# Distribution Board Schedule



Project Reference: Harehills Medical Centre

Job Number: P1371

Created By: Joe Veale

Rev Date:

Document No:

Created On: 11/04/2022

Revised By:

Revision:

## Board Data

Id No: DB/OF1/P

ModelNo:

L1 L2 L3

Name:

No. of Ways: 14

Spare: 42.9

Total Connected Load (A): 46.00 36.00 36.00

Board Rating (A): 125

Fault Rating (kA): 25

Ze (Ω): 0.07306

Total Diversified Load (A): 46.00 36.00 36.00

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A)			Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length	
						In	Ir	Type										
4	L2	STAFF ROOM GENERAL SKTS	8.0 8.0	1.00	0.00	32	N/A	RCBO	0.45	1.00	30	N/A	4	2 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	100.00
4	L3	114 AIR CONDITIONING	4.0 4.0	1.00	0.00	20	N/A	RCBO	0.45	1.00	30	N/A	4	1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00
5	L1	BOOKABLE GENERAL SKTS	8.0 8.0	1.00	0.00	32	N/A	RCBO	0.45	1.00	30	N/A	2.5	2 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	2.5	100.00
5	L2	STAFF ROOM WATER BOILER	4.0 4.0	1.00	0.00	20	N/A	RCBO	0.45	1.00	30	N/A	4	1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00
5	L3	115 HRU	4.0 4.0	1.00	0.00	20	N/A	RCBO	0.45	1.00	30	N/A	4	1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00

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# Distribution Board Schedule



Project Reference: Harehills Medical Centre

Job Number: P1371

Created By: Joe Veale

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Revision:

## Board Data

Id No: DB/OF1/P

ModelNo:

L1 L2 L3

Name:

No. of Ways: 14

Spare: 42.9

Total Connected Load (A): 46.00 36.00 36.00

Board Rating (A): 125

Fault Rating (kA): 25

Ze (Ω): 0.07306

Total Diversified Load (A): 46.00 36.00 36.00

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A) In Ir Type	Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length
6	L1	BOOKABLE GENERAL SKTS	8.0 8.0	1.00	0.00	32 N/A RCBO	0.45	1.00	30	N/A	2.5 2 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	2.5	100.00
6	L3	104 DOOR HOLD OPEN PSU	4.0 4.0	1.00	0.00	20 N/A RCBO	0.45	1.00	30	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00
7	L1	103 AIR CONDITIONING	4.0 4.0	1.00	0.00	20 N/A RCBO	0.45	1.00	30	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00
8	L1	130 INTRUDER ALARM PANEL	4.0 4.0	1.00	0.00	20 N/A RCBO	0.45	1.00	30	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00

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# Distribution Board Schedule



Project Reference: Harehills Medical Centre

Job Number: P1371

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## Board Data

Id No: DB/OF/L

ModelNo:

L1 L2 L3

Name:

No. of Ways: 8

Spare: 62.5

Total Connected Load (A): 15.00 15.00 15.00

Board Rating (A): 125

Fault Rating (kA): 25

Ze (Ω): 0.08335

Total Diversified Load (A): 15.00 15.00 15.00

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A) In Ir Type	Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length
1	L1	L0-L2 EMERGENCY STAIR CORE	2.0 2.0	0.95	10.00	10 N/A MCB	0.45	1.00	N/A	N/A	1.5 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	1.5	40.00
1	L2	L0-L2 MAIN STAIR CORE	2.0 2.0	0.95	10.00	10 N/A MCB	0.45	1.00	N/A	N/A	1.5 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	1.5	40.00
1	L3	L0 WAITING AREA LIGHTING	2.0 2.0	0.95	10.00	10 N/A MCB	0.45	1.00	N/A	N/A	2.5 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	2.5	80.00
2	L1	003 STORE, 006 & 007 WC LIGHTING	2.0 2.0	0.95	10.00	10 N/A MCB	0.45	1.00	N/A	N/A	1.5 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	1.5	40.00
2	L2	L0 RECEPTION & INTERVIEW LIGHTING	2.0 2.0	0.95	10.00	10 N/A MCB	0.45	1.00	N/A	N/A	1.5 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	1.5	40.00

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# Distribution Board Schedule



Project Reference: Harehills Medical Centre

Job Number: P1371

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Revision:

## Board Data

Id No: DB/OF/L

ModelNo:

L1 L2 L3

Name:

No. of Ways: 8

Spare: 62.5

Total Connected Load (A):

15.00 15.00 15.00

Board Rating (A): 125

Fault Rating (kA): 25

Ze (Ω): 0.08335

Total Diversified Load (A):

15.00 15.00 15.00

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A) In Ir Type		Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length	
2	L3	L0 LOBBY LIGHTING	2.0 2.0	0.95	10.00	10	N/A	MCB	0.45	1.00	N/A	N/A	1.5 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	1.5	40.00
3	L1	BIN STORE LIGHTING	2.0 2.0	0.95	10.00	10	N/A	MCB	0.45	1.00	N/A	N/A	1.5 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	1.5	40.00

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# Distribution Board Schedule



Project Reference: Harehills Medical Centre

Job Number: P1371

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## Board Data

Id No: DB/OF/P

ModelNo:

L1 L2 L3

Name:

No. of Ways: 14

Spare: 57.1

Total Connected Load (A): 60.00 60.00 60.00

Board Rating (A): 125

Fault Rating (kA): 25

Ze (Ω): 0.08335

Total Diversified Load (A): 60.00 60.00 60.00

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A) In Ir Type	Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length
1	L1	002 HRU	4.0 4.0	1.00	0.00	20 N/A MCB	0.45	1.00	N/A	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00
1	L2	024 POWERED DOORS	4.0 4.0	1.00	0.00	20 N/A RCBO	0.45	1.00	30	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00
2	L1	001 PATIENT TOUCH SCREEN	4.0 4.0	1.00	0.00	20 N/A RCBO	0.45	1.00	30	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00
2	L2	RECEPTION GENERAL SKTS	8.0 8.0	1.00	0.00	32 N/A RCBO	0.45	1.00	30	N/A	2.5 2 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	2.5	100.00
3	L1	ACC WC DISABLED ALARM	2.0 2.0	1.00	0.00	16 N/A RCBO	0.45	1.00	30	N/A	2.5 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	2.5	40.00

