

John Dalton House

Building Services Performance Specification

Qbic Hotel

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1.0

General Requirements

1.0 General Requirements

1.1 Introduction

John Dalton House is an existing seven storey, plus ground floor and basement level building which is being converted from office space use to a 261-bed hotel with the addition of a 2-storey extension of the building and new central lift core to the rear of the building.

The ground floor area currently occupied by 2no. existing retail restaurant units (Byron – now vacated – and Bill's) to which Bill's will remain operational throughout the duration of the works. The remainder of this floor will form the new ground floor entrance to the hotel reception / concierge together with the restaurant and bar / lounge for the hotel.

The main kitchen facilities together with plant area for the incoming services of water & data will be located at basement level (to cover approx. half of the floor area of the basement). The remainder of the basement is to be left as a "shell & core" tenant unit.

The plant area for the incoming gas service will be located at ground level, adjacent to the linen store.

This Specification details the Mechanical, Electrical and Public Health performance requirements for the John Dalton House Qbic Hotels scope of works.

The Contractor will fully design, coordinate, supply, install, set to work, test, commission, and demonstrate the complete Mechanical, Electrical and Public Health services to meet the requirements of this Performance Specification, the Materials & Workmanship Specifications (Part D1 and D2), and associated design intent drawings. This Specification will also be read in conjunction with the civil, structural, architectural, vertical transportation and any other specialist consultant information as well as the Main Contract Preliminaries.

Where specific equipment, manufacturers, or specialist Sub-contractors are noted, it will be deemed that the Contractor has included for those within his Tender return. No deviations will be accepted other than by agreement with the Employer and their retained Design Team. Alternatives may be considered; however, the Client and the retained design team withhold the right to reject any alternatives put forward.

Where Mechanical, Electrical, Public Health and Controls Services quantities, sizes etc. have been indicated on the indicative design intent Tender drawings, or in this Performance Specification, they are approximate and should be treated as indicative only to assist with pricing. The Contractor will be responsible for all final detailed design from the point at which the design is currently at.

The development will include all equipment required, even where it has not been specifically detailed or mentioned, to produce a working installation complying with all relevant standards and as described further within this or separate Specifications. Where a specific standard or guide has been superseded, the Contractor will design, install, test and commission to the most recent version.

The Contractor will include all Builders' work necessary for the execution of the installation including drilling, cutting, trimming, sleeving, plinths, etc. No extra payment will be entertained in respect of any such work not allowed for in the Tender but necessary for the proper execution of the Works.

The Contractor will be responsible for identifying any ambiguity or incompleteness within the Contract Documents and within this specification and obtaining clarification instructions prior to proceeding with any work that may be affected. Any ambiguity or incompleteness will be brought to the attention of the Contractor's Administrator (CA) and the Contractor will seek further clarification. No additional monies will be awarded due to post Tender return ambiguity or incompleteness.

Following the award of the Contract, the successful Contractor will provide details of the software that will be used to carry out all calculations including, but not limited to, lighting (internal and external), heat loss and gain calculations, electrical cable calculations, electrical protection devices settings and discrimination study.

1.2 Mechanical and Public Health

Works will include, but not limited to, the design, supply, installation, testing, commissioning and setting to work of the following systems (as applicable):

- Incoming Utility – Natural Gas supply
- Incoming Utility – Water Supply
- Wholesome cold-water supplies
- Domestic hot water services
- Above ground foul drainage services – as well as all new drainage systems, this is to include the necessary diversion requirements to the basement areas
- Above ground rainwater systems – this is only applicable to the new rainwater stacks, the new drainage systems & the necessary diversion requirements to the basement areas
- Connections to the below / underground drainage systems (new &/or existing)
- Category 5 cold-water services
- DX heating and cooling systems
- Heating systems
- Natural gas distribution
- Mechanical ventilation systems (incl. Kitchen extract ventilation)
- Smoke Clearance Systems
- Firefighting systems (dry riser)

The supply of all operating and maintenance instructions, as built drawings, EPC certificates, Health & Safety file and building log book.

The complete works, installation and final system(s) and commissioning will all conform fully with the latest editions of the relevant British Standards and Statutory Instruments, including but not limited to:

- British Standards and BS Code of Practice
- Building Regulations (latest versions)
- Design Guides e.g. CIBSE, CIPHE (formerly IoP), etc., incl. Technical Memoranda (HVCA & BSRIA)
- Local and Statutory Authority Requirements.
- Supply Authority Regulations.
- Commissioning Codes (CIBSE and BSRIA)

The editions of the above documents listed throughout this document are correct at the time of writing however the installation must be undertaken in accordance with the document edition current at the time of installation.

Where requirements differ between any of the above documents then this should be brought to the attention of the Contract Administrator who will adjudicate.

In the event that legislation standards or industry guides referred to in this document are found to be out of date or superseded by a new document, the Contractor will be required to utilise the most recent revision or latest replacement document.

1.3 Electrical Services

Works will include, but not limited to, the design, supply, installation, testing, commissioning and setting to work of the following systems (as applicable):

- Underground Services
- HV/LV Public Utility Supply
- Standby Diesel Generator/ Life Safety Systems

- Low Voltage (LV) distribution
- Containment
- General Small Power
- General Lighting and Lighting Control
- Emergency Lighting
- External Lighting
- ICT Infrastructure and Structured Data Cabling
- Facilities for the Disabled
- Radio/ TV/ Audio Visual Systems
- CCTV
- Access Control
- Security Detection and Alarm System
- Fire Detection and Alarm
- Earthing and Bonding
- Lightning protection
- Vertical transportation power supplies
- PV Solar Panels Power Generation

The Contractor will supply all operating and maintenance instructions, as built drawings, EPC certificates, building log book and manufacturer's literature.

The complete works, installation and final system(s) and commissioning will all conform fully with the latest editions of the relevant British Standards and Statutory Instruments, including but not being limited to:

- British Standards and BS Code of Practice.
- Building Regulations (latest versions).
- Design Guides i.e. CIBSE, CIPHE (IoP), etc., incl. Technical Memoranda (HVCA & BSRIA).
- Local and Statutory Authority Requirements, including the Local Authority Fire Officer, the Local Fire Brigade and the Local Police Force Policies.
- Supply Authority Regulations.
- Commissioning Codes (CIBSE and BSRIA).
- BS7671 18th IET Edition Wiring Regulations.
- IET Regulations and Design Guides.
- Electricity at Work Act 1989.
- CE Marked (all equipment).
- Health and Safety at Work Act 1974.
- The Construction Design and Management Regulations (CDM).
- NACOSS Code of Practice.

The editions of the above documents listed throughout this document are correct at the time of writing however the installation must be undertaken in accordance with the document edition current at the time of installation.

Where requirements differ between any of the above documents then this should be brought to the attention of the Contract Administrator who will adjudicate.

In the event that legislation standards or industry guides referred to in this document are found to be out of date or superseded by a new document, the Contractor will be required to utilise the most recent revision or latest replacement document.

1.4 Vertical Transportation

Refer to the separate Vertical Transport Specification (document reference 1017000-SPC-VT001).

1.5 Utilities

Existing below ground services drawings are limited to traces from statutory authority records. A GPR (below ground service) survey was undertaken by Survey Solutions in December 2015 with the survey results and associated information available.

The Contractor will be responsible for digging service trenches, backfilling and making-good once new services are installed.

Any further survey works will be carried out in accordance with the NRSWA and The Survey Association (TSA) guidance notes (most recent revision) for specifying a Utility Survey, with the express aim to determine the location, depth, positioning and identification of buried pipes and cables within the development boundary including type and size of the utility asset where practical.

The Contractor must ensure the maximum survey transect spacing to ensure the highest possible data accuracy. The level of the survey will be as defined within the TSA Guidance as a level 4 / level B comprehensive survey.

On completion of any further surveys, complete CAD plans will be produced confirming the full record of the survey results at a scale not less than 1:200 and 1:100 in areas of congestion. Copies of the completed plans will be issued to the Client in hard copy format (1 sets) and electronic format; both PDF and AutoCAD release 2015 (.dwg) versions. The Contractor is required to ensure the survey grid is related to North and to the Ordnance Survey national grid. The surveys will also co-ordinate with current survey drawings and placed within the existing 'UCS World' position within the AUTOCAD drawing file (set to WCS 0,0,0).

The Contractor is responsible for ensuring all staff are qualified, competent, appropriately insured and trained to do the tasks for which they are engaged. Relevant qualifications can include professional and technical membership of RICS, relevant national or regional licenses and other relevant professional bodies.

The Contractor is to provide all survey equipment, hardware and software necessary to carry out the survey and produce the deliverables unless specified otherwise above. The Contractor is responsible for ensuring all equipment is calibrated/verified and checked prior to use and maintained as such throughout the period of works, as well as ensuring it is fit for purpose.

The Contractor will make all efforts reasonably practicable to reduce the number of faint or unidentifiable traces. The Contractor is required to specifically and clearly highlight any of these instances.

Inserting traces from statutory authority records will not be accepted due to the associated increased inaccuracies. Any such instance observed will result in the Contractor being required to return to site to re trace, at no increased expense to the Client.

The Contractor will make all efforts reasonably practicable to reduce the number of survey obstructions traces. The Contractor is required to specifically and clearly highlight any of these instances. Where it may be possible to remove foliage in order to increase survey accuracy, the Contractor will proactively contact the Client to seek authorised permission before proceeding.

Wholesome Cold-Water

A new utility metered 63mm diameter wholesome cold-water supply will be installed from the new mains connection provided by the Water Utility Company (United Utilities) to serve the new Qbic Hotel facilities (i.e. hotel, reception areas, kitchen facilities). The Contractor will liaise with the Water Company (& the Architect / Services Engineer from the Design team) to agree the final connection point, to be located within the basement area; associated with the positioning of the new cold-water storage cistern (all appropriate fees / charges by the Water Company to be paid for by the Contractor).

Natural Gas

Existing natural gas service disconnections are to be completed for both the vacant Byron restaurant unit (connection off of Mulberry Square) and John Dalton House office building (connection off of Deansgate). The existing natural gas service to the Bill's restaurant unit is to be retained and kept in operation throughout the works.

A new natural gas supply will be installed from Mulberry Square to serve John Dalton House. The landlord's connection will be metered with the incoming meter to be positioned to the rear of John Dalton House, located in adjacent to the linen store.

Electricity

The existing ENW substation that is adjacent to the rear of the building at ground floor level will be upgraded to 980kVA. ENW will disconnect the existing transformer and ENW LV switchgear within the substation and will provide the upgraded transformer and LV switchgear (owned by ENW and installed within the substation), along with the associated cabling, containment and all the contestable and non-contestable works. The upgraded transformer will reduce the voltage from 6.6kV HV to 400V LV.

From the substation, 3 No. low voltage (LV) three-phase and neutral (400V / TPN) metered electrical supplies will be provided to the development:

- 1No. metered LV singles supply of 820kVA for the hotel. The point of connection will be at the ENW LV cabinet within the ENW substation.
- 1No. metered LV supply of 80kVA for the Shell & Core Unit on the basement. The point of connection will be a modular metering panel **in the Hotel's LV switch room** on the basement, ~~within the tenant's premises, at a location that will need to be confirmed.~~
- 1No. metered LV supply of 80 kVA for the existing restaurant of Bill's. The point of connection will be a modular metering panel in **the Hotel's LV switch room** on the basement, ~~located within the Comms Room.~~

Application for the provision of new HV/LV electrical supply/connection to serve the buildings ~~has been~~ **will be** made with ENW and the quotation is available. The Contractor will liaise with ENW (& the Architect / Services Engineer from the Design team) and will manage the process of accepting the quotation received by ENW in a time frame in accordance with the programme, in order to secure the upgraded HV 6.6kV supply to the existing ENW substation.

The Contractor will liaise with ENW (& the Architect / Services Engineer from the Design team) to determine the ENW LV switchgear disconnection and overall substation upgrade timeframes and schedule of works, which will be taken into account to ensure minimal disruption to the Bill's restaurant power supply, during the full phase of enabling works and hotel construction/ fit-out works.

The Contractor will liaise with ENW (& the Architect / Services Engineer from the Design team) to determine the incoming HV underground service routes and to manage any changes required to the substation access via the service yard, at the rear of the building.

The existing substation building **area** is considered adequate to house the upgraded transformer, as well as all required associated panels. The Contractor will liaise with ENW and confirm that the ~~current~~ **future** substation building **will** meet the ENW space and civil requirements to house the new upgraded transformer.

Incoming Data and Communications

The Client has employed a data and communications consultant (Haventrust) to provide the performance specification for the development. Please refer to the Haventrust specification for further details

Incoming telecommunication (BT) /ICT fibre optic service ducts will be provided to serve the new development. The Contractor to liaise with the Client and the Data/ Communications consultant to determine which private network broadband provider will be employed and to confirm the incoming data/ communications services routes.

The incoming service ducts will be routed into the building and to the Comms room, which will be located at basement floor level.

1.6 Electromagnetic Compatibility

The Contractor will select materials and equipment and will design and install the works included in this Contract such that electromagnetic interference to any equipment within the Buildings, or to anything else that is susceptible to such interference is avoided.

1.7 Electrolytic Reaction

All building services systems will be protected from the effects of electrolytic reaction. Particular care will be taken in the event of dissimilar metal use within any building services system. Protection will be provided on all building services systems where electrolytic action may cause the early degradation of materials.

1.8 Co-ordination

The Contractor will undertake to carry out all co-ordination of the services within the building fabric, structure and all other installations.

The Contractor will produce fully co-ordinated installation drawings to BSRIA BG06 standard for comment. Under no circumstances should consultant proposed Stage 04 Tender drawings be used for installation. All site co-ordination will be the responsibility of the Contractor. Contractor installation drawings will be produced prior to starting on site.

It will be the responsibility of the Contractor carrying out the services to fully co-ordinate the individual services with the latest architectural, structural drawings and other Sub-contractor installations.

The Contractor will include for his own Working Drawings and details which are necessary for execution of the works including typical ceiling void sections, wall elevations, relevant bracket and steelwork details and provision of manufacturers' drawings and other specialist Contractors, such as ductwork.

The working drawings will take into account any modifications throughout the contract period and will be reviewed and commented upon by the Client design team before issue to the Project Manager (PM) for comment and then use on the Contract.

'As Built' drawings and any specific manufacturers drawings will be provided by the Contractor on completion for inclusion in the O&M manuals.

1.9 General Principles

Layouts of all services, plant and equipment, whether on view, in ceiling voids or elsewhere will be neat, safe and logical. Positions will be chosen to afford easy access for operation, maintenance and replacement of any item of equipment with the absolute minimum of disruption and in full compliance with all relevant CDM regulations.

All exposed domestic pipework and associated valves and other fittings will be chrome coated.

1.10 Existing Site and Services

Limited existing services information or existing O&M information is available, therefore the Contractor must include for undertaking all necessary intrusive investigations required in order to identify the extent of any existing services, condition, requirements for temporary works, service diversions and modifications.

The Contractor will visit site as part of the Tender review, in order to familiarise themselves with the site and any associated constraints.

1.11 RAL Colours

The Contractor will liaise with the Architect and Client team over final required RAL colours of any visible services.

The Tender documents currently include for manufacturers standard RAL colours unless specified otherwise e.g. exposed soffit areas.

In particular, the finish of the electrical lighting and small power accessory face plates is to be agreed during the tender period.

1.12 Builderswork

All builders work associated with the installation will be carried out by the Contractor, unless indicated otherwise, to details provided by their Sub-Contractors.

The Contractor will be responsible for preparing all drawings as necessary and other details indicating the builders work requirements, including manufacturer's standard drawings and/or installation information for use by the Contractor, and will issue this information for approval of the Contractor, Architect and Structural Engineer prior to subsequent general issue and use on site.

All builders work drawings will be developed taking account of the latest architectural and structural drawings and the information will be approved by the Developer's Architect and Structural engineer prior to the Contractor carrying out the work.

Minor requirements for cutting and drilling in non-structural elements will be marked out and neatly cut on site by the Contractor and approval will be obtained for all fixings into or onto structural elements.

1.13 Labelling of Services

All services and items of equipment, are to be identified in accordance with BS 1710 and are to be further marked for direction of flow. Such identification is to be applied at intervals not exceeding 16 metres, and more frequently as necessary for clarity where any confusion might otherwise exist, including plantrooms (where identification is to be applied to each straight length).

Any services passing through the hotel demise which serve existing/future retail tenants are to be specifically labelled to identify the units/demise that is being served.

All electrical services are to be labelled with the correct network, distribution board and circuit references.

1.14 Strip-Out Works (TBC – Contractor to allow for Provisional Sum)

Prior to commencement of the main works, the Contractor will be responsible for undertaking the strip-out of all services remaining in the existing building, once the Enabling Works contract has been completed.

The strip out will encompass, investigations, making safe, draining down, isolation and safe removal of all remaining engineering services within the building. Prior to the main structural demolition, a soft strip element of the works will be undertaken to include equipment, plant, pipes, sanitary ware, cables, light fittings, cable tray etc. to completely strip the building back to its structure and attached components. No 'as installed' information is readily available for the existing building; therefore, the Contractor is advised to undertake a site inspection to ascertain the works involved.

Existing services include, but not limited to, the following:

- Basement ventilation fan unit and associated ductwork and ancillary equipment.
- Electrical switchboards, switches, breakers, busbars, tap-off units, containment, cabling and redundant electrical and communications equipment at Basement Level.
- Electrical containment, distribution boards and meters to each floor of John Dalton House.
- All building services systems (ventilation, air conditioning/miscellaneous heating, domestic water and public health and electrical services) serving 2no. vacant small retail units.
- Redundant building services systems (ventilation, kitchen extract ventilation, air conditioning/miscellaneous heating, domestic water and public health and electrical services) to Byron restaurant unit.
- Redundant above ground drainage (foul) pipework systems serving the Byron restaurant unit as well as the office spaces above – it should be noted / highlighted that ALL existing above ground drainage (foul) pipework systems serving Bills restaurant are to be retained temporarily, as well as ALL existing above ground drainage (rainwater) pipework serving the whole of the building.

Prior to commencement of any works the Contractor will ensure services are isolated, disconnected and drained down.

Refrigerant based units will be decanted in accordance with current regulations by qualified and certified operatives. Disposal certificates will be required, as it is a criminal offence to discharge refrigerant to atmosphere.

The Contractor will refer to the asbestos register and all available survey information prior to undertaking the works.

The following services are to be retained:

- The vertical distribution of the existing rainwater system to the building is to be retained with basement level to be altered/stripped out as necessary (see 52 series drawings)

The following services are to be altered / stripped out as necessary, as identified on the Tender Drawings, while maintaining full operation of the Bill's restaurant unit. Works to take place out-of-hours where possible to minimise disruption to Bill's.

- Bill's fresh air intake for supply ventilation
- Bill's kitchen extract ventilation
- Bill's toilet extract ventilation
- Bill's external condensers (3no.)
- Bill's kitchen cold room external condenser (1no.)
- Electrical services systems associated with Bill's power supplies, security, CCTV, external lighting and ancillaries.
- Bills existing foul above ground drainage systems located in the basement

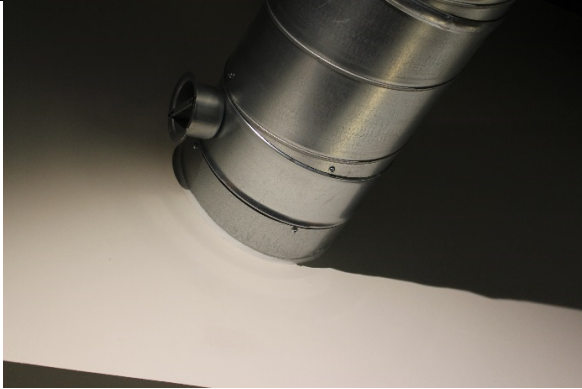
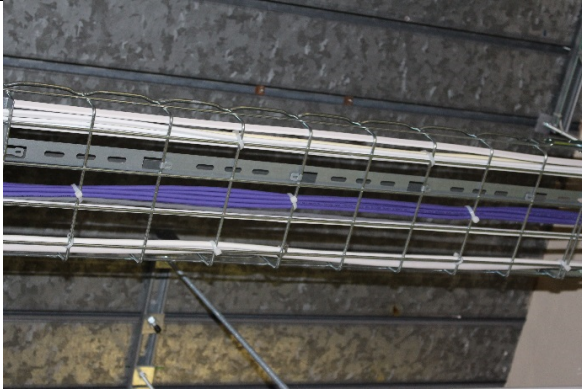
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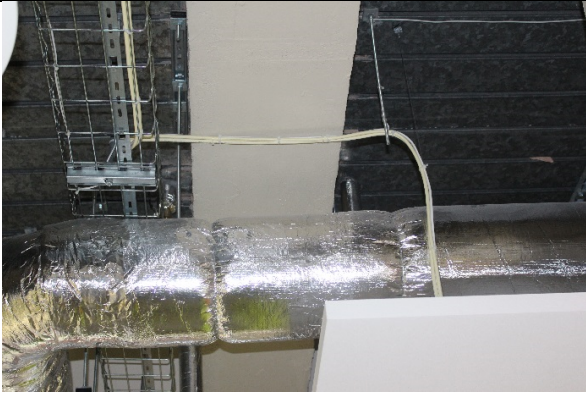
Standard Details & Installation Standards

2.0 Standard Details & Installation Standards

All systems and equipment will be selected and installed to comply and be in accordance with all current and appropriate legislation. Refer to the Regulatory Criteria and Environmental Standards section for further details.

The Contractor will also refer to the table on the following pages for examples and details of service installation standards and quality required for project where appropriate.

Ref	Description	Photograph Example
1	All linear lighting pendants to have white power and control cables neatly clipped to suspension wires. If two cables are feeding a fitting then these will be routed on separate suspension wires and not share a common wire.	
2	All exposed duct and service penetrations will be neatly matched in with silicone with colour to architect's specification.	
3	All cables will be clipped in separate groups with any fire alarms, ELV, security and data separated as per specification, wiring regulations and manufactures instructions.	

4	All drop rods will be trimmed off to 40mm and be complete with rubber end caps.	
5	Any statutory signage and emergency lighting not suspended from rafts will be neatly clipped and suspended similar to the illustration.	
6	All exposed pipework with the exception of the main condensate runs will be routed at 90° angles as far as possible and maintain equal spacing out throughout the distribution.	
7	Lighting power and control cabling where possible will be routed at 90° angles wherever possible when routing from cable management to lighting control modules.	

8	All fused spurs at high level and any other devices that may need to be reached will be positioned as such to maintain good access when working at high level.	
9	All light fittings will be set out by laser and lined up in all planes.	
10	Final service runs will be set out with laser measurements with filter positions in rafts located such that easy safe filter access can be afforded. All distribution services including ductwork joints will be cleaned with any mastic trimmed off as necessary.	

3.0

Design Philosophy & Criteria

3.0 Design Philosophy & Criteria

3.1 Introduction

This specification will be read in conjunction with the Architectural, Civil, Structural, Landscape, Acoustic, Fire, Lifts, Data/ Communications specialists and Cost Consultants reports, drawings, specifications, Room Data Matrix, and any other relevant documentation prepared by the other members of the design team, or documents issued by the Client.

The design philosophy has three key aspects:

- A well-insulated and sealed building fabric to reduce the energy required to provide the requisite internal environmental conditions within the building.
- Flexible, controllable and energy efficient engineering systems to occupants with an excellent internal environment.
- A building that is easy to operate and maintain and to adopt for changing occupancy needs

3.2 Resilience/Backup

Heating pumps:	Twin head duty/standby pump arrangement, giving 100% standby capacity.
Boilers:	N+1 boiler provision. Modular boilers for heating will reduce individual boiler failure impact on the heating provision (AHU Coils and LTHW V/T circuit).
Domestic Cold Water:	Sectional water storage tanks (Wholesome).
Smoke Extract Fans:	Duty/standby arrangement c/w diverse electrical power supplies and backup via life safety generator.
Emergency Lighting:	Emergency lighting will be self-contained and will have integral 3 hours battery backup in the event of main failure.
Life Safety Generator:	A diesel generator will be provided at roof level to supply life safety systems via a life safety panel board.

3.3 Energy Efficiency

A well-insulated and airtight building fabric will minimise heat loss from the building.

Overdoor heaters will reduce infiltration of cold air into the building.

Local temperature control will be provided in each heated or cooled space complete with setback / timed facility.

Energy efficient lighting and controls will be installed throughout.

Duct sizes and AHUs will be designed to minimise fan energy consumption.

The air handling plant will be a re-circulation type where appropriate, to reduce energy consumption in winter.

Metering and monitoring will be provided to allow effective Energy Management practices to be employed and monitored.

3.4 Maintainability

Engineering services will be located within accessible ceiling voids, fully co-ordinated to allow ease of access for maintenance and repair to the manufacturers' requirements.

Roof stair access will be provided to the roof for ease of maintenance to roof top plant.

Isolating valves will be installed, to permit local isolation of services, to avoid large sections of the building having to be shut down in the event of a minor component fault.

Services installed in ducts will also be accessible for maintenance, through hatches or doors. Where pipework is concealed in ceiling voids or in boxing, access will still be provided by removable wall or ceiling panels.

All access panels will be coordinated with the Architect and allow safe access to plant and equipment for maintenance.

All security and fire alarm systems will be accessible and maintainable.

3.5 Part L Compliance

The works will comply with the latest version of The Building Regulations Part L2A Conservation of Fuel and Power in New Non-Domestic Buildings and the associated Non-Domestic Building Services Compliance Guide.

The works are also required to comply with any local council policy which may exceed the Building Regulations minimum.

Provision of an Energy Performance Certificate (EPC) will be required at the completion of works. The Contractor will be responsible for producing a Part L model to prove compliance using approved software.

~~The client has targeted achieving an EPC A rating. Design decisions have been implemented in order to achieve this aspiration. In the case that final As Built performance levels do not meet minimum values set out, the Contractor will be responsible for offsetting energy savings and performance by enhancing other elements of the design and installation accordingly.~~

The Contractor will provide a final certificate post completion.

3.6 BREEAM Rating

The Contractor is to design and undertake construction of the works to achieve, as a minimum, a 'Very Good' rating under the BREEAM New Construction 2014 scheme.

Final Assessment: The Contractor is responsible for achieving the target score of at least 55% for a BREEAM 'Very Good' rating. This commitment includes providing the necessary supporting evidences to fulfil the criteria required for all targeted credits, including all 'Very Good' rating Mandatory credits within the BREEAM Assessment Tool (see accompanying Pre-Assessment), in order to obtain the final target score and official BREEAM certification.

Refer to section 6.16 for further details.

3.7 External Design Parameters

	Summer	Winter
Outdoor Design Temperatures (Manchester TRY Weather Data)	26°C db, 19°C wb.	-4.0°C (saturated)
Outdoor Design Temperatures for heat rejection plant	35.0°C.	-4.0°C

- The above external parameters will be utilised for plant sizing.
- Manchester TRY (Test Reference Year) values will be utilised for energy calculations.
- Manchester DSY (Design Summer Year) values will be utilised to assess overheating.

3.8 Internal Design Conditions

	Summer	Winter
Accommodation	22 °C (+/- 3°C)	21°C (+/- 3°C)

Office areas	24°C (- 2°C)	21°C (+/- 2°C)
Reception area	24°C (- 2°C) *	22°C (+/- 2 °C)
Toilet areas	Uncontrolled	18°C min
Circulation spaces	Uncontrolled	18°C min
Stairs	Uncontrolled	18°C min
Internal Plant Rooms	Uncontrolled	10°C min

*Note: All temperatures are dry resultant, except toilets, circulation and plant which are dry bulb
Internal design humidity: Not controlled (expected 40-60% RH).*

3.9 Building Fabric / Envelope Standards

The Architect's design stage building fabric performance is detailed below. The Contractor will be responsible for verifying the values below prior to undertaking the design.

In the case that final As Built performance levels do not meet the following minimum values, the Contractor will be responsible for offsetting energy savings and performance by enhancing other elements of the design and installation accordingly.

Fabric Detail	Value
Ground floor average area weighted U-value	0.25 W/m ² K,
External wall average area weighted U-value	0.27 W/m ² K,
Roof average area weighted U-value	0.18 W/m ² K,
Window average area weighted U-value	1.60 W/m ² K,
Curtain walling average area weighted U-value	1.60 W/m ² K,
Spandrel element average area weighted U-value	1.60 W/m ² K,
Pedestrian door average area weighted U-value	1.80 W/m ² K,
Glazing total solar transmission (G-value)	0.40
Tested air permeability @ 50 Pascals	5 m ³ /hr/m ²

3.10 Occupancy & Ventilation Parameters

- Accommodation: 2 people per hotel bedroom.
3 people per family/fun hotel bedroom
- Ground Floor Entrance / Restaurant and Bar / Lounge: 214 people maximum (combined total)

3.11 Ductwork Design Parameters

	Maximum Duct Velocities
Kitchen Extract	< 9m/s
Risers	< 6m/s
Main Branch onto Floor	< 4.5m/s

Final 'Run-outs' supply	< 2.5m/s
Exhaust grilles	< 2m/s

3.12 Casual Gains

	Heat Gain (Sensible unless stated otherwise)
Accommodation	IES calculated loads
Lighting	10W/m ²
Small power gains in offices / meeting rooms	25 W/m ²
Occupancy gain	130 W/person (75W (S) 55W (L))
Solar gain	To suit glazing G-value
Fresh air gains and losses	To suit final air volume / off coil temperature

3.13 Water Services Design Parameters

Service	Duty / Temperature
LTHW F & R Temps	80 / 60°C
Heating water systems working pressure:	4.0 Bar g
Domestic Hot and Cold-water systems working pressure:	6-11 Bar g max.
Domestic Hot and Cold-water systems working pressure:	1 Bar g (minimum pressure at outlet)
Maximum pipe-work velocities	up to 40mm dia: <1.0m/s
	50mm dia to 80mm dia: <1.5m/s
	100mm dia and above: <2.0m/s
HWS Temperature	65°C (max – excludes any temperature purging of system), 60°C (min – production), 55°C (min – distribution), 50°C (min – furthest outlet of system, either where no TMV exists <u>or</u> immediately prior to a TMV fitting).
CWS Temperature	10°C (Max) ideally but this is governed by the temperature

	of the incoming mains water supply
HWS Outlet Temp (at point of use)	38-41°C (TMV2 Mixing Valve)
Above Ground Drainage	System III, as described in BS EN 12056-2:2000

No thin wall steel products will be accepted.

Welded copper (domestic) and steel (heating) will be utilised within the respective plant rooms. Final branches to each en-suite facility & within the kitchen areas will be copper (domestic), or steel (heating). It should be noted that the use of aluminium multi-layered pipework for domestic water usage may be considered.

3.14 Electrical Services

The building services installations will be designed in accordance with British Standards and legislation applicable under English Law. Where good engineering practice is not covered by British Standards or legislation the relevant guides produced by the Chartered Institute of Building Services Engineers (CIBSE) will apply.

The basis of design data has been taken from the following documentation (latest versions):

- BS 7671 - The IET Wiring Regulations, 18th Edition.
- Electricity at Work Act.
- British Standards and BS Code of Practice
- CIBSE Guides and Technical memoranda
- BCO Guidance
- CE Marked (all equipment)
- Health and Safety at Work Act
- The Construction Design and Management Regulations (CDM)
- Building Regulations
- The Fire Strategy
- Local and Statutory Authority Requirements
- Supply Authority Regulations
- The Disability Discrimination Act (DDA) 2004
- Part L of the latest Building Regulations.
- The Equality Act
- NSI Standards
- NICEIC guidelines.
- BS EN 62305 Lightning Protection
- BS 7430 – Code of Practice for Protective Earthing of Electrical Installations
- CIBSE SLL Code for Lighting
- CIBSE Lighting Guides LG3, LG5, LG6, LG7, LG12
- BSEN 12464, Lighting of Workplaces
- BS 5266 – Emergency Lighting
- BS EN 1838 – Lighting Applications. Emergency Lighting
- BS 5489 – Road Lighting
- BS 5839 – Fire Detection and Fire Alarms for buildings

- BS 9999 - Fire Safety in the Design, Management and Use of Buildings. Code of Practice
- BS EN 54 – Fire Detection and Fire Alarm System
- BS 6387 – Test method for resistance to fire cables required to maintain circuit integrity under fire conditions
- NACOSS Code of Practice
- PD 6662 – Scheme for the Application of European Standards for Intrusion and Hold-up Alarm Systems
- EN 50131 – European Standards for Intruder Alarm Systems
- BS EN 50133 – Alarm Systems. Access control systems for use in security applications
- BS EN 50132 – Alarm Systems. CCTV Surveillance systems for use in security applications
- BS 8418 – Installation and remote monitoring of detector-activated CCTV Systems. Code of Practice
- BS EN IEC 60118-4 – Electroacoustics. Hearing Aids. Induction-Loop Systems for Hearing Aid Purposes. System performance requirements
- BS 7594 – Code of Practice for Audio-Frequency Induction-Loop Systems (AFILS)
- BS EN 50525-1 – Electric cables. Low Voltage energy cables of rated voltages up to and including 450/750 V
- BS EN 61439 Low-voltage switchgear and control gear assemblies
- BS EN 6049 Electrical cables, installation. Protection sleeve in meta-aramid fibres. Technical specification
- BS EN 50173 – 1 Information Technology – Generic Cabling Systems. General Requirements
- BS EN 50174 – 1 Information Technology – Cabling Installation Specification & Quality Assurance
- BS EN 50174 – 2 Information Technology – Cabling Installation, Installation Planning and Practices inside Buildings
- BS EN 50174 – 3 Information Technology – Cabling Installation, Installation Planning and Practices outside Buildings
- BS EN 6701 – Telecommunications equipment and telecommunications cabling. Specification for installation, operation and maintenance
- BS 60529 Degrees of protection provided by enclosures (IP code)
- BS EN ISO 1461 Standard Galvanizing Specifications
- BS 8300 Design of buildings and their approaches to meet the needs of disabled people. Code of practice
- BS 6840 – Sound System Equipment
- BS 6259 – Code of Practice for the design, planning, installation, testing and maintenance of sound systems
- BS EN 60728-1 – Cable networks for TV signals, sound signals and interactive services

Also refer to descriptions for each electrical service.