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# Distribution Board Schedule



Project Reference: Harehills Medical Centre

Job Number: P1371

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Document No:

Created On: 11/04/2022

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Revision:

## Board Data

Id No: DB/OF/P

ModelNo:

L1 L2 L3

Name:

No. of Ways: 14

Spare: 57.1

Total Connected Load (A): 60.00 60.00 60.00

Board Rating (A): 125

Fault Rating (kA): 25

Ze (Ω): 0.08335

Total Diversified Load (A): 60.00 60.00 60.00

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A) In Ir Type	Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length
3	L2	005 DISABLED & DRUGS FRIDGE ALARM PANEL PANEL	4.0 4.0	1.00	0.00	20 N/A RCBO	0.45	1.00	30	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00
3	L3	003 DOOR HOLD OPEN PSU	4.0 4.0	1.00	0.00	20 N/A RCBO	0.45	1.00	30	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00
4	L1	001 ACCESS CONTROL	4.0 4.0	1.00	0.00	20 N/A RCBO	0.45	1.00	30	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00
4	L2	001, 004 & 005 CLEANERS SKTS	8.0 8.0	1.00	0.00	32 N/A RCBO	0.45	1.00	30	N/A	2.5 2 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	2.5	100.00
4	L3	WAITING AREA CLEANERS SKTS	8.0 8.0	1.00	0.00	32 N/A RCBO	0.45	1.00	30	N/A	2.5 2 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	2.5	100.00

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# Distribution Board Schedule



Project Reference: Harehills Medical Centre

Job Number: P1371

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Revision:

## Board Data

Id No: DB/OF/P

ModelNo:

L1 L2 L3

Name:

No. of Ways: 14

Spare: 57.1

Total Connected Load (A): 60.00 60.00 60.00

Board Rating (A): 125

Fault Rating (kA): 25

Ze (Ω): 0.08335

Total Diversified Load (A): 60.00 60.00 60.00

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A) In Ir Type	Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length
5	L1	001 POWERED DOORS	8.0 8.0	1.00	0.00	20 N/A RCBO	0.45	1.00	30	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00
5	L2	INTERVIEW GENERAL SKTS	8.0 8.0	1.00	0.00	32 N/A RCBO	0.45	1.00	30	N/A	2.5 2 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	2.5	100.00
6	L1	001 OVER DOOR HEATER	8.0 8.0	1.00	0.00	20 N/A RCBO	0.45	1.00	30	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	40.00
6	L3	WAITING GENERAL SKTS	8.0 8.0	1.00	0.00	32 N/A RCBO	0.45	1.00	30	N/A	2.5 2 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	2.5	100.00

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# Distribution Board Schedule



Project Reference: Harehills Medical Centre

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## Board Data

Id No: DB/Pharmacy

ModelNo:

L1 L2 L3

Name:

No. of Ways: 12

Spare: 91.7

Total Connected Load (A): 1.00 0.00 0.00

Board Rating (A): 125

Fault Rating (kA): 25

Ze ( $\Omega$ ): 0.05089

Total Diversified Load (A): 1.00 0.00 0.00

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A) In Ir Type		Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length
1	L1	Cbl_FC-6 FAP	1.0 1.0	1.00	0.00	16	N/A	MCB	1.00	1.00	N/A	N/A	4 1 x 1 x 3c Draka FT120 Cu 4D2	0	N/A	20.00

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# Distribution Board Schedule



Project Reference: Harehills Medical Centre

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## Board Data

Id No: DB-PLANT

ModelNo:

L1 L2 L3

Name:

No. of Ways: 8

Spare: 37.5

Total Connected Load (A): 78.00 66.00 66.00

Board Rating (A): 125

Fault Rating (kA): 25

Ze (Ω): 0.06114

Total Diversified Load (A): 78.00 66.00 66.00

## Incomer Details

Device Manufacturer: N/A

Device Type: Isolating Switch

Device Rating (A): 100

Way	Phase	Id No: Name	Load (A) Diversified Connected	Pf	3rd Harmonic	Protective Device (A) In	Ir	Type	Cg	Ca	RCD	AFDD	Cable Cores	Cable Type	Grouped with other circuits	Sep. CPC	Design Length
1	L1	PLANT LIGHTING	2.0 2.0	1.00	0.00	10	N/A	MCB	0.45	1.00	N/A	N/A	1.5 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	1.5	10.00
4	L1,L2,L3	IT ROOM EXTERNAL CONDENSOR	16.0 16.0	1.00	0.00	20	N/A	MCB	0.73	1.00	N/A	N/A	4 1 x 1 x 4c	Multicore 90°C thermosetting armoured	5	N/A	10.00
5	L1,L2,L3	PHARMACY EXTERNAL CONDENSOR	25.0 25.0	1.00	0.00	32	N/A	MCB	0.73	1.00	N/A	N/A	6 1 x 1 x 4c	Multicore 90°C thermosetting armoured	5	N/A	10.00
6	L1,L2,L3	EXTERNAL CONDENSOR	25.0 25.0	1.00	0.00	32	N/A	MCB	0.73	1.00	N/A	N/A	6 1 x 1 x 4c	Multicore 90°C thermosetting armoured	5	N/A	10.00
7	L1	PLANT GENERAL SKTS	10.0 10.0	1.00	0.00	20	N/A	RCBO	0.45	1.00	30	N/A	4 1 x 2 x 1c	Single-core 90°C thermosetting non-arm *R	11	4	10.00