3.15 Utility Provisions

Preliminary budget quotations have been received for utility service connections to the building. The Contractor will be responsible for obtaining firm quotations, programming, payment, and on-site management of the utility companies.

Budget quotations have been based on approximate loads as indicated below. The Contractor will be responsible for calculating the final load / duty required before applying for firm quotations:

Service	Duty / Temperature
Natural Gas Supply	1100 kW
Wholesome Water Supply	63mm (metered, wholesome) – 1.56 l/s inlet supply
Electrical Supply	980kVA consisting of 2 No. LV metered 80kVA supplies and 1 No. LV metered 820kVA supply. Note this supply has not yet been accepted and paid by the Client.

Communications	Refer to the Haventrust Specification. Data/ communications providers have not been engaged yet at this point of time.
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4.0

Testing, Commissioning and Aftercare

4.0 Testing, Commissioning and Aftercare

4.1 Mechanical and Public Health

On completion of works the reconfigured and new systems are to be tested and commissioned. All relevant codes are to be followed and, in particular, those of CIBSE, BSRIA and the IEE.

All packaged plant will be tested and commissioned by the Contractor with attendance provided by the respective manufacturers. The following tests are to be undertaken on the relevant systems:

- Pressure testing of all pipework, (including rainwater/storm & foul water drainage)
- Factory testing of all major items of plant,
- Water Quality certificates for all wet systems

All domestic hot, cold-water & non-wholesome water pipework will be flushed and chlorinated prior to completion and handover, with all pipework being suitably pressure tested in accordance with BS EN 806-4: 2010 "Specifications for installations inside buildings conveying water for human consumption", and HVCA TR/20 "Installation and testing of pipework systems".

All above slab drainage pipework (including that which is located in the basement areas – new & altered) will be pressure tested in accordance with BS EN 12056-5:2000 "Gravity Drainage System Inside Buildings – Installation and testing, instructions for operation, maintenance and use", prior to completion and handover.

Check correct operation of devices. Confirm interlocks and sequences operate correctly. Provide test equipment and consumables to complete tests and retest any failed installations following corrective measures. Check and confirm correct sequence in multiphase circuits.

Carry out electrical site testing and inspection and provide test certificates for specialist installations. Record all results and readings. Provide copies of any test and inspection result.

Commissioning results are to be included in the final operation and maintenance manuals.

Coordinate and arrange the scheduled list of demonstrations of the services for the design team. It is the responsibility of the Contractor to make all required arrangements and preplanning to ensure that the demonstrations and reviews of services against the commissioning data can be conducted in a 1-day period.

The Contractor must allow for returning to site to attend to all defects as they arise during the 12 months from handover at the request of and by arrangement with the Client.

4.2 Electrical Services

The commissioning is to include the energising of the electrical installation for as long as is necessary to prove the operation of all controls, alarms, safety devices and performance of the equipment under consideration.

Record drawings prepared by the electrical Sub-contractor/specialist installer e.g. lightning protection specialist. The Contractor is to show all information necessary to safely operate, inspect, test and maintain all systems, plant and equipment and are to incorporate the following information:

- a. The routes of all underground conduits, ducts and cables including laying depths, type, size, date of installation, typical cross sections and lengths between terminations.
- b. The locations and details of all underground access/test points such as earth electrode terminations and joints/draw-in boxes, including construction details.
- c. The location and details of adjacent underground services or obstructions in close proximity or where diversion has been necessary such as at services crossing points.
- d. The location and details of all items of plant, equipment, apparatus and engineering terminals including luminaires and lamps.
- e. The routes, type, size and locations of all cables, tapes, conduits, trunking and cable tray.
- f. All electrical circuit references corresponding to the actual installation.

- g. Diagrams of connections for all systems and equipment including main distribution, fire alarm/detection, lighting controls, etc.
- h. Locations of access panels provided in connection with engineering services.
- i. Fully detailed layouts of factory-built equipment, site-built assemblies and all associated components.
- j. Location of each earthing and bonding connection.
- k. Prospective short circuit current measured at the origin of the installation and at each Distribution Board.
- l. Earth fault loop impedance of that part of the system external to the installation.
- m. Earth loop impedance of each final circuit measured at the further point of utilisation.
- n. For each ring circuit, the midpoint of the circuit used when testing conductor continuity.
- o. Insulation resistance of each final circuit.

The Contractor will maintain on site a copy of each contract drawing and keep it updated at intervals not exceeding one week to incorporate all changes and modifications. The record drawings will be prepared from these drawings.

The works are to comply with the following:

- a. BS 7671 - The IET Wiring Regulations, 18th Edition
- b. The Electricity Supply (Amendment) Regulations, 1998.
- c. The Health and Safety at Work Act, 1974.
- d. All relevant current British Standards.

The Contractor and electrical Sub-contractor is to invite the technical authorised person to witness the Factory Acceptance Test on the LV distribution panels and also the Site Acceptance tests following delivery and installation of the equipment.

The services engineers and consultants must be invited to view the full systems demonstrations following the commissioning procedure. It is the responsibility of the Contractor to arrange and coordinate all parties and external Contractors, to ensure that a 2-day window for the total scheduled services demonstrations can be attended by the services engineers.

5.0

Standard Manufacturers Listing

5.0 Standard Manufacturers Listing

The design intent included within this Tender package has been completed using the named plant and equipment manufacturers detailed within this Tender package and listed in the 'Manufacturer Schedule' below.

The Contractor will provide a fully compliant Tender return utilising all the named manufacturers within this Tender package.

Should the Contractor wish to propose alternative suppliers/manufacturers these will be listed as "below the line" options with clear identification of the cost difference the alternative provides including any exclusions etc. This cost will also consider and include any further changes to systems required by a change in the named manufacturer.

Any alternative should be accompanied with a full technical submission for review/comment by the Client team. All alternatives will be fully inclusive of all changes required to accommodate the alternative plant etc. No further costs will be entertained should alternatives attract additional cost due to the change of plant and/or equipment from the Tender package. The Client team reserves the right to choose which alternatives are adopted if any.

5.1 Mechanical Manufacturers List

Service / Product Type	Manufacturer	Telephone Number	Website
AHU	CVS (Exhausto)	Mark Hadfield; 07557733347	www.completeeventsolutions.co.uk
	Daikin Applied	Derek Howkins; 07811 361617	https://www.daikinapplied.uk/
Extract Fans	Nuaire	Warren Wright; 07767298210	www.nuaire.co.uk
	Complete Ventilation Solutions Ltd	Mark Hadfield; 07557733347	www.completeeventsolutions.co.uk
Smoke Extract Fans	Soler & Palau	Wayne Pomfret; 07827278109	https://www.solerpalau.com/en-en/
Run-around coils	CVS (Exhausto)	Mark Hadfield; 07557733347	www.completeeventsolutions.co.uk
Condensing Unit	Airedale	Rob Rhodes; 07860 675187	http://www.airedale.com/web/show
Overdoor heaters	Kampmann	01932 228 592	www.kampmann.co.uk
	J.S. Air Curtains	01903 858656	www.jsaircurtains.com
	Diffusion Environmental Systems Ltd	Nathan Duce; 07919214890	www.diffusion-group.co.uk
Fire/Smoke/Controls/Dampers	Actionair (Swegon)	Dave Harding; 07710 601523	www.actionair.co.uk
	Gilberts (Blackpool) Ltd	01253 766911	www.gilbertsblackpool.com
Grilles and diffusers	CVS (Koolair)	Les Murphy; 07557733348	www.completeeventsolutions.co.uk
	Gilberts (Blackpool) Ltd	01253 766911	www.gilbertsblackpool.com
Attenuators	Caice	0118 918 6470	https://www.caice.co.uk/
Gas fired boilers	Hamworthy Heating	01202 662552	https://www.hamworthy-heating.com/
Pumps	Lowara (Xylem)	Phil Dunphy; 07825 715287	www.lowara.co.uk

	Grundfos	01525 850000	https://uk.grundfos.com/
Radiators	Stelrad	01709 578950	https://www.stelrad.com/
	Merriott	Danny Jones; 01633 657223	https://merriottuk.com/
	Zehnder	Alex McDonald 07795 361643	https://www.zehnder.co.uk/
Electric panel heaters	Dimplex	0344 879 3588	www.dimplex.co.uk
DX Split Systems	Mitsubishi Electric Europe	Lee Darbyshire; 07747845162	https://les.mitsubishielectric.co.uk/
	Daikin UK	David Conlan; 07881 816675	www.daikin.co.uk
Condensate Pumps	Aspen Pumps	01323 848842	https://www.aspenpumps.com/
Rainwater outlets	By Architect	-	-
Sanitaryware, taps and fittings	By Architect	-	-
Wholesome water storage tank	Dewey Waters	01782 692934	https://www.deweywaters.co.uk
Boosted Cold Water Pumpset	New Haden Pumps	Robert Donaldson; 07469 855935	https://www.NHPumps.com
Foul drainage Pumpset	New Haden Pumps	Robert Donaldson; 07469 855935	https://www.NHPumps.com
Domestic hot water generation (incl. GAHP/ASHP)	Lochinvar	Steve Addis; 07977 453733	https://lochinvar.ltd.uk/
CAT 5 Boosted Cold Water Pump set	Arrow Valves	01442823123	https://www.arrowvalves.co.uk/
Valves (general)	Crane Fluid Systems	Nick Boyle; 07766464964	www.cranesbu.com
	Herz Valves	Ian Andreson; 07976723766	www.herzvalves.com
Hot water return pump	Lowara	Phil Dunphy; 07825 715 287	https://www.xylem.com/en-uk/brands/lowara/
Water heaters (Electric)	ZIP	0870 608 8888	www.zipwater.co.uk

5.2 Electrical Manufacturers List

Service / Product Type	Manufacturer	Telephone Number	Website Address
Access Control/Integrated	Europlex Technologies (UK) Ltd	0870 060 0140	www.euroQlex.ie
	Lenel Systems International	01483815230	www.lenel.com

Intruder Detection Systems	Gallagher Security (Europe) Ltd	024 7664 1234	www.cardax.com
Air Circuit Breakers and Moulded Case Circuit Breakers	ABB Ltd	01952 670477	www.abb.co.uk
	Terasaki (Europe) Ltd	0141 941 1940	www.terasaki.com
	Schneider Electric Ltd	0870 608 8608	www.schneider.co.uk
Air Sampling Units	SKC Ltd	01258480188	www.skcltd.com
Busbar	Schneider Electric Ltd	0870 608 8608	www.schneider.co.uk
	Barduct now Moeller Electric Ltd	01296 393322	www.moeller.co.uk
	MEM see Eaton Electric Ltd	01216852100	www.memonline.com
Cables	Pirelli Cables now Prysmian	023 8060 8760	www.uk.QIYsmian.com
	AEI Cables Ltd	01914103111	www.aeicables.co.uk
	BICC Cables now Prysmian Cables & Systems UK Ltd	023 8060 8760	www.uk.QIYsmian.com
	Draka	01332345431	www.drakauk.com
Call Systems – Disabled Toilets	Wandsworth Group Ltd	01483713400	www.wandsworthgrouQ.com
	Static Systems Group pic	01902 895551	www.staticsystems.co.uk
Containment	Kinstrut now Datatray Systems Ltd	01707 332239	www.datatray.co.uk
	Ackermann now Honeywell UK	01268563720	www.ackermann.co.uk
	Mita (UK) Ltd	01352 792300	www.mita.co.uk
	Cableduct	02086831126	www.cableduct.ltd.uk
DC Battery Chargers	Chloride Batteries now EnerSys	0161 7944611	www.enersys-emea.com
	Bardic now Honeywell UK	01162462212	www.bardic.co.uk
Disabled Alarm	Wandsworth Group Ltd	01483713400	www.wandsworthgrouQ.com
	Static Systems Group pic	01902 895551	www.staticsystems.co.uk
Distribution Panels & Distribution Boards	MEM see Eaton Electric Ltd	0121 6852100	www.memonline.com
	Terasaki (Europe) Ltd	0141 9411940	www.terasaki.com
	Schneider Electric Ltd	0870 608 8608	www.schneider.co.uk
	ABB Ltd	01952670477	www.abb.co.uk
	Eaton Electric Ltd	0121 685 2100	www.eaton.com
Electrical Accessories	MK Electric now Honeywell UK	01268 563000	www.mkelectric.co.uk
	Wandsworth Group Ltd	01483713400	www.wandsworthgrouQ.com
	Legrand	08456054333	www.legrand.co.uk
Fire Alarm System	Cerberus see Siemens Building TechnoloQies (not open protocol)	01932 898500	www.buildinnntechonolones.siemens.com
	Gent now Honeywell UK (not open protocol)	01162462000	www.gent.co.uk
	Protec Fire Detection pic (managed protocol)	01282 717171	www.Qrofire.co.uk
	Notifier by Honeywell (Morley panels are open protocol, Notifier panels closed protocol)	01444 230300	www.notifierfiresystems.co.uk
Floor Boxes	Power Plan Systems Ltd	01995 640844	www.powerplan.co.uk
	Ackermann now Honeywell UK	01268 563720	www.ackermann.co.uk
	Electrak International Ltd	01207 503 400	www.electrak.co.uk
	Kidde Fire Protection Ltd	01844 265 003	www.kfp.co.uk