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# Switchboard Report



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## Board Data

**Id No:** DB/CL

**Name:**

## Cables

Phase	IdNo: Name:	Load (A) Diversified	Load (A) Connected	PF	3rd Harmonic %	Protective Device (A)			Cg	Ca	RCD (mA)	AFDD	Cable Type	Grouped with other circuits	Size mm <sup>2</sup>	Cores	Sep.CPC mm <sup>2</sup>	Design Length (m)
						In	Ir	Type										
L1,L2,L3	DO NOT PRINT	15.0	15.0	1.00	0.00	100	100	MCCB	1.00	1.00	N/A	N/A	Single-core 70°C thermoplastic non-arm Cu	0	630	1 x 4 x 1c	6	0.5
L1,L2,L3	DO NOT PRINT	60.0	60.0	1.00	0.00	100	100	MCCB	1.00	1.00	N/A	N/A	Single-core 70°C thermoplastic non-arm Cu	0	630	1 x 4 x 1c	6	0.5

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# Switchboard Report



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**Job Number:** P1371

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## Board Data

**Id No:** DB/CL1

**Name:**

## Cables

Phase	IdNo: Name:	Load (A) Diversified	Load (A) Connected	PF	3rd Harmonic %	Protective Device (A)			Cg	Ca	RCD (mA)	AFDD	Cable Type	Grouped with other circuits	Size mm <sup>2</sup>	Cores	Sep.CPC mm <sup>2</sup>	Design Length (m)
						In	Ir	Type										
L1,L2,L3	DO NOT PRINT	15.0	15.0	1.00	0.00	100	100	MCCB	1.00	1.00	N/A	N/A	Single-core 70°C thermoplastic non-arm Cu	0	630	1 x 4 x 1c	6	0.5
L1,L2,L3	DO NOT PRINT	60.0	60.0	1.00	0.00	100	100	MCCB	1.00	1.00	N/A	N/A	Single-core 70°C thermoplastic non-arm Cu	0	630	1 x 4 x 1c	6	0.5

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# Switchboard Report



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## Board Data

**Id No:** DB/LP0

**Name:**

## Cables

Phase	IdNo: Name:	Load (A) Diversified	Load (A) Connected	PF	3rd Harmonic %	Protective Device (A)			Cg	Ca	RCD (mA)	AFDD	Cable Type	Grouped with other circuits	Size mm <sup>2</sup>	Cores	Sep.CPC mm <sup>2</sup>	Design Length (m)
						In	Ir	Type										
L1,L2,L3	DO NOT PRINT	25.0	25.0	1.00	0.00	100	100	MCCB	1.00	1.00	N/A	N/A	Single-core 70°C thermoplastic non-arm Cu	0	630	1 x 4 x 1c	4	0.5
L1,L2,L3	DO NOT PRINT	67.3	67.3	0.97	0.00	100	100	MCCB	1.00	1.00	N/A	N/A	Single-core 70°C thermoplastic non-arm Cu	0	630	1 x 4 x 1c	4	0.5

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# Switchboard Report



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## Board Data

**Id No:** DB/OF

**Name:**

## Cables

Phase	IdNo: Name:	Load (A) Diversified	Load (A) Connected	PF	3rd Harmonic %	Protective Device (A)			Cg	Ca	RCD (mA)	AFDD	Cable Type	Grouped with other circuits	Size mm <sup>2</sup>	Cores	Sep.CPC mm <sup>2</sup>	Design Length (m)
						In	Ir	Type										
L1,L2,L3	DO NOT PRINT	15.0	15.0	1.00	0.00	100	100	MCCB	1.00	1.00	N/A	N/A	Single-core 70°C thermoplastic non-arm Cu	0	630	1 x 4 x 1c	6	0.5
L1,L2,L3	DO NOT PRINT	60.0	60.0	1.00	0.00	100	100	MCCB	1.00	1.00	N/A	N/A	Single-core 70°C thermoplastic non-arm Cu	0	630	1 x 4 x 1c	6	0.5

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# Switchboard Report



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## Board Data

**Id No:** DB/OF1

**Name:**

## Cables

Phase	IdNo: Name:	Load (A) Diversified	Load (A) Connected	PF	3rd Harmonic %	Protective Device (A)			Cg	Ca	RCD (mA)	AFDD	Cable Type	Grouped with other circuits	Size mm <sup>2</sup>	Cores	Sep.CPC mm <sup>2</sup>	Design Length (m)
						In	Ir	Type										
L1,L2,L3	DO NOT PRINT	15.0	15.0	1.00	0.00	100	100	MCCB	1.00	1.00	N/A	N/A	Single-core 70°C thermoplastic non-arm Cu	0	630	1 x 4 x 1c	6	0.5
L1,L2,L3	DO NOT PRINT	46.0	46.0	1.00	0.00	100	100	MCCB	1.00	1.00	N/A	N/A	Single-core 70°C thermoplastic non-arm Cu	0	630	1 x 4 x 1c	6	0.5

[u] = User Defined

# Switchboard Report



**Project Reference:** Harehills Medical Centre

**Job Number:** P1371

**Created By:** Joe Veale

**Rev Date:**

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**Created On:** 11/04/2022

**Revised By:**

**Revision:**

## Board Data

**Id No:** Sb-1

**Name:** NPG Bemco

## Cables

Phase	IdNo: Name:	Load (A) Diversified	Load (A) Connected	PF	3rd Harmonic %	Protective Device (A)			Cg	Ca	RCD (mA)	AFDD	Cable Type	Grouped with other circuits	Size mm <sup>2</sup>	Cores	Sep.CPC mm <sup>2</sup>	Design Length (m)
						In	Ir	Type										
L1,L2,L3	Cbl_SM-1	94.8	316.0	1.00	0.00	100	N/A	Fuse	0.82	1.00	N/A	N/A	Multicore 90°C thermosetting armoured *	2	35	1 x 1 x 4c	16	10
L1,L2,L3	Cbl_SM-2	96.5	192.9	1.00	0.00	100	N/A	Fuse	0.82	1.00	N/A	N/A	Multicore 90°C thermosetting armoured *	2	35	1 x 1 x 4c	16	10
L1,L2,L3	Cbl_SM-3	91.7	91.7	0.98	0.00	100	N/A	Fuse	0.82	1.00	N/A	N/A	Multicore 90°C thermosetting armoured *	2	35	1 x 1 x 4c	16	50
L1	Cbl_SM-4	1.0	1.0	1.00	0.00	100	N/A	Fuse	1.00	1.00	N/A	N/A	Multicore 90°C thermosetting armoured *	0	35	1 x 1 x 2c	16	15

[u] = User Defined

# Switchboard Report



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## Board Data

**Id No:** Sb-2

**Name:** Medical Panel Board

## Cables

Phase	IdNo: Name:	Load (A) Diversified	Load (A) Connected	PF	3rd Harmonic %	Protective Device (A)			Cg	Ca	RCD (mA)	AFDD	Cable Type	Grouped with other circuits	Size mm <sup>2</sup>	Cores	Sep.CPC mm <sup>2</sup>	Design Length (m)
						In	Ir	Type										
L1,L2,L3	Cbl_SM CL	75.0	75.0	1.00	0.00	100	100	MCCB	0.77	1.00	N/A	N/A	Multicore 90°C thermosetting armoured *	3	35	1 x 1 x 4c	16	20
L1,L2,L3	Cbl_SM CL1	75.0	75.0	1.00	0.00	100	100	MCCB	0.77	1.00	N/A	N/A	Multicore 90°C thermosetting armoured *	3	35	1 x 1 x 4c	16	15
L1	Cbl_SM COM	30.0	30.0	1.00	0.00	100	63	MCCB	0.88	1.00	N/A	N/A	Multicore 70°C thermoplastic insulated ar	1	16	1 x 1 x 2c	6	40
L1,L2,L3	Cbl_SM OF	75.0	75.0	1.00	0.00	100	100	MCCB	0.77	1.00	N/A	N/A	Multicore 90°C thermosetting armoured *	3	35	1 x 1 x 4c	16	20
L1,L2,L3	Cbl_SM OF1	61.0	61.0	1.00	0.00	100	100	MCCB	0.77	1.00	N/A	N/A	Multicore 90°C thermosetting armoured *	3	35	1 x 1 x 4c	16	15

[u] = User Defined

# Switchboard Report



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**Revision:**

## Board Data

**Id No:** Sb-3

**Name:** Landlord Panel Board

## Cables

Phase	IdNo: Name:	Load (A) Diversified	Load (A) Connected	PF	3rd Harmonic %	Protective Device (A)			Cg	Ca	RCD (mA)	AFDD	Cable Type	Grouped with other circuits	Size mm <sup>2</sup>	Cores	Sep.CPC mm <sup>2</sup>	Design Length (m)
						In	Ir	Type										
L1	Cbl_FC-1 Intruder Alarm Panel	5.0	5.0	1.00	0.00	16	16	MCCB	1.00	1.00	N/A	N/A	Draka FT120 Cu 4D2	0	2.5	1 x 1 x 3c	N/A	20
L1	Cbl_FC-2 Refuge Panel	5.0	5.0	1.00	0.00	16	16	MCCB	1.00	1.00	N/A	N/A	Draka FT120 Cu 4D2	0	2.5	1 x 1 x 3c	N/A	20
L1	Cbl_FC-3 Solar PV	5.0	5.0	1.00	0.00	100	63	MCCB	1.00	1.00	N/A	N/A	Multicore 90°C thermosetting armoured *	0	25	1 x 1 x 2c	16	20
L1	Cbl_FC-4 Lift	5.0	5.0	1.00	0.00	40	32	MCCB	1.00	1.00	N/A	N/A	Multicore 90°C thermosetting armoured *	0	10	1 x 1 x 2c	6	20
L1	Cbl_FC-5 Smoke Damper Panel	5.0	5.0	1.00	0.00	16	16	MCCB	1.00	1.00	N/A	N/A	Draka FT120 Cu 4D2	0	2.5	1 x 1 x 3c	N/A	20
L1	Cbl_FC-127 Fire Alarm Panel	5.0	5.0	1.00	0.00	16	16	MCCB	1.00	1.00	N/A	N/A	Draka FT120 Cu 4D2	0	2.5	1 x 1 x 3c	N/A	20
L1,L2,L3	Cbl_SM BMS	30.0	30.0	1.00	0.00	100	63	MCCB	0.73	1.00	N/A	N/A	Multicore 90°C thermosetting armoured *	5	25	1 x 1 x 4c	16	10
L1,L2,L3	Cbl_SM EVC	64.9	64.9	1.00	0.00	160	125	MCCB	1.00	1.00	N/A	N/A	Multicore 90°C thermosetting armoured *	0	95	1 x 1 x 4c	50	65
L1,L2,L3	Cbl_SM LL	2.0	2.0	1.00	0.00	100	63	MCCB	0.82	1.00	N/A	N/A	Multicore 90°C thermosetting armoured *	2	25	1 x 1 x 4c	16	10

[u] = User Defined

# Switchboard Report



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## Board Data

**Id No:** Sb-3

**Name:** Landlord Panel Board

## Cables

Phase	IdNo: Name:	Load (A) Diversified	Load (A) Connected	PF	3rd Harmonic %	Protective Device (A)			Cg	Ca	RCD (mA)	AFDD	Cable Type	Grouped with other circuits	Size mm <sup>2</sup>	Cores	Sep.CPC mm <sup>2</sup>	Design Length (m)
						In	Ir	Type										
L1,L2,L3	Cbl_SM PLANT	78.0	78.0	1.00	0.00	100	100	MCCB	0.73	1.00	N/A	N/A	Multicore 90°C thermosetting armoured *	5	35	1 x 1 x 4c	16	10