Gas Extinguishing Systems	Siemens Building Technologies Ltd	01784 461616	www.buildinnntechnologies.siemens.com
	Wormald Ansul now Tyco Fire & Integrated Solutions	0161 4554400	www.tycofis.co.uk
Generator	FG Wilson (Engineering) Ltd	028 9049 5000	www.fgwilson.com
	Power Electrics Generators	03708500858	www.powerelectrics.com
Leak Detection	Raychem see Tyco Thermal Controls	0191 419 8200	www.tycothermal.com
	JAM Ltd	01268 777222	www.jam.uk.com
Lifts	Kone UK	08451 999999	www.kone.com
	Otis Ltd	020 8955 3000	www.otisworldwide.com
	Schneider Electric Ltd	0870 608 8608	www.schneider.co.uk
	Mitsubishi Electric Europe BV	01707 276100	www.mitsubishielectric.co.uk
	ThyssenKrupp Elevator UK Ltd	01159868213	www.thyssenkrugg.com
Lighting Control	Luxmate now Zumtobel Liahtina Ltd	020 8589 1800	www.zumtobel.co.uk
	ECS Philips Lighting UK	01293 776774	www.lighting.ghiligs.com
	SimmTronic	01992 456869	www.simmtronic.com
	Osram	01925 273 360	www.osram.co.uk
	Whitecroft Lighting	0161 330 6811	https://www.whitecroftlighting.com/
Lightning Protection	Wm & R W Bacon Ltd	01268561035	www.wmbacon.co.uk
	Furse	0115 964 3700	www.furse.com
	A N Wallis & Co Ltd	01159271721	www.an-wallis.com
Low Voltage Protection Relays (integral with ACB or MCCB)	Areva T & D	01785 250070	www.areva-td.com
	Schneider Electric Ltd	0870 608 8608	www.schneider.co.uk
	ABB Ltd	01952670477	www.abb.co.uk
Low Voltage Switchgear	GR Electrical Services Ltd	01977 681681	www.gr-electrical.co.uk
	Durham Swtchgear now ABB Ltd	01952670477	www.abb.co.uk
	A.F Switchgear Ltd	01623 555600	www.afswitchgear.co.uk
	Sapphire Controls Ltd	01603 480560	www.sagghirecontrols.co.uk
Medium Voltage Relays	Alstom UK	01788 577111	www.alstom.com
	Schneider Electric Ltd	0870 608 8608	www.schneider.co.uk
	ABB	0161 438 3036	www.abb.com
	Eaton Electrical UK	0121 665 2100	www.eatonelectrical.com
Medium Voltage Switchgear	Alstom UK	01788 577111	www.alstom.com
	Schneider Electric Ltd	0870 608 8608	www.schneider.co.uk
	ABB	0161 438 3036	www.abb.com
	Eaton Electrical UK	0121 665 2100	www.eatonelectrical.com
Metering for Electrical Distribution (Building Regulations Part L)	C-Matic Systems Ltd	01892 665688	www.cmatic.co.uk
	Schneider Electric Ltd	0870 608 8608	www.schneider.co.uk
Miniature Circuit Breakers (Manufacturers to match distribution boards)	Terasaki (Europe) Ltd	0141 941 1940	www.terasaki.com
	Schneider Electric Ltd	0870 608 8608	www.schneider.co.uk
	MEM now Eaton Electric Ltd	0121 685 2100	www.memonline.com
Modular Wiring	Modular Wiring Systems Ltd	01753 566700	www.modularwiring.com
	Apex Wiring Solutions	0191 378 7900	www.al:1exwiringsolutions.co.uk
	Cameo Systems Ltd	01202 892088	www.cameosystems.co.uk

PA/VA System, Fire Telephones, Refuge Call Systems	Baldwin Boxall Communications Ltd	01892 664422	www.baldwinboxall.co.uk
Power Factor Correction	ABB Ltd	01952670477	www.abb.co.uk
	Schneider Electric Ltd	0870 608 8608	www.schneider.co.uk
Rotary UPS Systems	Piller (UK) Ltd	01285 657721	www.pillar.co.uk
	Hitec Power Protection Ltd	01926 484535	www.hitecup.s.co.uk
Security	Link Controls Ltd	01928 579050	www.link-controls.co.uk
	Link Integrated Security Systems Ltd	08704 232911	www.linkintegrated.com
	West London Security	020 8676 4300	www.westJondonsecurity.com
Solar PV	Tbc	Tbc	Tbc
Static Switches	Piller (UK) Ltd	01285657721	http://www.piller.co.uk/
	Cyberex part of Thomas & Belts Power Solutions	001 804236 3311	cyberex.com
	MGE UPS Systems Ltd	020 8861 4040	http://www.mgeups.co.uk/
	Chloride UK	0238061 0311	http://www.chloridepower.com/
	Powerware see Eaton Power Quality Ltd	01753608700	www.powerware.com
	Socomec Ltd	01462 440033	www.socomecgroup.com
Static UPS Systems	Powerware UPS see Invensys Group	020 7834 3848	www.invesys.com
	Chloride UK	023 8061 0311	www.chloridepower.com
	Schneider Electric	0870 608 8608	www.schneider.co.uk
	Socomec Ltd	01462 440033	www.socomecgroup.com
	Liebert part of Emerson Network Power Ltd	01628 403200	www.eu.emersonnetworkpower.com
	AVK/SEG (UK) Ltd	01628503900	www.avk-seg.co.uk
Surge Suppression	MEM now Eaton MEM	01616521111	www.memonline.com
	Liebert part of Emerson Network Power Ltd	01628 403200	www.eu.emersonnetworkpower.com
	Furse	01159643700	www.furse.com
Transfer Switches	Asco Power Technologies Ltd	01628 403872	www.asco.com
Transformers	Starkstrom-Geratebau GmbH	01785 252763	www.sgb-trafo.de
	ABB	01952 670477	www.abb.co.uk
	Schneider Electric Ltd	01628 508500	www.schneider.co.uk
	ArevaT & D	01785 250070	www.areva-td.com
Underfloor Busbar Power Track	Power Plan Systems Ltd	01995 640844	www.powerplan.co.uk
	Ackermann now Novar ED&S	01268563720	www.ackermann.co.uk
	Electrak International Ltd	01207 503 400	www.electrak.co.uk

6.0

Mechanical and Public Health

6.0 Mechanical and Public Health

6.1 Overview

Unless stated elsewhere in this specification, the Contractor will design, supply, install, commission, test, certify and set to work all systems detailed in this specification, employing suitable specialists where required. The Contractor will utilise the indicative design intent Tender information as the basis of design. The Contractor will develop this information through the RIBA stages of design to produce final construction information.

All installed/constructed systems are to be compliant with all guidance and regulations and form complete, safe and operational installations.

All required systems, fixings, fitting and accessories will be included for to form complete and fully operational installations. No mechanical, electrical or public health system in the buildings will be left without power/data upon completion of the site works.

The Contractor will develop the indicative design intent drawings and schematics. These are indicative only and do not provide final quantities of equipment required. The quantities of equipment shown on the indicative design intent drawings are shown to convey the design strategy/intent only. It is the Contractor's responsibility to ensure that the correct quantities of equipment are provided in order to comply with this specification.

6.2 Incoming Underground Services

From the date of engagement, the Contractor will be responsible for continuing all liaisons with the statutory authorities from the point at which these liaisons have reached at that time. The Contractor will be responsible for re-applying for any expired quotations, ensuring they are satisfied with the supply capacities. The Contractor will be responsible for managing the process of acceptance of the quotations at the appropriate time, liaising as required with the utility companies, ensuring the design meets their requirements, and ensuring connections are made live at the appropriate time in accordance with the construction programme.

6.3 Rainwater Pipework

Design Parameters

The Contractor will design, supply, install, test and commission a gravity rainwater drainage system capable of providing adequate roof coverage and drainage to serve the whole of the building roof areas. It should be noted that the existing cast iron primary rainwater stacks will be required to be extended; the new roof will discharge rainwater into the respective rainwater outlets connected to each rainwater stack.

Each primary rainwater stack will discharge into the existing basement area upon which it will be collected at high level (using cast iron pipework), to make its final connection to the existing combined outfall pipework.

The systems have been designed and will be installed to meet the performance requirements of BS EN 12056-3:2000, the Building Regulations and all other technical Manual & Guides applicable including, but not restricted to, the documents shown in the design parameters of this document.

The rainwater drainage system designs are based on a Category Risk 2 design rate with a building life span of 60 years, which equates to an intensity of 0.055l/s per m² run-off.

System Description

Install the rainwater systems using the minimum pipework and fittings necessary to carry away all rainwater from the building roofs to ultimately discharge into the below ground drainage system quickly, quietly and with freedom from nuisance or risk of injury or health. Clearly identify all pipelines in accordance with BS 1710.

Install the rainwater systems to convey discharges without crossflow, back-flow, leakages or blockages. Adequately test, clean and maintain the systems at all times throughout the whole of the construction process, until the project is fully handed over.

All roof outlets are to be detailed, designed and specified by the architect.

Ensure that all internal rainwater pipework is able to withstand the head of water likely to occur in the event of a blockage.

Install any horizontal rainwater pipes to a gradient equivalent to 1 : 60, but to suit the individual flow characteristics of each rainwater pipe, to achieve a minimum self-cleansing velocity.

Make all branches to horizontal rainwater pipework at high level on any floor using 45° branches swept in the direction of flow. These branch connections are to incorporate swept and full radiused branches. The use of short radius bends in the rainwater drainage above ground systems is not permitted.

Acoustically insulate all new vertical internal rainwater pipes / stacks for a minimum length of 3m, to minimise the risk of condensation forming / occurring on the pipework within any habitable room / corridor.

Install access doors / caps on rainwater pipework to facilitate rodding and maintenance access to installed pipework. Co-ordinate access through architectural casings with pipe accessories.

Provide access doors to all main rainwater pipes / stacks in accordance with the Building Regulations and BS EN 12056, as follows (it should be noted that this is not achievable on retained existing vertical stacks & is therefore only applicable to all new rainwater pipework):-

Vertically

- 1 at lowest floor level and first floor, as a minimum, located at finished floor level plus 1350mm at each installed position, to the centreline of the access fitting
- 2 install access on vertical pipework above and below any offset

Horizontally

- 1 all changes in direction

All new rainwater pipework has been designed to drop within designated service ducts or integrated ceilings. Co-ordinate removable access panels with the drainage access points to enable maintenance to rainwater pipework. Where pipework is designed to be exposed, install to a high standard, true to line, with adequate support fixings, in accordance with the requirements of BS EN 12056 and the manufacturer's recommendations. In addition, where this exposed pipework is located on the ground & basement floors – to minimise the risk of any leakages occurring – additional couplings should be provided (e.g. TeeKay Couplings).

Air test all rainwater pipework at various stages and on completion of the installation to ensure compliance with the requirements of the Building Regulations and BS EN 12056.

Carry out continuity bonding to all new metal drainage systems pipework and test to ensure earth continuity in accordance with BS 7671 and this specification.

6.4 Foul Drainage Above Ground

Design Parameters

The Contractor will be responsible for the design, supply, install, test and commission of all necessary above ground soil and waste, anti-syphon pipework required to serve new sanitary appliances and other drainage outlets throughout the new Qbic hotel facilities. This includes all new foul pipework located on all floors as well as the ground floor & basement areas.

It should be noted that low level waste pipework associated with each ensuite "pod" will have already been installed, tested & commissioned as part of the factory construction of each "pod". In addition, all low-level waste pipework associated with the bar area on the ground floor & the kitchen areas in the basement will be installed, tested & commissioned by the kitchen specialist; various respective stub stacks (as indicated) are to be provided. All foul waste pipework will, ultimately, be connected to the existing below ground drainage system outfall, located in the basement.

The Works will be installed in accordance with the Building Regulations and all relevant Local and Statutory Authorities' requirements, specifically:

- BS EN 12056 :2000 - Gravity drainage systems inside buildings (design based upon System III)
- The Building Regulations - Part H (April 2002) of the Building Regulations 2000.
- BS EN 12354-1:2000 - Building Acoustics. Estimation of acoustic performance in buildings from the performance of elements.

The above ground foul drainage systems design has been based upon System III as defined in BS EN 12056-2:2000 with relief ventilation pipework terminating to atmosphere as necessary and using the tabulated discharge units as shown in Table 2 within this BS EN document.

System Description

Install the foul water drainage systems to meet the performance objectives as stated in BS EN 12056-2, the Building Regulations and all other technical manuals & Guides applicable including, but not restricted to, the documents shown in the design parameter of this section. Install the systems using the minimum pipework and fittings necessary to carry away all foul discharges from the building to the below ground drainage system quickly, quietly and with freedom from nuisance or risk of injury or health. Prevent air from the discharge pipes from entering the building. Clearly identify all pipelines in accordance with BS 1710.

Pipework to Floors 1 to 9 incl. will be installed in uPVC to BS EN 1329-1:2000 with the Kitemark certification. The installation will incorporate suitable measure to accommodate thermal movement and expansion. For all other primary foul waste pipework to the ground & basement floor levels will be installed using cast iron (the material to be classified as A1) to BS EN 877 with the Kitemark certification.

Install all drainage pipework to convey discharges without cross flow, backflow, leakage or blockage. Adequately test, clean and maintain the systems at all times throughout the construction process, until the project is fully handed over.

It should be noted that the design of the foul drainage above ground systems meets the requirements of BS EN 12056-2 and is based on the discharge unit method (DU). The frequency factor used in the flow calculations is taken from BS EN 12056-2 Table 3 and for this type of development, a factor of 0.7 will be used.

Ensure that WC overflows are the internal / integral type, as permitted within the current Water Regulations.

The design of the underground drainage system(s) will be undertaken by others, and all details relating to this drainage will be provided by them. The above ground foul drainage will connect to the underground drainage via connections / couplings provided by them the contractor will refer to the design documentation prepared by the kitchen specialist GWP Food Service Design for information related to grease traps and associated equipment with the Kitchen installation. Any gullies, channels, outlets, pipework etc. at the basement floor area will be detailed by the civil / structural engineer (these fittings having already been specified by Cundall).

Make all branches to horizontal discharge pipework at high level any floor using 45° branches swept in the direction of flow where possible. These branch connections are to incorporate swept and fully radiused branches. The use of short radius bends in the foul drainage above ground system is not permitted.

Install all discharge pipework to a gradient equivalent to 1:60 (for a 100mm dia nom. pipe size), but to suit the individual flow characteristics of each discharge / foul pipe, to achieve a minimum self-cleansing velocity. Where a 50mm dia nom. pipe is utilised, the gradient should increase to an equivalent of 1:40.

Install access doors / caps on sanitary pipework to facilitate rodding and maintenance access to installed pipework. Co-ordinate access through architectural casings with pipe accessories ensuring that access to the pipe access door is unobstructed.

Provide access doors to all primary SVP's in accordance with the Building Regulations and BS EN 12056, as follows:

Vertically

- 1 at every floor level, located at finished floor level plus 1350mm at each installed position, to the centre line of the access fitting. Note that this is NOT applicable to the primary stacks behind each ensuite "pod"; in this instance, the access doors are to be installed at approx. 400mm AFFL
- 2 on stub stack connections at finished floor level plus 400mm to the centreline of the access fitting.

- 3 as required to facilitate access for testing

Horizontally

- 1 all changes in direction
- 2 on all horizontal floats (use of "standpipe")

Ensure all traps to appliances have deep seals in compliance with BS EN 12056 and the Building Regulations.

Ventilating pipework is to terminate through the new roof as indicated to meet architectural and technical requirements.

Install all discharge and ventilation pipework installations within designated service ducts or integrated ceilings & voids. Co-ordinate removable access panels with the drainage access points to enable maintenance to discharge pipework. Where pipework is designed to be exposed (cast iron), install to a high standard, true to line, with adequate support fixings.

Test all discharge and ventilation pipework at various stages and on completion of the installation to ensure compliance with the requirements of the Building Regulations and BS EN 12056.

Continuity bond and test all new metal drainage systems pipework to ensure earth continuity in accordance with BS 7671 and this specification.

Cast iron pipework used for all primary distribution pipework at ground and basement floors will be labelled in accordance with the appropriate British Standard and will include a British Kitemark to indicate the appropriate quality standard.

Where plastic soil / foul vent pipework penetrates fire compartment walls or floors, proprietary intumescent collars / sleeves will be fitted to maintain compartment integrity. Copper sleeves will be provided to plastic waste pipework below 50mm diameter, where penetrating fire compartment walls.

Condensate connections will be permitted into soil waste stacks via inline traps such as Hepworth HepvO.

Due to the possibility of water entering the firefighting lift shaft (despite all appropriate measures undertaken in accordance with the relevant British Standard to prevent / minimise this occurrence), a lift pit sump should be created at the base of the firefighting shaft (to be detailed by the Structural Engineer). The minimum dimensions of the sump pit should be 500mm x 500mm x 500mm deep to enable a small portable sump pump to be positioned retrospectively. The sump pit should be provided in an accessible corner of the base of the lift shaft.

6.5 Domestic Hot and Cold-Water Service (Wholesome)

Design Parameters

The Contractor will design, supply, install, test, commission, and set to work domestic hot and cold-water service systems capable of providing an adequate supply of hot water and cold wholesome water to various draw-off points throughout the building.

The installation has been designed and will be installed in accordance with the Building Regulations and all relevant Local and Statutory Authorities' requirements, specifically (but not restricted to):-

- The Water Supply (Water Fittings) Regulations 1999.
- BS EN 806-2:2005 - Specification for installations inside buildings conveying water for human consumption (design).

- BS EN 806-3:2006 – Specifications for installations inside buildings conveying water for human consumption (pipe sizing – simplified method).
- BS EN 806-4:2010 – Specifications for installations inside buildings conveying water for human consumption (installation).
- BS 8558:2015 – Guide to the design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages – complementary guidance to BS EN 806.
- Relevant Local and Statutory Authority Regulations and Byelaws.
- CIBSE Guides
- HSE: Legionnaires' disease : The Control of Legionella Bacteria in Water Systems. Approved Code of Practice and guidance on regulations – L8 (fourth edition) published 2013.
- HSE : Legionnaires' disease : Part 2 The control of legionella bacteria in hot & cold water systems. HSG274 Part 2 published 2014.
- Building Regulations.
- British Standards.

The following parameters will be adhered to (but not limited to):

- Fixed water flow devices will be provided on all sanitaryware to control water usage (note – these are included as part of the ensuite “pods”).
- Provision will be made for suitable backflow prevention measures through devices in accordance with the fluid category risk to each mains water appliance as required by WRAS and WRc guidelines (including break tanks, RPZ valves, etc.).
- All supplies to basins and showers to be blended to prevent scalding via TMV2 blending valves (note – these are included as part of the ensuite “pods”). TMV's are to incorporate a means by which full thermal pasteurisation flush-through can be achieved.
- All sanitaryware fittings will be provided with an isolating valve to allow for servicing and maintenance of the fitting.
- Where pipework runs within sub-floor voids, leak detection tape will be provided linked to solenoid valves to shut off domestic water supplies.
- Self-regulating temperature maintenance tape will be provided on hot water supply pipework on all dead legs downstream of return pipework connections greater than two metres. The heat cycle will be capable of raising the temperature above the hot water delivery set point to sanitize the water in the pipe.

Pipework identification will be specific to each type of water service to ensure that no cross-connections occur between wholesome and non-wholesome supplies. Identification between each type of water service will be provided by a distinctive colour and label referencing the water conveyed e.g. Non-Wholesome Water Service – WC Flushing.

System Description (Wholesome)

The Contractor will design, supply, install, test, commission, and set to work domestic hot & cold-water service systems capable of providing an adequate supply of hot & cold wholesome water to various draw-off points / connections throughout the building.

A new dedicated, metered, mains cold water (MCWS) supply will be provided within the basement in an agreed location; the new supply into the building is to be installed by the local Water Company (a budget cost has already been provided for this installation). The MCWS will convert from MDPE to copper pipework complete with stop tap, double check valves and strainer, upon entering the building (after the meter).

The new metered supply will be delivered primarily to a central sectional cold-water storage tank installation, located in the basement plant room; a branch supply will be provided to serve a small Category 5 cold water service (non-wholesome).

The wholesome cold-water storage strategy for the building is to provide storage via 1no. sectional tank located in the basement which will serve all sanitary fittings & other water appliances within the Qbic Hotel demise. The tank will have the following, but not limited to, features:-

- Section (minimum of 2 sections).

- Thermally insulated.
- Externally flanged.
- Raised access chamber.
- Keraflo Aylesbury twin disc delayed action valves (variable)
- High & low-level alarms.
- Temperature gauges.
- Constant read contents gauges.
- Overflow & warning pipework.
- 500mm high “dwarf” walling on which the tank will be situated upon.

A cold-water booster set will be provided within the basement plant room to serve the domestic cold-water systems, complete with duty, assist & standby pump operation. The booster set will be of the packaged type, provided with the following, but not limited to, features:-

- Duty / Standby / Assist pumps (3 pumps).
- Inverter driven VSD.
- Accumulation vessel
- NRVs, IVs, PRVs etc
- Control panel and associated integrated controls c/w ‘Hand’ ‘Auto’ ‘Off’ switches
- Anti-vibration / flexible connections.
- Fully WRAS approved
- Soft fill mode
- Vacuum breakers (at top of risers to prevent ‘hammering’)

Domestic hot water will be generated centrally from the roof plantroom and distributed via gravity throughout the building via the respective en-suite risers at high level of Floor 9.

Generation will be provided via a series of packaged gas fired hot water heaters, c/w pre-heat via a Gas Absorption Heat Pump (GAHP) and associated thermal store, buffer vessels & buffers.

From the basement plant room, domestic cold-water will be routed at high level / ceiling void level within the basement to serve all the staff facilities (toilets, showers, etc.), public conveniences & the kitchen facilities, as well as rising in specific locations to serve the bar area on the ground floor. In addition, the domestic cold-water will then rise up through the ground floor to high level of first floor, before branching and rising to serve pre-plumbed ensuite “pods” & other ancillary areas and plant. The boosted cold-water will generally be provided to the following, but not limited to, areas:-

- En suite, prefabricated bedroom “pods”.
- Traditionally built en suite shower rooms.
- Kitchen.
- Staff amenity areas.
- Public toilet facilities.
- Plant rooms.
- Cat 5 supply (refer to separate section below).
- Tea points to each floor.

The water meter installation will include a pulsed output for connection to a BMS system – should such a system be provided in future – which will log water consumption & leak detection. The leak detection system will be capable of detecting a major leak on the mains water supply within the building. The leak detection system will be:-

- Audible when activated.
- Activated when the flow of water passing through the water meter is at a flow rate above a pre-set maximum for a pre-set period of time.
- Able to identify different flows & therefore leakage rates, e.g. continuous, high and/or low level, over set periods.
- Programmable to suit the owners / users water consumption criteria.
- Designed to avoid false alarms caused by normal operations.

Domestic cold-water monitoring will be provided to monitor and manage water consumption throughout the building. The water meter will be provided with a pulsed output for connection to the BMS – should such a system be provided in future. The flow meter will be provided on the following, but not limited to, domestic cold-water supplies:-

- Incoming mains cold-water supply to the building (in the basement).
- Connection to domestic hot water generation plant (on the roof).
- Connections, if any, to other major plant (e.g. CHP, pre-heats, buffers, etc.).

Domestic hot water storage system will be of the packaged type provided with the following minimum features and required ancillaries including, but not limited to:-

- WRAS approved products.
- Stainless steel cylinders.
- Easily removable / flanged twin coils or plates & cylinders.
- 6 Bar tank rating to 95°C.
- 12 Bar coil rating to 110°C.
- Removable insulation jacket.
- Clean out door at the bottom of each cylinder.
- Pasteurisation cycle facility (weekly)
- Expansion vessels.
- Pressurisation unit(s).
- Safety relief valves.
- Isolation, non-return, lock shield, check valves, etc.
- Temperature and pressure gauges.
- Hot water return circulation pumps.

Drain lines from the water heater expansion relief valves and safety valves will be taken via a tundish to discharge to outside.

The Gas Absorption Heat Pump (GAHP) and associated thermal store will be of the packaged system type and must achieve a minimum system efficiency of 152%.

The provision of GAHP, thermal store and associated gas fired hot water heaters will be carried out by Lochinvar) or equal and approved.

In the case that final As Built performance levels do not meet minimum values set out, the Contractor will be responsible for offsetting energy savings and performance by enhancing other elements of the design and installation accordingly to achieve an EPC A rating.

Domestic hot water return pumps will be of the inline type, provided with the following features including, but not limited to:

- WRAS approved product.
- Variable speed drive.
- Bronze or stainless-steel construction.
- ERP 2018 compliant.
- Digital display.
- In-built energy metering.
- Wireless communication.

The gas fired domestic hot water cylinders will be served by the new natural gas distribution.

The domestic hot water will be stored at 65°C, with a pasteurisation cycle being incorporated at least once a week where the cylinder temperature and downstream pipework water temperature will be elevated to 75°C. This is to ensure that microbiological matter such as Pseudomonas and Legionella within the system is eliminated / minimised.

The domestic hot water within the building will be supplied through a circulating flow and return piped network, ensuring that the return water temperature does not drop below 50°C. The return pipework will incorporate a circulating pump adjacent to the calorifiers.

All water services have been designed and will be installed to meet the requirements of HSE ACoP L8 / Guidance HSG274 Part 2 on the control of Legionella for domestic water services, and the Water Supply (Water Fittings) Regulations 1999.

Pipework will be installed either in copper with pipework thicknesses to be in accordance with BS EN 12449:2016 and/or using proprietary aluminium multi-layered pipework systems – the Contractor to provide evidence as to which system is to be used & agreed by the Design Team prior to installation. Pipework insulation will generally be foil faced mineral wool and applied to all concealed pipework, all external pipework, pipework in voids, plant rooms, risers, etc.; and all high level (exposed or concealed) pipework above 2400mm AFFL. Pipework in plant rooms will be provided with a stucco aluminium protective finish. External pipework will be finished in waterproof black PIB. All insulation materials installed for building services should have an 'A+' or 'A' Green Guide Rating (www.thegreenguide.org.uk).

Cold water services will be distributed throughout the building using insulated pipework, which will be concealed where practicable. Horizontal distribution will be generally be through the Basement at high level, from where it will run vertically up through the ground floor to high level of the first floor before branching into the respective ensuite service ducts to serve the domestic water outlets in each bedroom / bathroom and all high level (exposed or concealed) pipework above 2400mm AFFL.

From the roof plant room, domestic hot-water will be routed down to high level of Floor 9 before branching off to the respective ensuite risers (at the back of each bedroom ensuite) to serve each pre-plumbed shower "pods" on each floor and other ancillary sanitary areas located on the ground & basement floors. Domestic hot water will generally be provided to the following, but not limited to, areas:

- Ensuite, prefabricated bedroom "pods".
- Traditionally built ensuite shower rooms.
- Kitchen.
- Staff amenity areas.
- Public toilet facilities.

The Contractor will include for thermostatic balancing valves return leg pipework in conjunction with a new variable speed domestic hot water return pumps, set to maintain a minimum return temperature of 55°C.

All domestic hot water supply pipework will be fully insulated (Phenolic Foam insulation will not be accepted) to guard against heat loss from the water within the pipework in a bid to conserve energy. In addition, domestic hot water pipework will be routed separately from domestic cold-water pipework to prevent heat gain of the wholesome cold water.

Pressure reducing valves (PRVs) will be incorporated on domestic hot water supplies to individual sanitary fittings downstream of the circulating return connection to manage supply pressure and balance the domestic hot water against the wholesome water supply pressure. PRVs will not be installed on circulating pipework.

In order to allow for full drain down of the system, drain-off cocks will be provided at all low points within the system. Automatic air vents will be provided at all high points within the system to guard against air pockets.

Surge arrester valves will be located at the head of all risers to help minimise risk of pressure surges from water hammer.

Servicing valves will be provided on all connections to individual sanitary fittings to enable complete maintenance of fittings to be undertaken. Pressure reducing valves will be incorporated on domestic hot & cold-water supplies to individual ensuites and sanitary appliances as required. All white goods will be provided with sufficient backflow prevention in accordance with manufacturers guidance and the Water Regulations.

No thin wall products will be accepted. Welded copper will be utilised within plant rooms, at basement and ground floor level except where it is exposed which will be stainless steel.

Ballofix servicing valves will be provided on all connections to individual sanitary fittings to enable complete maintenance of to be undertaken.

Water efficient sanitary fixtures and fittings will be provided (specified by the Architect) to reduce the consumption of wholesome water. All wc cisterns will be a dual flush / low flush type of maximum 6/4 litres (or equivalent). All flow rates to be confirmed with the Architect.

All pipework will be flushed through and chlorinated prior to handover, in accordance with BS EN 806, BS 8558 and BSRIA documentation.

System Description (Non-wholesome, Category 5 service)

The Contractor will design, supply, install, test, commission, and set to work, a Category 5 (Cat 5) water system to serve the bib tap located in the rear service yard (by the refuse bins).

A Category 5 water supply is required / provided to serve an area requiring a water supply that is thought to pose a potential risk of back syphonage and/or cross contamination to the wholesome water supply. This area will include the following:

- General washdown points such as:-
 - o Bin stores

The Category 5 system will incorporate a small packaged GRP tank and booster pump set as part of a proprietary packaged Cat 5 booster set, and will be located within the basement plantroom to serve the specific area.

As the area is “open” to the elements then the tap should be a frost resistant ‘Kemper Frosti-plus’ outdoor hose union tap, wall mounted, and provided with local isolation facility and protective sheaths to protect the tap from impact damage e.g. from bins.

The booster set will be sized to ensure that the fitting / tap is provided with a pressure of at least 2.5 bar.

All Category 5 water supply pipework will be fully insulated (Phenolic Foam insulation will not be used) to guard against heat gain of the water within the pipework.

6.6 Fire Fighting Systems

Design Parameters

The Contractor will ensure that the dry riser (existing & new) installation will be designed and installed in accordance with the recommendations of (latest versions at time of installation):

- Building Regulations
- British Standards
- BS EN 12845:2005 – including A2:2009
- BS EN 12845:2005 – Annex F for life safety requirements and Annex E for high rise requirements
- BS 5839 2013
- BS 5306 (Dry Riser)
- LPC Red Book
- Factory Mutual (FM) rules, regulations and associated data sheets.

Dry Riser (existing & new)

The existing damaged dry riser inlet box – located on the Deansgate façade - will be removed & replaced with a new box in the same location. The existing pipework from the inlet box will be retained &/or modified to suit the new inlet box.

The existing dry riser pipework rises from low level to high level on the ground floor, before offsetting. A new dry riser branch is to be created / installed to serve the basement at low level, complete with new landing valve with a recessed outlet cabinet.

The existing dry riser pipework then rises through the ground floor & up through the respective floors (Floors 1 -7 incl.). At Floor 7, the dry riser is to be extended to serve floors 8 & 9.

The existing & new dry riser pipework will comply with the requirements of BS 5306 Part 1 & BS 9990, and will incorporate an inlet breeching pieces and inlet box located at ground floor level, and “built-in” outlet valve chambers at

each subsequent floor level. The Contractor will ensure that the installation of the dry riser system is in full compliance with BS 5306, BS 9990, LPC rules and any specific insurance company Regulations and requirements.

The dry riser inlet at ground level provides the connection to the water supply. The system is normally dry and is charged by the fire brigade in an emergency. The breeching inlet will be a 2-way type and will be located on the facade of the building. The inlet will have 2 connections complete with 65mm male instantaneous inlets to BS 336 fitted with non-return valves, drain valve and caps and chains. Inlet breechings will comply with the requirements of BS 5041 Part 3. The dry riser inlet will serve the existing / extended 100mm rising main.

The breechings will be housed in an inlet cabinet, recessed into the wall of the building in a vertical or horizontal position ideally adjacent to the emergency staircase, manufactured in accordance with BS 5041 Part 5.

The water supply to the dry riser system will be taken from the hydrant points positioned outside the building. Proper access for the fire tenders to approach the building to pump water into the dry riser system must be allowed for. It is required that the fire tenders can be parked within 18 metres and in plain sight of the dry riser inlet.

6.7 Natural Gas

The Contractor will design, supply, install, test and commission and set to work a new natural gas distribution system within the building to serve all natural gas plant items and kitchen area, as identified on the Tender Drawings.

A utility gas meter will be located within a dedicated, purpose-built gas meter enclosure to the rear of the building adjacent to the linen store. A louvred or perforated door will be provided to the gas meter enclosure to outside to provide sufficient high and low-level ventilation in accordance with IGE guidelines and in accordance with the gas supplier (3% of the nominal floor area when the ventilation is on one wall only).

As part of the Contractor's design, the free area requirements will be confirmed back to the Architect from a combustion, gas regulation and overheating point of view. If additional free area is required, the Contractor will provide additional louvres as required, coordinated with the Architect.

The incoming gas supply will be sufficient to serve the 1No. plant rooms and 1No. kitchen requiring natural gas supplies as follows:

Roof Level / Roof Level Plant Room

- Gas fired boilers
- Gas fired hot water heaters
- Gas Absorption Heat Pump (GAHP)

Basement Level

- Kitchen equipment

From the incoming gas meter enclosure, natural gas will route into the ground floor to the rear of the accessible WC. From here the system will split into the plant room gas supply and kitchen gas supply.

The plantroom gas supply will rise to high level ground floor and be routed to the underside of riser 05 where it will rise up to roof level and route to the roof level plant room.

The kitchen gas supply will drop to high level basement level and route through the ceiling void to the kitchen.

The Contractor will provide an automatic gas shut off valve local to the entry point within the plant room. The gas shut-off valves will be complete with auto reset facility from the fire alarm panel and manual shut of valves on the incoming mains.

Emergency knock off buttons at all exit doors of the plant room will be provided by the Contractor.

The automatic safety shut off valves will be operated via both the fire alarm system and local shut of buttons. Automatic safety shut off valve with auxiliary contacts for remote indication of the valve position and connection to installed controls will be provided. The safety circuit will also be auto-reset after power failure and reset signal from the fire alarm panel however the safety circuit must not shut off on fire alarm test.

The Contractor will provide gas meters to include pulsed output signal for connection to a BMS system. Separate meters will be provided for the plant room and kitchen gas supply to monitor energy consumption due to:

- Boiler gas supply
- Gas fired hot water heaters
- GAHP gas supply
- Space heating (heat meters)
- Domestic hot water (heat meters)

All meters will be located to allow easy access for regular monitoring and readings by the building's staff and facilities manager. The meters will be labelled with their end-energy consuming use.