[u] = User Defined

# Switchboard Report



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## Board Data

**Id No:** Sb-4

**Name:** Dentist Panel Board

## Cables

Phase	IdNo: Name:	Load (A) Diversified	Load (A) Connected	PF	3rd Harmonic %	Protective Device (A)			Cg	Ca	RCD (mA)	AFDD	Cable Type	Grouped with other circuits	Size mm <sup>2</sup>	Cores	Sep.CPC mm <sup>2</sup>	Design Length (m)
						In	Ir	Type										
L1,L2,L3	Cbl_SM-9	91.7	91.7	0.98	0.00	100	100	MCCB	0.72	1.00	N/A	N/A	Multicore 90°C thermosetting armoured *	7	35	1 x 1 x 4c	16	10

[u] = User Defined

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**Appendix E**

Pre-Handover Commissioning Demonstration Checklist



**PRE-HANDOVER COMMISSIONING DEMONSTRATION CHECKLIST (EXAMPLAR)**



Item	Service	Demonstration Date	Demonstration Successful	Comments
<b>1.00</b>	<b>ABOVE GROUND FOUL DRAINAGE (SANITARY PIPEWORK)</b>			
1.01	Demonstration to building control			
<b>2.00</b>	<b>WATER SERVICES</b>			
2.01	Demonstrate cold water is being maintained within specification limits.			
2.02	Demonstrate domestic hot water calorifier/generator HWS flow temperature			
2.03	Demonstrate domestic hot water calorifier/generator HWS return temperature			
2.04	Demonstrate HWS & CWS temperatures at draw off points - Sinks			
2.05	Demonstrate HWS & CWS temperatures at draw off points - Wash hand basins			
2.06	Demonstrate HWS & CWS Temperatures at draw off points - Showers			
2.07	Demonstrate thermostatic mixing valve (TMV) safety drop tests.			
<b>3.00</b>	<b>DX COOLING</b>			
3.01	Demonstrate that the DX plant can maintain specified room temperature.			
<b>4.00</b>	<b>LTHW</b>			
4.01	Demonstrate LTHW system dynamic flushing and dosing			
<b>5.00</b>	<b>VENTILATION</b>			

**PRE-HANDOVER COMMISSIONING DEMONSTRATION CHECKLIST (EXAMPLAR)**



Item	Service	Demonstration Date	Demonstration Successful	Comments
5.01	Demonstrate smoke or fire damper operation			
5.02	Demonstrate ventilation system operation and air balancing			
<b>6.00</b>	<b>BMS CONTROLS</b>			
6.01	BMS demonstration			
7.02	Desmonstrate different control regimes			
6.02	Demonstrate gas valve open.			
7.03	Demonstrate/confirm heater run signals.			
6.03	Demonstrate/confirm heater common faults.			
7.04	Demonstrate control regimes for ventilation plant.			
6.04	Demonstrate interface for shutdown of AHUs on activation of fire alarm			
7.05	Demsonstare audible and visual alarm at start of test			
6.05	Demonstrate that room temperatures meet specification.			
<b>7.00</b>	<b>LIGHTING</b>			
7.01	Demonstrate general lighting - Manual controls.			
7.02	Demonstrate general lighting - Presence detection.			
7.03	Demonstrate external lighting and timclock controls /over ride			
<b>8.00</b>	<b>EMERGENCY LIGHTING</b>			

**PRE-HANDOVER COMMISSIONING DEMONSTRATION CHECKLIST (EXAMPLAR)**



Item	Service	Demonstration Date	Demonstration Successful	Comments
8.01	Demonstrate operation by isolating individual circuit breakers.			
8.02	Demonstrate operation by isolating distribution/panel board.			
8.03	Demonstrate operation by isolating distribution/panel board.			
<b>9.00</b>	<b>FIRE ALARM</b>			
9.01	Demonstrate audibility levels			
9.02	Demonstrate fire alarm interface with lifts			
9.03	Demonstrate fire alarm interface with BMS MCC's			
9.04	Demonstrate fire alarm interface with main gas solenoid valve			
9.05	Demonstrate text at all panels			
9.06	Demonstrate system by operation of break glass units.			
9.07	Demonstrate system by operation of smoke/heat detectors.			
9.08	Demonstrate fire alarm interface with roller shutter and access control doors.			
9.09	Demonstrate system by disconnection of mains supply.			
9.10	Demonstrate system by disconnection of battery.			
<b>10.00</b>	<b>STAFF &amp; PATIENT CALL SYSTEM</b>			
10.01	Demonstrate audibility levels			
10.02	Demonstrate text at all panels			
10.03	Demonstrate system by operation of call units and resets.			