The Contractor will ensure that:

- The energy metering systems are installed such that they enable at least 90% of the estimated annual energy consumption of each fuel to be assigned to the various end-use categories of energy consuming systems.
- The energy consuming systems within the buildings with a total useful floor area greater than 1,000m² are metered using an appropriate energy monitoring and management system.
- The end energy consuming uses are identifiable to the building users through labelling or data outputs.

All internal gas pipework routes will need to be suitably ventilated by the Contractor by natural means, either provided with 'pipe in pipe' ventilated sleeving or grilles located within the ceiling at all joint locations and within risers. It is not envisaged that the riser or voids will be ventilated and a 'pipe in pipe' installation will be installed.

The Contractor will provide sufficient purge points along the pipework distribution. All gas pipework will be painted yellow ochre.

All rooms served with natural gas will be designed with suitable and appropriately sized natural ventilation and interlocked mechanical ventilation systems in place to suit the connected kW load.

The Contractor will provide the following to each plant room and any other rooms with natural gas supplies (basement kitchen):

- (a) A local quarter turn isolation valve.
- (b) A gas pressure proving system with solenoid gas valve and control panel to prove that the gas system is sound and there are no open gas valves or leaks.
- (d) Emergency knock-off buttons located at each exit.
- (e) Natural gas, heat detectors, CO₂ and CO detectors suitably located within the plant rooms.

6.8 Gas Fired Boilers

The Contractor will design, supply, install, test, commission, and set to work natural gas fired boilers, capable of providing an adequate supply of low temperature hot water (LTHW) throughout the building.

John Dalton House will be provided with central generation within the roof level plantroom. Generation will be provided via a series of modular gas fired boilers in the plant room, with a resilience level in line with N+1.

Gas fired boilers will be of the packaged type provided with the following, but not limited to, minimum features and required ancillaries:

- Fully automatic ignition (not permanent pilot flame).
- Condensing boilers.

- Volt free contact to indicate boiler lockout status.
- Upto 11 Bar working pressure (or plate heat exchanger to protect lower working pressure boilers).
- Integrated non-return flue gas valve
- Acid condensate neutraliser
- Manual re set high limit thermostat.
- Ultra-low NOx. (0% O₂) of 20mg/kWh (Class 5)
- Minimum of 94.8% efficiency at max output
- Minimum efficiency at 30% load: 105%
- Stainless steel heat exchanger (weld free)
- 10-year heat exchanger and burner warrantee
- Integrated control panel incorporating a minimum of the following:
 - o Alarm output
 - o Maintenance self-check
 - o BMS interface
 - o Cascade control
- Factory supplied fully insulated boiler casing.
- C E compliance marking.

In addition to the above, each boiler will also be provided with the following:

- Isolating valves to both flow and return connections.
- 2-port shut off valves to prevent bypassing
- Strainer fitted downstream of boiler return isolating valve.
- Air vent/valve fitted upstream of boiler flow isolating valve.
- Safety valve sized in accordance with boiler maximum rated output. This will be provided with an outlet bore sized copper discharge pipe terminating 100mm from finished floor level. This discharge pipe will have a union connection at the safety valve.

The natural gas fired boiler plant will be located within the plant room located at roof level.

The Low Temperature Hot Water (LTHW) heating requirement from each plant room will be met by a series of 2 no. (minimum) gas fired boilers or boiler modules, each rated to provide N+1 capacity of the design peak load (i.e. 2 boilers at 50% duty each). Each boiler will be fitted with fully matched (low NOx) modulating burners, to ensure high combustion efficiencies at full and part load. NOx emission will be fully in accordance with the requirements above.

Removal of combustion products will be via individual, conventional stainless-steel flue discharging vertically from the plant rooms to outside, in accordance with Manufacturers installation guidelines.

Doors in the plant rooms will be fully louvred to provide adequate fresh air for combustion, natural gas dissipation and overheating control. If louvred doors cannot provide sufficient free area the Contractor will allow for additional louvres through the façade, coordinated with the Architect.

Where a natural flue system cannot be achieved, the Contractor will allow for fan assist or flue dilution. The Contractor will allow for the worst-case option for agreement at the next stage as part of the Contractor's detailed design.

The boilers will be piped in a reverse return arrangement within a pumped primary LTHW circuit. The primary circuit will feed a low loss header from which the secondary circuits serving the respective equipment will be derived. Each boiler will be fitted with an automatic shut off valve that will stop water circulating through the boiler when not in use.

LTHW shunt and circulating pumps will be provided to serve the respective LTHW heating systems, sized to accommodate the peak flow rates required.

Each circulating pump set will be of the packaged type, provided with the following, but not limited to, features:

- Twin pump duty / standby duplex arrangement
- Variable speed drives
- Non-return valve
- ERP 2018 A rating
- Digital display
- In-built energy metering
- Wireless communication
- Auto Adapt constant pressure control

- In-built differential-pressure and temperature sensors with the capability for remote pressure / temperature sensing (along index run)

Secondary circuits for the wet heating system and the AHU coils will be extended in a secondary system arrangement. Each of these secondary circuits will be fitted with its own run / standby variable speed circulating pump (refer to 'Low Temperature Hot Water' section).

The heating system will be pressurised from pressurisation units and expansion vessels located within the plantroom complete with a quick fill connection. Pressurisation units will be of the 'direct' type to suit the static head and working pressures of the retrospective LTHW systems. Once the system is filled the quick fill connection will be disconnected with minimal dead legs.

The Contractor will allow for bringing treated water onto site to fill the system and for testing / commissioning purposes. On no account will raw water be used for any forms or testing including pressure testing.

The Contractor will allow for water treatment specialist to take samples and issue to consultants for approval during all stages of work control requirements.

The Contractor will provide a combined air/dirt separator on the hottest part of the system on the common flow from the boilers.

Air vents and drain cocks will be provided at all high and low points respectively and full-bore dirt pockets installed at the base of all risers.

A water treatment dosing vessel will be provided across the LTHW primary circuit.

The heating system will be controlled by an optimum start controller which will predict and start the heating system based on previous outside air temperature measurements, internal air temperatures requirements against the required occupancy/time schedule set within the building management control system. The optimum start will ensure the building is up to temperature before the occupied period.

The boiler plant will be sized to accommodate the fabric, infiltration, ventilation and fresh air heating loads. The boilers will be of a design which incorporates facilities to enable low standing losses to be achieved. This will be by means of either auto closing flue dampers or limiting water circulation through the boiler when off load.

The boiler flues will be manufactured and installed in accordance with BS 4543 and BS 5854 together with the boiler manufacturers' requirements. The flues will be twin wall and fabricated from 304-grade (outer) and 316L (inner) stainless steel, suitably insulated to prevent nuisance heat gains. Flues will be provided with high density rigid rock wool and capillary breaks suitable for condensing boilers. The annulus between inner and outer skins will be a minimum of 25mm and be thermally insulated with heat resisting material having a 'Thermal Conductivity' value not exceeding 0.04 W/mk. All joints will be fully gas tight and condensing boiler flues will be so installed as to retain all condensate within the inner flue section prior to draining at purpose made drain points. Drains will be provided at low points to all flues. Stainless Steel flue systems for gas fired installations between 60 kW and 2 MW will comply with BS 6644 and the 1956 clean air act.

All bends, supports, adapters and flashings will be provided to form a complete working installation. A plastic drain pipe complete with union connection will be connected to the flue from condensing boilers, run to the nearest floor drain. If the existing flue pipes are available but not suitable, the Contractor will include for all costs associated with the installation of new flue systems.

The boiler plant area will have sufficient fixed ventilation installed to meet the requirements for combustion air and cooling air required by the relevant British Standards Code of Practice for the rated size of plant to be installed.

Pressurisation units and expansion vessels will be suitable for the system heights and working pressures:

- Duty/standby pumps that will automatically reset upon mains power disruption.
- A hard-wired control circuit to disable the boilers and pumps under high/low pressure conditions. The unit will automatically reset when designed pressure conditions are achieved.
- Control panel incorporating all necessary control circuits, pump run/trip lamps and high/low system pressure lamps together with panel live lamp.

Expansion vessels will be provided of sufficient capacity to accommodate the design expansion volume under maximum load conditions and system static head. Alternatively, a spill back type system may be installed where the size of the system requires excessively sized expansion vessels. The Contractor will allow for sufficient expansion joints or bellows, as required, to accommodate thermal expansion of the pipework.

All interconnecting pipework will be in galvanised steel. An anti-gravity loop complete with automatic air vent will also be provided to prevent heat loss by gravity circulation.

The Contractor will ascertain whether the expansion vessel system falls within the remit of the Pressure Systems Safety Regulations 2000. For systems covered by the above legislation, the Contractor will provide a written scheme covering all requirements of the legislation for forwarding to the building owners/operators insurers.

6.9 Low Temperature Hot Water Heating System

The Contractor will design, supply, install, test, commission, and set to work heating circuits to provide an adequate supply of low temperature hot water (LTHW) throughout the building.

Generation will be provided via a series of modular gas fired boilers in the plant room as detailed in 6.8.

The modular boilers are located in the roof level plant room.

Distribution

From the boiler array in the plant room, the Contractor will provide two separate secondary LTHW heating circuits, as described below:

- Constant Temperature (CT) / Variable Volume heating circuits serving AHU coils.
- ~~Variable Temperature (VT) / Variable Volume heating circuits serving radiators and door air curtains.~~

The CT circuits will be variable volume, with control generally at the equipment via 2-port Pressure Independent Control Valves (PICV) arrangements. The furthest plant item will be provided with a 3-port diverter valve to maintain minimum pump turn down volumes.

~~The VT circuit will be a variable temperature, variable volume circuit with weather compensated / optimised control with a maximum flow temperature of 80°C. The VT circuit will schedule the flow temperature against the external temperature, demand, and return temperature to allow further energy savings.~~

Each circulating pump set will be of the packaged type, provided with the following, but not limited to, features:

- Twin pump duty / standby duplex arrangement
- Variable speed drives
- Non-return valve
- ERP 2018 A rating
- Digital display
- In-built energy metering
- Wireless communication
- Auto Adapt constant pressure control
- In-built differential-pressure and temperature sensors with the capability for remote pressure / temperature sensing (along index run)

Secondary (and primary / shunt) pumps will be selected in order to match pump duty flow rate and pressure at the middle of the pump speed/performance range and will be automatically self-adapting to suit demand. All pumps will be fitted with flexible connections to suction and delivery ports. Pumps will be fixed to purpose made mounting brackets with anti-vibrational fixings. Pumps will be controlled via remote pressure sensors located towards the end of the index run for maximum energy savings. Where it is feasible the index could change, the Contractor will allow for multiple pressure sensors linked back to the pumps via the BMS.

CT and VT circuits will generally be constant pressure circuits utilising modulating 2-port Pressure Independent Control Valves (PICVs) to regulate flow rate based on demand. All final 'end of line' terminals / rooms at each floor level / end plate heat exchanger / coil will be provided with 3 or 4-port valves complete with flow regulator valves to maintain minimum pump turndown flow rates and maintain flow around all sub-circuits at low demand conditions.

~~VT circuits will be provided with main 3-port control valves to vary the temperature of the secondary circuit using weather compensation and optimisation control.~~

From the plant rooms the secondary LTHW circuits will distribute throughout the building via the central mechanical risers before branching onto the respective floor plates. Branches from the risers will be provided with Differential Pressure Control Valves (DPCVs) before running along central circulation routes to serve the final radiator circuits. Differential Pressure Control Valves (DPCVs) will be provided on main branches at each floor level to allow any downstream pressure 'dependent' valves, such as 2 port valves and TRVs, to operate within their design differential pressure ranges.

Main LTHW pipework runs from the plantroom, within risers, and along corridors will be heavy or medium grade mild steel.

'Pods' / en-suites will be heated from 'borrowed' heat from adjacent heated spaces.

Terminal Units

~~Final heat emitters will generally be limited to radiators core areas and door air curtains (DAC) above main entrance doors.~~

~~Each final common flow & return branch into each apartment / room will be provided with a 2-port valve / PICV, located within an accessible location either within the corridor or above the entrance to the apartment. The 2-port valve will be linked to a control device and stat in each apartment to provide the following control strategies:~~

~~All radiators will be of high quality pressed steel and sympathetic to the aesthetics of the spaces served.~~

~~Radiators will be single/double panel fitted with/without convector fins as the room heat requirement. Each radiator will be installed complete with the required number of proprietary mounting brackets. The type and location of all radiators will be agreed with the Architect prior to installation. Selection will suit the space available and heat loss to the space. Accessible (DDA) areas will be provided with LST (low surface temperature) type radiators.~~

~~The flow connection will be complete with a high quality chrome body and head finish thermostatic valve. Where thermostatic valves and / or emitters are to be enclosed or susceptible to direct heat gain, remote sensors will be provided and located in positions typical of ambient conditions. The return connection will be fitted with a high quality chrome body finish lock shield valve with replaceable gland, the shield of which will be secured with the manufacturer's purpose designed tamper proof retaining screw. A minimum of ten number manufacturers retaining screw keys will be handed to the Employer upon completion of commissioning. Connections to radiators will be bottom or top opposite ends, dependent on final pipework dropping/rising positions. Drain cocks will be provided to each radiator.~~

~~'Pods' / en-suites will be heated from 'borrowed' heat from adjacent heated spaces.~~

~~Door Air Curtains (DAC) will generally be provided to all main entrances, designed and sized to maintain a comfortable and stable environment by creating a wall of air to help prevent infiltration of outside air into the ground floor reception areas. All DACs will be of the exposed type, provided with the following, but not limited to, features and accessories:~~

- ~~*—Water side pressure independent control~~
- ~~*—Variable volume modulating EC/DC fans~~
- ~~*—Packaged controls with BMS interface~~
- ~~*—Off coil temperature sensing & control~~
- ~~*—Removable filters~~
- ~~*—Low SFP~~
- ~~*—Low noise~~
- ~~*—Wall mounted controller~~

~~Each DAC will be provided with water side control via PICVs with the exception of end of line which will be provided with 4-port valves complete with flow regulator valves to maintain minimum pump turndown flow rates and maintain flow around all sub-circuits at low demand conditions.~~

The following Pressure Independent Control Valve (PICV) arrangements will be provided to each DAC including, but not limited to, the following:

- PICVs (or 4 port end of line with flow limiter)
- Commissioning stations
- Flushing bypasses
- Test points
- Isolation valves
- Drain cocks
- Air vents
- Flexible connections
- Flush points

General

All circulation pumps will be twin head type variable speed, or duplex arrangement, to provide integrity of flow in the event of pump failure. The heating and cooling systems will be pressurised from pressurisation units and expansion vessels located within the plant rooms, suitable for the static and working pressures.

Air vents and drain cocks at all high and low points respectively will be provided and full-bore dirt pockets installed at the base of all risers. Water treatment dosing pots and conditioners will be provided across the primary and secondary circuits.

The Contractor will allow for bringing treated water onto site to fill the system and for testing / commissioning purposes.

On no account will raw water be used for any forms or testing including pressure testing.

Allow for water treatment specialist to take samples and issue to consultants for approval during all stages of work control requirements.

Allowances will be made for a full flush, back flush, clean and dose of the systems in accordance with BSRIA BG 29/2012.

Pipework insulation will generally be foil faced mineral wool and applied to all concealed pipework, all external pipework, pipework in voids, plant rooms, risers, etc.; and all high level (exposed or concealed) pipework above 2400mm AFFL. Pipework in plant rooms will be provided with a stucco aluminium protective finish. External pipework will be finished in waterproof black PIB.

All insulation materials installed for building services will have an 'A+' or 'A' Green Guide Rating (www.thegreenguide.org.uk) and have zero ozone depletion potential.

Pipework runs will be designed and installed to be as unobtrusive as possible. Long runs of visible horizontal pipework without direct connections to radiators will not be permitted. Vertical rises and drops will be in stores, corners of rooms or down columns. Pipework will run in service and ceiling voids where accessible, with branch rises and drops run as above.

Allowances for thermal expansion will be made via cold drawn expansion bellows and allow for purge points at each floor. Allowance for earthquakes will be made. The system will be appropriately protected from earthquake damage.

All sub circuit branches and connections from the mains will be capable of isolation.