**PRE-HANDOVER COMMISSIONING DEMONSTRATION CHECKLIST (EXAMPLAR)**



Item	Service	Demonstration Date	Demonstration Successful	Comments
10.04	Demonstrate system by disconnection of mains supply.			
10.05	Demonstrate system by disconnection of battery.			
<b>11.00</b>	<b>VOICE &amp; DATA</b>			
11.01	Demonstrate system infrastructure and comms cab installation			

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**Appendix F**

Handover Testing and Commissioning Certification Checklist

PROJECT TITLE: Harehills Medical Centre		M & E Services Testing and Commissioning Certification					Rev 1:
Item	Description	Applicable (Yes / No)	Documents Received (Yes / No)	Compliant			Comments
				(Yes / No)	Date	Completion Status	
<b>1.00</b>	<b>ABOVE GROUND FOUL DRAINAGE</b>						
1.01	Stack and pipework air pressure test	Y					
<b>2.00</b>	<b>WATER SERVICES</b>						
2.01	Domestic services water installation disinfection / chlorination test certificate	Y					
2.02	Laboratory microbiological test results and certification	Y					
2.03	Domestic water services installation pipework hydraulic pressure test	Y					
2.04	Domestic hot water generator commissioning / test certificates	Y					
2.05	Domestic hot water generator HWS flow temperatures	Y					
2.06	Domestic hot water generator HWS return temperatures	Y					
2.07	Temperature testing - DHWS & CWS draw off points - sinks	Y					
2.08	Temperature testing - DHWS & CWS draw off points - wash hand basins	Y					
2.09	Thermostatic mixing valve (TMV) safety drop tests.	Y					
<b>3.00</b>	<b>DX HEATING &amp; COOLING</b>						
3.01	Condensate clearance tests	Y					
3.02	Refrigerant pipework pressure & leak test	Y					
3.03	Refrigerant pipework evacuation test	Y					
3.04	Refrigerant charge test	Y					
3.05	Air-conditioning system Inspection certificates	Y					
3.06	Refrigerant Leak Detection Testing & Commissioning Certificate	Y					
<b>4.00</b>	<b>ASHP</b>						
4.01	Manufacturer's standard test & commissioning sheets.	Y					
4.02	Pump test certificates	Y					
4.03	Pressurisation unit certificate.	Y					
4.04	Flushing certificate.	Y					
4.05	LTHW pipework pressure test certificates.	Y					
<b>5.00</b>	<b>VENTILATION</b>						
5.01	Ventilation air balancing test sheets	Y					
5.02	AHU commissioning certificates	Y					
5.03	Fire/smoke damper drop test certificate	Y					
<b>6.00</b>	<b>HVAC CONTROLS</b>						
6.01	NICEIC electrical installation (design, construction, inspection and testing) certificate.	Y					
6.02	Calibration, as far as practical of all instrumentation measuring systems.	Y					
6.03	HVAC Panel communications to Head Office checked.	Y					
6.04	Field devices checked to ensure correct status or values are displayed.	Y					
6.05	Functional testing of each item of mechanical and electrical equipment to demonstrate correct operation (as far as practical).	Y					
6.06	HVAC Panel tests/commissioning records in accordance with CIBSE Commissioning Code C.	Y					
<b>7.00</b>	<b>POWER INSTALLATION</b>						
7.01	NICEIC electrical installation (design, construction, inspection and testing) certificates.	Y					
7.02	NICEIC schedule of circuit details for the installation - (distribution board schedules).	Y					
7.03	Spare capacity & compliance with schedule checks	Y					
<b>8.00</b>	<b>LIGHTING</b>						

PROJECT TITLE: Harehills Medical Centre		M & E Services Testing and Commissioning Certification					Rev 1:
Item	Description	Applicable (Yes / No)	Documents Received (Yes / No)	Compliant			Comments
				(Yes / No)	Date	Completion Status	
8.01	Lighting and controls commissioning certificate in accordance with CIBSE Code L	Y					
<b>9.00</b>	<b>EMERGENCY LIGHTING</b>	Y					
9.01	NICEIC emergency lighting completion certificate.	Y					
9.02	NICEIC emergency lighting design declaration certificate.	Y					
9.03	NICEIC emergency lighting construction declaration certificate.	Y					
9.04	NICEIC emergency lighting verification declaration certificate.	Y					
10.05	Manufacturers Testing and Commissioning Certificate for Static Inverter System and associated Changeover Relays etc	Y					
<b>10.00</b>	<b>FIRE ALARM</b>						
10.01	Fire detection and alarm completion certificate	Y					
10.02	Fire detection and alarm design certificate	Y					
10.03	Fire detection and alarm verification certificate	Y					
10.04	Fire alarm installer installation and commissioning certificate	Y					
10.05	Fire alarm sound record certificate - All areas	Y					
10.06	Fire Alarm Zone Chart	Y					
<b>11.00</b>	<b>STAFF &amp; PATIENT CALL SYSTEM</b>						
11.01	System certificate of compliance.	Y					
11.02	Installation and commissioning certificate	Y					
<b>12.00</b>	<b>ACCESS CONTROL</b>						
13.01	System certificate of compliance.	Y					
13.02	Installation and commissioning certificate	Y					
<b>13.00</b>	<b>TV SYSTEMS</b>						
13.01	Installation and commissioning certificate	Y					
<b>14.00</b>	<b>VOICE AND DATA SYSTEMS</b>						
14.01	Testing and Commissioning Results	Y					
14.02	Voice / Data Point Numbering Schedule cross referenced with As Installed Drawings	Y					
14.03	Confirmation of "live" lines from External Service Provider.	Y					
<b>15.00</b>	<b>ELECTRICAL VEHICLE CHARGERS</b>						
15.01	Installation and commissioning certificate	Y					
<b>16.00</b>	<b>DOCUMENTATION</b>						
16.01	O&M manuals issued	Y					
16.02	As Installed' drawings issued	Y					