Commissioning sets with differential pressure control valves will be installed as required to both main and sub circuit pipework. Main circuits will also be adequately valved to minimise disruption to services and to ease maintenance and any future alterations and to enable accurate commissioning and adequate isolation of all heating circuits.

Valves will be installed in service voids where possible. In situations where this is not practicable, they will be located in accessible but unobtrusive positions such as ceiling voids or storage areas. Any access panels required will be agreed with the Architect prior to installation.

6.10 Electric Heaters

Design Parameters

The Contractor is to design, supply, install, test, commission and set to work electric heating systems to provide heating to areas identified on the tender drawings.

- Electricity at Work Act
- BS 7671:2018, The IET Wiring Regulations
- CE Marked (all equipment)
- The Construction Design and Management Regulations (CDM)
- BCO Guidelines
- The Building Regulations Part L2B, 2013 and supplementary document Non-Domestic Building Services Compliance Guide, 2013.

System Description

Final heat emitters will generally be limited to electric panel heaters to core areas throughout the building and door air curtains (DAC) above main entrance doors at ground floor level (3No.).

Electric panel heaters will be installed complete with the required number of proprietary mounting brackets. Type and location of electric panel heaters will be agreed with the Architect prior to installation. Selection will suit the space available and heat loss to the space. Accessible (DDA) areas will be provided with LST (low surface temperature) type electric panel heaters.

Door Air Curtains (DAC) will generally be provided to all main entrances, designed and sized to maintain a comfortable and stable environment by creating a wall of air to help prevent infiltrations of outside air into the ground floor reception areas. All DACs will be of the exposed type, provided with the following, but not limited to, features and accessories:

- Variable volume modulating EC/DC fans
- Packaged controls with BMS interface
- Off coil temperature sensing & control
- Removable filters
- Low SFP
- Low noise
- Wall mounted controller

6.11 DX Cooling Heat Pump Systems

Design Parameters

The Contractor will design, supply, install, test, commission and set to work multiple DX systems to provide cooling to serve the Comms room at Basement Level. The system provided will be 2No. (duty / standby), as identified on the Tender Drawings.

The installation will be designed and installed in accordance with the Building Regulations and all relevant local and statutory authorities' requirements, specifically:

- Institute of Refrigeration guidance documents
- BS:EN:378 Parts 1, 2 and 3
- F-gas Regulations
- The Building Regulations Part L2A, 2013 and supplementary document Non-Domestic Building Services Compliance Guide, 2013.

System Description

The contractor will design, supply, install, set to work and commission refrigerant cooling systems to off-set heat gains within the Comms room at Basement level.

Comms Room

The contractor will provide 2No. (duty/standby- Units are to both be operational, running at part load) refrigerant cooling systems to serve the Comms room at Basement level.

Each system will comprise an air-cooled condenser located on the roof, with refrigerant pipework distributed via the services riser and within ceiling voids to the wall mounted indoor unit. All internal refrigeration pipework, condensate pipework and interconnecting wiring to be routed on cable tray from the indoor units to the external interface co-ordinated with the structure and services.

The Contractor will provide 'Big Foot' type framing systems to mount external units on. The design, selection and installation of heat rejection units supports will be in-line with manufacturer's recommendations for maintenance and adequate airflow for heat rejection.

General

All internal refrigeration pipework, condensate pipework and interconnecting wiring will be routed on cable tray from the indoor units to the external interface. All pipework will be labelled with I.D. number (condenser unit reference) at 3m centres.

Where internal units are provided they will provide the required environmental conditions with a minimum of noise, noting that internal room noise is key. External condensing unit fans will also provide the required performance with minimum noise intrusion to the internal space & to comply with any local planning external noise control requirements.

Where rooms are provided with wall mounted units, the Contractor will provide direct fresh air supplies into the room for the fresh air allowance. The Contractor must ensure the heating and cooling loads associated with any direct fresh air supplies is accommodated within the unit selection.

Indoor units will be selected to achieve the sensible cooling duty required with the discharge temperature from the units selected based on a minimum 14°C supply temperature to prevent condensation.

The refrigerant used in DX systems will be R32.

Pipe work will be sized and installed by an Approved (certificate approval must be submitted prior to installation commencement) Refrigerant Engineer and accordance to BSEN 378 2016 Specification. All pipe work 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. 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. After installation of pipe work, and prior to sealing of insulation joints and starting of equipment, pipe work should be pressure tested to 28Kg/cm.sq (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).

Condensate drainage pipework from the indoor units will run to a fall to connect/discharge into the primary foul drainage stacks. Condensate drains from indoor units will be installed to a minimum 1 in 100 fall, by gravity, wherever possible. Wall mounted units to be installed with separate condensate lift pump. A plastic condensate connection will be taken from the units at a continuous fall, to discharge into the foul drainage stacks via a suitable non-return trap such as Hepvo or equal and approved. All drip trays will be thermally insulated.

All penetrations from internal to external spaces (external interfaces) will be designed, installed and made weatherproof.

The Contractor will include all necessary power supplies to external condenser units, which are used to power the internal units.

The Contractor will include for the thermal insulation of all refrigerant pipework. All insulation materials installed for building services will have an 'A+' or 'A' Green Guide Rating (www.thegreenguide.org.uk) and have zero ozone depletion potential.

Each room will be provided with an individual wall mounted programmable controller providing the Client with the ability to set multiple time schedules, adjust set point temperatures and fan speed as a minimum.

6.12 Variable Refrigerant Flow (VRF) Systems

Design Parameters

The Contractor will design, supply, install, test, commission and set to work multiple VRF simultaneous heating and cooling heat recovery systems to provide comfort cooling and heating to the 261 no. hotel bedrooms, ground floor and basement level front of house and back of house areas, as identified on the Tender Drawings.

The installation will be designed and installed in accordance with the Building Regulations and all relevant local and statutory authorities' requirements, specifically:

- Institute of Refrigeration guidance documents
- BS:EN:378 Parts 1, 2 and 3
- F-gas Regulations
- The Building Regulations Part L2A, 2013 and supplementary document Non-Domestic Building Services Compliance Guide, 2013.

System Description

The contractor will design, supply and install a refrigerant based VRF systems to provide simultaneous heating and cooling to basement, ground and levels L01-L09 with leak detection included as necessary and in accordance with BS EB 378.

The system will comprise of high efficiency high COP/EER heat recovery air cooled condensers located at roof plant level within designated heat rejection plant space, with refrigerant pipework distributed via the services risers.

Branch controller boxes will be located close to the above transient areas or store rooms to prevent nuisance noise breakout from the branch controller. At L01-L09 the branch controller boxes will be located at high level within the Linen Store and Stair 02 Lobby. The Contractor will allow for acoustically lining or enclosing the branch controller boxes to reduce noise further (new and existing).

At levels L01-L09 branch controller boxes will be 16-way. At ground floor and basement level, branch controller boxes will have 20% minimum spare capacity.

The refrigerant will then be distributed from the branch controller boxes to each individual terminal units. Unit type will be that of wall mounted units at L01-L09, ceiling mounted indoor fan coil units at Ground floor and wall mounted units at basement level.

Ground Floor

The open plan ground floor area will be zoned (typically 6m x 4.5m perimeter zones) with each zone requiring a dedicated indoor VRF fan coil.

All zones will be provided with ducted supply to pressed steel swirls c/w coandă effect plate/collar, selected to provide an even distribution of air across the zone.

All secondary supply ducts and fan coil unit supply plenum boxes will be thermally insulated. All plenum boxes to fan coil units and grilles/diffusers will be acoustically lined.

Return air to the fan coil units will be via open air flow path to the rear of the units.

Each indoor VRF fan coil unit will be provided with a remote discrete return air 'button' sensor on a flying lead, located at high level to the rear of the units in a suitable to provide a true space temperature reading.

Fresh air will be provided from the central AHU and will be ducted close to the backs of each fan coil unit ($\leq 300\text{mm}$). Fresh air will be tempered to room temperature in winter, however will be supplied at ambient temperature (with cooling recovery) during the summer months (outside of the heating season).

Basement Level

Basement level will be provided with wall mounted internal units c/w separate condensate lift pumps, as identified on the Tender Drawings.

Fresh air will be provided from the central AHU and will be ducted supply and extract. Fresh air will be tempered to room temperature in winter, however will be supplied at ambient temperature (with cooling recovery) during the summer months (outside of heating season).

L01-L09

All hotel bedrooms at L01-L09 will be provided with wall mounted internal units c/w separate condensate lift pumps, as identified on the Tender Drawings.

Fresh air will be provided from the central supply only AHUs with a ducted supply to each room. Fresh air will be tempered to room temperature in winter, however will be supplied at ambient temperature (with cooling recovery) during the summer months (outside of heating season). Extract ventilation will be via central extract only fans from each 'pod' location in each room.

General

The simultaneous heating and cooling arrangement will allow spaces with different load characteristics (i.e. some in heating mode and some in cooling) to be offset against one another, reducing the overall load requirement of the roof mounted condenser unit.

The systems will maintain a comfortable and stable environment for the occupants of the building based on the design criteria within this performance specification.

The system will provide comfort cooling to offset the effects of the summer fabric and solar heat gains, fresh air loads, natural infiltration loads and internal gains due to equipment, lights and occupancy. The system will also provide terminal heating to offset the winter fabric heat losses.

The Contractor will provide an energy efficient heat recovery installation using a 2-pipe refrigerant system. Refrigeration pipework will be sized by appropriately qualified personnel taking into account actual system lengths and lifts. Refrigeration pipework will be sized and installed to ensure return of oil to the compressor under all operating conditions. Oil traps will be formed in refrigerant lines wherever there is the possibility of entrained oil accumulating. These will be designed with short pitch centres to avoid trapping large quantities of oil and are to be of double riser pipe type if necessary for a system with capacity control.

No diversity will be allowed on the selection of the outdoor units and the selection will take into account any de-rating due to internal and external design conditions in summer and winter. This will allow future overloading of outdoor units as required in the future.

The Contractor will make due consideration to external noise requirements and, if necessary, external units will be acoustically treated to meet the acoustic report, planning requirements or any other limiting external noise requirements.

The internal units will be a mixture of chassis type ceiling void mounted installation and wall mounted installation. The units will be selected on a high sensible output basis, the discharge temperature from the fan coil units will be selected based on an elevated supply temperature to prevent condensation or dumping of air supply from the terminal diffusers (maximum 10 K temperature differential of the supply air to the space temperature).

All internal refrigeration pipework, condensate pipework and interconnecting wiring to be routed on cable tray from the indoor units to the external interface co-ordinated with lighting, ductwork, structure and drainage.

The Contractor will ensure all VRF systems are installed in accordance with the manufacturer's requirements and installed by the manufacturer's approved installers. Provide VRF systems to maintain the required space environmental temperatures within the space during occupied hours and to enable the building fabric protection during un-occupied hours.

There are a number of units located at Ground floor where services will be exposed with no suspended ceiling. In these locations, the Contractor will allow for powder coating or spraying in situ the MEP services black (TBC - RAL colour in agreement with the Architect). The installation needs to be particularly neat and well-coordinated within these areas. Where services are exposed, insulation to ductwork will be internal rather than external with no directional arrows. Refrigeration pipework will be installed in tray rather than basket to RAL colour as above.

The systems will use refrigerants with low ozone depletion capacity (e.g. R410a, R32 etc.).

Refrigeration pipework will be sized by appropriately qualified personnel taking into account actual system lengths and lifts.

Condensate drainage pipework from the indoor VRF units will run to a fall to connect/discharge into the dedicated condensate stacks. Condensate drains from indoor units will be installed to a minimum 1 in 100 fall, by gravity, wherever possible. Wall mounted units to be installed with separate condensate lift pump. A plastic condensate connection will be taken from the units at a continuous fall, to discharge into the foul drainage stacks via a suitable non-return trap such as Hepvo or equal and approved. All drip trays will be thermally insulated.

All penetrations from internal to external spaces (external interfaces) will be designed, installed and made weatherproof.

All indoor and external units will be installed such that there is sufficient space and access to allow manufacturers recommended maintenance strategy to be implemented. Where access panels are required in ceilings these will be coordinated and agreed with the Architect prior to installation. The Contractor will be fully responsible for the final locations and sizes of access panels.

Appropriate precautions will be taken to prevent the discharge of refrigerant gases to atmosphere and also discharge of systems inside the building.

The Contractor will include performance testing of the completed installations as described herein.

The Contractor will include all necessary power supplies to external condenser units, internal units and any supplementary controls equipment in accordance with the base build tenant metering strategy.

All insulation materials installed for building services will have an 'A+' or 'A' Green Guide Rating (www.thegreenguide.org.uk) and have zero ozone depletion potential and be fully in accordance with relevant BREEAM Credit requirements for insulation.

Control Requirements

A selection of centralised and localised controllers will be deployed to control and monitor the VRF systems. Cellular spaces will be provided with local hotel style room adjuster control to each individual space, to provide temperature adjustment from the set point condition. The system will revert to the set point temperature condition each day.

Controllers selection will include:

- Mitsubishi AE-200E control panels
- Mitsubishi EW50E control panels
- PAR-CT01MAA

A Mitsubishi Electric MELCOTEL system will be provided to work as a standalone BMS for the Hotel. It will link the fan coils to vingroup systems so that the units shut off when the room is unoccupied. When in an unoccupied mode, the systems go into a setback to ensure the rooms don't drop below a set temperature. When the card inserted the system will turn on at a dedicated set point so that energy is not wasted.

6.13 Mechanical Ventilation

Design Parameters

The Contractor will design, supply, install, test, commission and set to work mechanical ventilation systems to serve John Dalton House.

The works will be designed and installed in accordance with the Building Regulations and all relevant local and statutory authorities' requirements, specifically:

- HVAC guidance documentation including Building Engineering Services Association publications (previously HVAC).
- DW 144, 145 and 172
- DW TM2 Guide to good practice - Internal cleanliness of new ductwork installations
- TR /17 Cleanliness of Ventilation Systems
- The Building Regulations Part L2A, 2013 and supplementary document Non-Domestic Building Services Compliance Guide, 2013.

System Description

Ground Floor

1 No. roof mounted supply and extract air handling unit (AHU 03) will be provided to serve the Ground floor. Heat recovery is to be incorporated into the air handling units in the form of thermal wheels with a minimum 73% thermal efficiency in accordance with ERP 2018. Supply and exhaust ductwork from the unit will be routed across the roof to the service riser (riser 05), which will be weatherproofed with a 'dog kennel' type housing. Duct mounted attenuators will be provided on both the room and atmosphere side of the system. Distances between air intakes / exhausts will be maximised to eliminate cross contamination of air streams.

Ductwork will be distributed internally at high level of ground floor, as identified on the Tender Drawings. Fresh air will be delivered to the rear of the VRF fan coil units by means of distribution ductwork from the main risers to each unit, terminating in a raw end discharge connection directed at the fan coil unit air intake and within 300 mm of the unit. Branches from the main ductwork will be extended to serve the 5No. meeting rooms. Ceiling suspended/mounted circular swirl diffusers c/w coandă effect plate/collar will be installed as necessary to supply surplus outside air. From open plan areas and meeting rooms, return air will be via high level extract bell mouths. In cellular type rooms, extract will be via extract grilles/extract valves.

The AHU will be a stacked unit, suitable for external mounting with the following construction and components;

- 50mm aluminium pentapost construction
- Insulated galvanised panels with Plastisol coating
- 100mm base frame
- ~~Pitched roof~~
- Pre-wired packaged controls
- G4 panel and F7 bag filters
- LTHW heating coil
- Mixing box and motorised dampers
- Thermal wheel heat recovery section
- Backward curved direct-driven supply and extract plug fans (inverter controlled)
- Access panels

The unit will be designed to operate at a maximum of 10% outside air when operating in heating mode.

The unit will be controlled on the dictates of the internal temperature, measured at ground floor within the occupied zone. Motorised dampers will be adjusted to ensure the most efficient performance of the AHU with full fresh air supplied when free cooling is possible.

Basement Level

1 No. roof mounted supply AHU and 1 No. roof mounted extract AHU will be provided to serve the Basement floor. The supply AHU provides make-up fresh air for the kitchen extract system as well as supply ventilation to the basement front of house (FoH) and back of house (BoH), and will also operate as smoke extract make up fresh air ventilation in conjunction with the smoke extract system for the basement level (refer to section 6.15). The extract AHU provides extract ventilation only to the FoH and BoH at basement level. Supply and exhaust ductwork from the unit will be routed across the roof to the service riser (riser 02), which will be weatherproofed as necessary at roof level. Duct mounted attenuators will be provided on both the room and atmosphere side of the system. Distances between air intakes / exhausts will be maximised to eliminate cross contamination of air streams.