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**Appendix G**

Demonstration & Training Schedule



# M&E DEMONSTRATIONS AND TRAINING SCHEDULE

Project Title: Harehills Medical Centre				M & E Services - Demonstrations and Training Schedule						Revision: 1				
Date	System / Equipment	Required Attendance by:				Demonstration			Training			Acceptance Status		Notes / Comments
		Client	M & E Contractor	Main Contractor	Other	Start Time	Finish Time	Duration	Start Time	Finish Time	Duration	Accepted	Signed Off	
	Main Incoming Services Isolation Points (Electric, Water, Gas,Comms)	TBC	M&E	Main Contractor										
	Domestic Cold Water Systems	TBC	M	Main Contractor										
	Above Ground Drainage	TBC	M	Main Contractor										
	Ventilation Systems	TBC	M	Main Contractor										
	Heating Systems	TBC	M	Main Contractor										
	Comfort Cooling System	TBC	M	Main Contractor										
	HVAC Controls	TBC	M&E	Main Contractor										
	Electrical Power Distribution	TBC	E	Main Contractor										
	General Lighting and Controls	TBC	E	Main Contractor										
	Emergency Lighting	TBC	E	Main Contractor										
	Voice/Data Systems	TBC	E	Main Contractor										
	Access Control	TBC	E	Main Contractor										
	External Lighting	TBC	E	Main Contractor										
	Fire Detection & Alarm	TBC	E	Main Contractor										
	Automatic Doors	TBC	Main Contractor	Main Contractor										
	Electric Vehicle Charger	TBC	E	Main Contractor										
	Staff & Patient Call	TBC	E	Main Contractor										

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**Appendix H**

O & Manual Checklist and Requirements

## BUILDING SERVICES OPERATION & MAINTENANCE GUIDANCE AND CHECKLIST

The purpose of the document is to provide M & E Contractors with details and overall guidance as to the layout, content and level of information to be provided as a minimum for the Operation and Maintenance Manuals in accordance with BSRIA Guide BG 1 / 2007 – Handover, O & M Manuals and Project Feedback.

The M & E Contractor shall ensure that prior to submission of the Operation and Maintenance Manuals to NOVO Integration for comment that this guidance is adhered to ensure that all required information is provided. Failure to ensure that a comprehensive information is provided will delay potential sign off and overall completion and acceptance of the project.

### 1.0. The Content of O&M Manuals

Although the degree of detail will vary, all O&M manuals for Building Services Installations need to contain certain types of information. BS 4884 lists nine categories of information to be included.

Those that apply to Building Services O&M manuals include:

- The purpose of the installation
- Installation records
- Description of the installation
- How the installation is to be used
- How to keep the installation operational
- Maintenance schedules
- How the installation may be changed
- Disposal of the installation

O&M Section	Description	Checklist (✓ or x)	Comments
	<b><u>Mechanical &amp; Electrical Services</u></b>		
1.0	Project Details	✓	
2.0	Project Names and Addresses	✓	
3.0	Systems Description	✓	
4.0	General Maintenance	✓	
5.0	Emergency Procedures	✓	
6.0	Testing and Commissioning Dataa	✓	
7.0	Plant and Equipment Schedules	✓	
8.0	Manufacturers Names and Addresses	✓	
9.0	Manufacturers Literature	✓	
10.0	As Installed Drawings	✓	

### 2.0. Contents, Structure & Layout

The following sections set out a presentational sequence for an O&M manual, describing what is required under each heading.

This section is a guide to the contents, structure and layout of the manual. It enables the reader to comprehend the scope and purpose of the document and helps to identify where specific information can be obtained.

### **Contractual and Legal Records**

The contractual and legal records of an installation should include:

- The name and address of the installation.
- Details of local and public authority consents.
- Details of the design teams, consultants, installation contractors and associated subcontractors.
- Dates for the start of the installation, for handover (practical completion) and for the expiry of the defects liability period.
- Information on all guarantees affecting components, systems and plant items, together with expiry dates and names, addresses and telephone numbers of relevant contacts.

For each item of plant and equipment installed within the building and contained in the list of services covered by the O&M manual, copies of the following documents should also be provided, where applicable:

- Descriptions of the various Systems Installed
- All testing and commissioning results and certificates
- Plant/equipment schedules and manufacturer model numbers
- Training and Operation User Manuals
- CE certificates
- Test/QA certificates for any pre tested units to be issued to P&G prior to testing on site i.e. Light Fittings
- CBAs
- CE certificates
- Spares lists – Microsoft excel spreadsheet
- Electrical Design Information (Cable Calculations, etc)
- As Fitted Cable Schedules
- As Fitted Electrical drawings and schematic wiring diagrams
- Electrical Installation Testing and Commissioning Certificates
- Emergency Lighting Testing and Commissioning Certificates
- Fire Alarm Testing and Commissioning Certificates
- Lightning Protection Testing and Commissioning Certificates
- Any Specialist Training Details to be advised
- Manufacturers' guarantees and warranties
- Insurance inspection reports
- Safety and fire certificates

A clear statement should be made in this section concerning hazards and safety precautions of which the operators and maintainers need to be aware. This should include:

- Any known feature or operational characteristics of the equipment or systems installed which may produce a hazard.
- Any mandatory requirements relating to safety
- Any other safety precautions which should be observed
- Any other relevant warning

### **3.0.Overall Purpose**

This section should provide a general overview of the original design intent (available in outline from the design brief and in detail from the specification).

This section should be kept as brief as possible.

It should include a summary for each engineering system installed, giving:

- The parameters and conditions within which it has been designed to operate a system
- The type of each service (gas, electricity and water) required to operate a system
- The intended method of control

### **4.0. Description**

This section should provide a detailed description of each engineering system installed. It should include:

- System location and what it serves
- What the system depends upon in order to function
- Design data, basic design parameters, basic assumptions made during design
- Reasons for selecting particular plant
- Expected service life (where available)
- Planned operational efficiency

### **5.0. Equipment Schedule**

The type, model and serial number of all components items within the system should be listed, together with the names of their respective manufacturers or suppliers.

### **6.0.Parts Identification and Recommended Spares**

This should comprise a parts identification list detailing and identifying replaceable assemblies, sub-assemblies and components. It should include suppliers' recommendations for both spares and running spares (parts required for replacement due to wear or deterioration).

Items normally held in stock by a supplier, or for which a refurbishment service is available, should be identified separately.

### **7.0.Spares Policy**

This section should offer a guide to the setting up of a spares facility including recommended stock levels. It should be prepared after consultation with the occupier regarding the consequences of failure, risk to core business, and the period of acceptable downtime. It should also take into account suppliers' recommendations as given above. Again, those items normally held in stock by a supplier (or for which a refurbishment service is available) should be clearly identified.

### **8.0.Commissioning Data**

The results of all commissioning work and associated tests should be given. This should include:

- Measured data
- Measurement points
- Test equipment used
- Details of calibration certificates
- A statement of whether design requirements were achieved

It is always useful for the commissioning certificates to include plant data, such as models, type and serial numbers. This information can be used as a cross-check against as-installed data sheets. This information can be easily transferred into an asset database.

### **9.0.Operation**

Instructions must be given for the safe and efficient operation of each engineering system, under normal and emergency conditions. These will be in addition to manufacturers' literature for plant items, and should include:

- A recommended strategy for operation and control
- An outline of general operating mode
- Control data (location, effect, object, sequence, limits of capability, modes, set-points)
- Standard operating and emergency operating procedure, and sequences for start-up, running and shut-down, under normal and emergency conditions. These should be accompanied where possible with photographs or video recordings of the standard operating and emergency operating procedures.
- Interlocks between plant items
- Operating procedures for stand-by plant
- Precautions necessary to overcome known hazards
- The means by which any potentially hazardous plant can be made safe
- Target figures for both energy consumption and energy costs
- Forms for recording plant running hours, energy consumption and energy costs

### **10.0.Maintenance Instructions**

The manufacturers' recommendations and instructions for maintenance must be detailed for each item of plant and equipment installed. Clear distinction should be made between planned tasks (preventative maintenance) and work done on a corrective basis. Instructions should be given on each of the following:

- The isolation and return to service of plant and equipment
- Adjustments, calibration and testing
- Dismantling and re-assembly
- The exchange of components and assemblies
- Dealing with hazards that may arise during maintenance
- The nature of deterioration and checks for defects
- Special tools, test equipment and ancillary services

### **11.0.Maintenance Schedules**

Maintenance schedules should be provided for all preventative maintenance tasks. These should be based on both manufacturers' recommendations and other authoritative sources (such as statutory and mandatory requirements). The schedules should include:

- Inspections
- Examinations
- Tests
- Adjustments
- Calibration
- Lubrication
- Periodic overhaul

The frequency of each tasks may be expressed as specific time intervals, running hours or completed operations, as appropriate. Collectively, the schedules will form a complete maintenance cycle, repeated throughout the working life of the installation.

The source of the schedules should be stated, and necessary periodic inspections and tests for instance, local authority or supply authority purposes should be noted.

### **12.0.Modification Information**

Modifications are authorised changes which affect safety, reliability, operation or maintenance of a system or any of its components.

Information on permitted plant or system modifications allowed for by manufacturers or system designers, should be included for each system. Space must be provided in the manual for the recording of all modifications and changes as they occur (this would initially comprise a series of appropriately headed blank pages). Furthermore, it is essential that a procedure is devised and incorporated to ensure that all modifications are noted in every copy of the manual, wherever they are located.

### **13.0.Fault Finding**

Procedures for the logical diagnosis and correction of faults should be provided.

### **14.0.Lubrication**

A schedule of all plant requiring lubrication should be provided, together with manufacturers' recommendations on the type of lubricants and the method and frequency of application. Where a type of lubricant is identified by product names, a generic reference (such as a British Standard) should also be given. Information must also be provided on special requirements for the handling and storage of lubricants.

### **15.0.Disposal Instructions**

Where relevant, information should be provided on the following details:

- Any known dangers likely to arise during the disposal of specific items of plant or equipment, together with the necessary precautions and safety measures
- Methods for safely disposing of or destroying the equipment or parts thereof, including packaging, insulation and fluids
- Sources from which further advice can be obtained
- Recycling information for the specific item of plant

#### **16.0.Names and Addresses of Manufacturers**

Details of all manufacturers and suppliers of equipment listed in the manual should be provided, including name, address, telephone and fax number, email contact and website. Any additional information likely to help the building operator make contact with, or obtain advice from, a manufacturer or supplier should be included.

Where appropriate details of local stockists of spare parts, replaceable assemblies or complete units should also be provided. Details should be arranged in alphabetical order of manufacturer or supplier name to provide a logical information-retrieval procedure.

#### **17.0.Index of Plans and Drawings**

An index should be provided of all as-fitted drawings supplied during the installation process, identified by number and title. The index should also include a schedule of all drawings issued by manufacturers and suppliers during the course of the installation work, such as control panel wiring diagrams.

#### **18.0.Emergency Information**

An important feature of any manual is the emergency information. This information should be located at the end of the document for ease of reference, and should include name, address, telephone and fax number, email addresses of the appropriate contracts in the event of fire, theft or burglary, and gas, electricity or water failures, and leaks. It should also list firms or staff to contact in the event of the failure or breakdown of plant, such as lifts, boilers or pumps. Where applicable, the location of fire-fighting equipment, hydrants and rising mains should be described. Special attention should also be given to hazards particular to the building. Depending on client policy, a note of security installations may also be included.

#### **19.0.Manufacturers' Literature**

A complete set of all manufacturers' literature should be provided for the plant and equipment installed, and assembled for each building service system.

This literature should provide the following information:

- Description of the product purchased
- The cost and date of purchase
- Performance-behavioural characteristics of the equipment in use
- Application (suitably for use)
- Operation and maintenance details
- Labour, plant, materials and spatial resources required
- Methods of operation and control
- Cleaning and maintenance requirements



- Protective measures
- Labour safety and welfare associated with the equipment
- Public safety considerations

Where the data is not adequately provided in manufacturers' literature, the author of the O&M manual should attempt to gather the information. If the information proves unavailable, or if a supplier is unwilling to unhelpful, this should be treated as a breach of contract.