Ductwork will be distributed internally at high level of basement level, as identified on the Tender Drawings. Fresh air will be delivered to the areas via ceiling suspend/mounted grilles and diffusers and a mixture of grilles and bellmouths c/w return air grilles for extract ventilation

The AHUs will be single supply or extract units, suitable for external mounting with the following construction and components;

- 50mm aluminium pentapost construction
- Insulated galvanised panels with Plastisol coating
- 100mm base frame
- ~~Pitched roof~~
- Pre-wired packaged controls
- G4 panel and F7 bag filters
- LTHW heating coil (supply only)
- DX cooling coil (supply only)
- Backward curved direct-driven supply and extract plug fans (inverter controlled)
- Access panels

L01-L09

2 No. roof mounted supply and extract AHU (AHU 01 & 02) ~~and 2 No. associated roof mounted extract AHU (TEF01 & 02) c/w run around coil (RAC) heat recovery~~ will be provided to serve the hotel rooms on L01-L09, split in to 2 No. zones (left hand side (LHS) and right-hand side (RHS)). **Heat recovery is to be incorporated into the air handling units in the form of thermal wheels with a minimum 73% thermal efficiency in accordance with ERP 2018.** Supply and exhaust ductwork from the units will be routed across the roof to the following service risers:

- LHS – Supply (riser 06) / Extract (riser 05)
- RHS – Supply (riser 01) / Extract (riser 07)

Each riser will which will be weatherproofed as necessary at roof level. Duct mounted attenuators will be provided on both the room and atmosphere side of all systems. Distance between air intakes / exhausts will be maximised to eliminate cross contamination of air streams.

Ductwork will be distributed internally at high level of each floor through the ceiling void of the corridor access to hotel bedrooms. The supply AHUs provide fresh air supply ventilation to the hotel bedrooms by individual supply duct connections from the ceiling void to the corridor, to each room c/w motorised smoke fire damper (MSFD) and attenuator via a linear slot grille mounted in a bulkhead over the door (dependant on room orientation – as identified on Tender drawings). The extract AHUs provide extract ventilation to the hotel rooms by individual extract duct connections to each room c/w MSFD and attenuator via an extract valve (supplied by others) located at high level in the bathroom 'pod'. The contractor is to provide rigid ducting to as close as possible of the 'pod' extract valve spigot connection with the final connection to be made with a piece of flexible ductwork (maximum length ≤ 300mm).

The AHUs will be a stacked unit, suitable for external mounting with the following construction and components;

- 50mm aluminium pentapost construction
- Insulated galvanised panels with Plastisol coating
- 100mm base frame

- Pre-wired packaged controls
- G4 panel and F7 bag filters
- LTHW heating coil
- Mixing box and motorised dampers
- Thermal wheel heat recovery section
- Backward curved direct-driven supply and extract plug fans (inverter controlled)
- Access panels

General

Supply and extract ductwork will generally be carried out in galvanised steel. Ductwork will be insulated to appropriate thicknesses as follows:

- All fresh air supply ductwork routed internally
- All return air extract ventilation ductwork routed internally when served by a unit c/w heat recovery
- All external supply and exhaust ductwork (include for PIB weatherproof finish)

All insulation materials installed for building services will have an 'A+' or 'A' Green Guide Rating (www.thegreenguide.org.uk) and have zero ozone depletion potential.

All grilles will be powder coat finish with colours and locations coordinated and agreed with the Architect and interior designer. The face velocity of air transfer grilles will not exceed 1.5 m/s.

Air Handling Unit - General

GENERAL CONSTRUCTION

Panels will be double skin construction, minimum insulation thickness 40mm of approved fire retardant insulation. Inner panels will be 0.9mm minimum thickness galvanised mild steel. Outer panels will be 0.7mm minimum thickness galvanised mild steel, "Plastisol" faced to special colour to be advised.

ACCESS PANELS/DOORS

Will be provided where required, and access will be provided to all parts of the plant including fan motors and drives, dampers/motors and filters. Air tight seals will be provided.

FILTERS

Access to filters will be from side withdrawal frames or from access panels. Face velocity through filters will not exceed 2.75 m/s for panel filters and 3 m/s for bag filters. Differential pressure sensors will be installed for connection to the remote monitoring panel. The unit will not be run without filters installed.

DRAIN PANS

All sections requiring condense/water removal will have removable "slide out" stainless steel drain pans of adequate size having a 1 in 20 slope sides to the outlet so that no liquid can remain in the trays.

Ductwork – General

GENERAL

Ducting will be manufactured from continuously hot-dip zinc coated and iron zinc alloy coated steel to BS 2989; quality: Z2G.275. This specification covers low and medium pressure ducting as classified by the HVCA DW/144 specification.

Ducting gauges and jointing methods will be suitable for the design pressures and cross-sectional areas specified, as defined by the DW/144 specification. All ducting will be manufactured off-site by sheet metal Fabrication specialists approved by the Contract Administrator for review to manufacture and installation. Copies of detailed dimensioned "shop" fabrication drawings will be made available to the Contract Administrator.

RECTANGULAR DUCTING

Maximum spacings between joints and stiffeners will be as indicated by the DW/144 Specification. Cross joints will be by bolted flanges to each section. Use of self-tapping screws will not be permitted. 90° branch off takes will be made with a “shoe” fitting. Bends will be normally “medium” radius, or square with turning vanes. Double skin type turning vanes will be used at centres detailed in the DW/144 Specification. Where taper pieces are used the angle of each side will not exceed 15°, without the use of splitters. Particular care will be given to the design and manufacture of fan discharge expansion pieces. Off sets will incorporate radius bends.

CIRCULAR DUCTING

The ISO standard range of nominal sizes will be used. Ducting construction will normally be spirally wound. Minimum sheet thickness and stiffening requirements will be as defined in the DW/144 Specification.

Jointing methods will be suitable for the design pressures and diameters as defined in the DW/144 Specification. Bends up to 400mm dia. will be pressed type, medium or long radius. Larger size bends will be of segmented construction. Branch off takes will be made using a “shoe” fitting.

FLEXIBLE DUCTING

Flexible ductwork will only be used for final connections and the length will be kept to a maximum of 300mm

SEALANTS

Sealants will permanently retain adhesion and elasticity through a temperature range from 0°C to 70°C. Gaskets used for flanged joints will be as detailed in DW/144. Self-adhesive tape will not be used as a primary sealant.

SUPPORTS GENERAL

Proposed methods of attachment to the building structure will be agreed in writing with the Contract Administrator before any site work is carried out. Bracketing will be designed to adequately support ducting loads. The weight of any applied insulation will be taken into consideration. Special support arrangements will be made to support duct mounted items such as fans and attenuators. Measures will be taken to minimise transmission of vibration to the building structure. Minimum spacings for hangers will be as detailed in the DW/144 Specification.

SUPPORTS RECTANGULAR DUCTING

Horizontal ducting will be normally supported on rolled steel channels suspended by hanger rods from the building structure, a suitable compressible pad will be placed between the channel support and the duct. The final mounting height will be capable of adjustment by means of threaded rod and lock-nuts. Vertical ducts will be supported at floor slabs or from walls. The support will coincide with a stiffening or joint angle frame. Consideration will be given to antivibration mounts. Centres for supports will not exceed 4.0 metres.

SUPPORTS CIRCULAR DUCTING

Horizontal ducting will be normally supported using single adjustable drop rods, and split brackets with eye-bolts. Compressible packing will be inserted between the duct and bracket. Details of supports will be as defined in the DW/144 Specification.

INSULATION VAPOUR SEALS

Where a continuous vapour seal is required, bracketing will be over the insulation. Suitable reinforcement sections will be provided at support points as detailed in the DW/144 Specification.

ACCESS DOORS GENERAL

Access doors will be sized and positioned such that whole of the ductwork installation can be inspected internally and cleaned in accordance with TR19. Access doors will be fitted adjacent to fire dampers to allow access to both dampers and fusible links. Access doors will be fitted to allow access to motorised control dampers and linkages, and adjacent to manual dampers, filters, heating and cooling coils, and humidifiers. The positions and sizes of all access/inspection doors will be agreed with the Architect in writing before manufacture begins.

CONSTRUCTION

Sizes and types will comply with the DW/144 Specification. Where ducting is to be insulated an extended frame will be provided.

DAMPERS GENERAL

Dampers will normally have the same face area as the duct into which they are installed. The positions and types of damper will be determined by the Contractor. Exact locations of all dampers will be agreed in writing with the Architect before manufacture commences.

BALANCING DAMPERS

Will normally be opposed blade type with lockable external quadrant control in accessible position. Adequate number of dampers will be installed, typically on each and every branch, to ensure the entire system can be fully balanced.

FIRE/SMOKE DAMPERS

The Contractor will review the Architect's drawings to identify all locations where fire dampers are required.

Fire Dampers (FD) will be of the multi-leaf shutter type, out of air stream when open.

Motorised Smoke Fire Dampers (MSFD) will be of the opposed blade aerodynamic interlocking blade with synthetic seal type, in airstream when open, c/w motor positioned out of the air stream.

Smoke Control Dampers (SCD) will be of the opposed blade aerodynamic interlocking blade with synthetic seal type, in airstream when open, c/w thermally insulated electric control modes with motor positioned out of the air stream and be operational up to 300°C for a period of two hours.

Operation of the dampers will be as detailed in the Particular Specification. Frames will be provided. All dampers to be CE marked.

The Contractor will be responsible for ensuring that all installation frames are built into the structure of the wall by the main Contractor and any gaps are filled with intumescent sealant. If it is not possible to build installation frames into the wall then the Contractor will supply and install purpose made supports and fixings and ensure that the Main Contractor provides adequate fire integrity provision for the installation.

The provision of fire dampers and associated controls will be carried out by Action Air (Swegon Air Management) or equal and approved.

AIR TERMINALS

Each grille or diffuser will be fitted with an integral volume control damper, of the type specified. The dampers will be key operated from the front of the grille. All grilles, louvres, registers and external louvres will be powder coated to a BS colour to be advised by the Architect. Weather louvres secured to external walls must be installed using a suitable sealant.

GRILLES, DIFFUSERS AND LOUVRES

Where required insulated plenum boxes will be installed behind the air terminals. Flexible connections will be provided to spigot connections on the boxes. The weight of this assembly will be taken by hanger rods to the building structure.

ATTENUATORS

These will be circular or rectangular, constructed from galvanised steel plate, having an perforated inner casing and filled with mineral wool, covered with a stable fibre layer (melonex or equivalent) to prevent fibres entering the air flow. Rectangular attenuators will have matching duct flanges. The attenuators will be individually supported to the structure using ant vibration mountings as necessary.

THERMAL INSULATION

Ductwork will be insulated where required with flexible Mineral Wool ductwrap with factory applied Bright Class O reinforced aluminium foil. All joints closely butted and sealed with 100mm wide matching self adhesive foil tape. All duct insulation will be fully adhered to the duct and firmly secured by proprietary insulation pins, 20 mm aluminium bands or 50 mm mesh galvanised wire netting according to the manufacturers installation recommendations. External ductwork will be thermally insulated as above with the addition of aluminium cladding and associated sealant to provide a water tight construction.

TESTING & COMMISSIONING

All ductwork systems will be leakage tested whether designated low, medium or high pressure or under positive or negative pressure, unless otherwise stated in writing by the Contract Administrator. Leakage testing procedures will be carried out in accordance with HVCA DW/143. All air distribution systems will be set to work and regulated as detailed in CIBSE Commissioning Code Series A, and associated control systems will be commissioned as indicated in CIBSE Commissioning Code Series C. Before any testing commences or fans are run, all sections of the ductwork system and plant items will be inspected and cleaned to current standards, as detailed in the BSRIA standard "Specification for Ventilation Hygiene".

Before testing and commissioning commences the Commissioning Engineer must have in his possession all relevant information as detailed in CIBSE Code A.

Records of results will be made on site, as testing and commissioning progresses. Records of what adjustments were made, and revised results must be kept and be made available to the Contract Administrator. Seven working days notice of the commencement of testing and commissioning will be given in writing to the Contract Administrator.

Copies of test certificates, tabulated details of final flow rates, and all other test data will be included in the Operating and Maintenance Manuals.

6.14 Kitchen Ventilation

Design Parameters

The Contractor will design, supply, install, test, commission and set to work kitchen ventilation system to serve the John Dalton House basement level kitchen. The contractor will refer to the design documentation prepared by the kitchen specialist GWP Food Service Design.

The works will be designed and installed in accordance with the Building Regulations and all relevant local and statutory authorities' requirements, specifically:

- HVAC guidance documentation including Building Engineering Services Association publications (previously HVAC).
- DW 172
- DW 144 and 145
- DW TM2 Guide to good practice - Internal cleanliness of new ductwork installations
- TR /17 Cleanliness of Ventilation Systems
- The Building Regulations Part L2A, 2013 and supplementary document Non-Domestic Building Services Compliance Guide, 2013.

System Description

The building includes 1No. kitchen located at basement level, to serve the restaurant, bar and lounge area. One number central kitchen extract fan will be provided and installed at roof level with ductwork distributed to roof level in riser 02. The system will incorporate bifurcated/motor out of air stream extract fan unit and associated ductwork distribution system will be provided to ventilate the kitchen.

The exhaust air will be extracted via kitchen extract hood/canopy and/or ceiling mounted grilles, connected to a ductwork distribution system. Ductwork within the building, but external to the kitchen area, will be installed in fire rated ductwork.

The kitchen ventilation system will be equipped with primary silencing as required to meet the acoustic criteria.

Silencers on kitchen ventilation systems will be provided with Melinex lining (or equal and approved) to prevent migration of any fibres and adverse impact of moisture laden air.

2No. canopies to be provided:

- Main extract canopy
- Dishwash canopy

Kitchen canopies and integrated fire suppression by GWP Food Service Design.

6.15 Smoke Extract/Smoke Control

Design Parameters

The Contractor will design, supply, install, test, commission and set to work smoke clearance ventilation systems within John Dalton House based on the Tender drawings and the Fire Safety Stage 4 documentation.

The works will be designed and installed in accordance with the Building Regulations and all relevant local and statutory authorities' requirements, specifically:

- BS 9999:2017
- Approved Document B (ADB) – Fire Safety
- The Regulatory Reform (Fire Safety) Order 2005
- The Building Regulations Part B; 2010
- HVAC guidance documentation including Building Engineering Services Association publications (previously HVAC).
- DW 144 and 145
- DW TM2 Guide to good practice - Internal cleanliness of new ductwork installations
- TR /17 Cleanliness of Ventilation Systems
- The Building Regulations Part L2A, 2013 and supplementary document Non-Domestic Building Services Compliance Guide, 2013.

System Description

General

Ventilation to the fire-fighting stairs (Stair 02) will be provided by an AOV with 1.0m² geometric free area at high level on the top storey of the stair, remotely or automatically openable. This will have a manual switch on the ground floor (fire service access level) to enable manual operation by the fire brigade. The AOV will also be linked to the fire alarm system.

The lobby on each floor is on an external wall and therefore ventilation will be provided by a vent on this wall with 1.5m² geometric free area at each storey. Lobby vent to be either bottom or side hung and higher than the top of the door opening into the fire-fighting stair.

Ground Floor

A mechanical smoke extract ventilation system will be installed that serves 2no. lobbies adjacent to the fire-fighting stair (stair 02), as identified on the Tender Drawings.

Smoke and heat ventilation system that will provide

- Ten air changes per hour to each compartment served;
- Capable of handling gas temperatures of 300°C for not less than 60mins;
- Come into operation automatically on activation by an automatic fire detection system conforming to BS5839-1:2013

Replacement air will be provided either externally or from the fire-fighting stair (stair 02).

Basement Level

A separate mechanical smoke extract ventilation system will be installed for both Qbic demise/operated areas and the separate “shell & core” basement unit, as identified on the Tender Drawings.

Qbic demise – Smoke and heat ventilation system that will provide

- Ten air changes per hour to each compartment served;
- Capable of handling gas temperatures of 300°C for not less than 60mins;
- Come into operation automatically on activation by an automatic fire detection system conforming to BS5839-1:2013

Replacement air will be provided by the fresh air supply ventilation system, and operate automatically, using the automatic fire detection system described in section 7.19

“Shell & Core” unit – Smoke and heat ventilation system that will provide

- Ten air changes per hour to each compartment served;
- Capable of handling gas temperatures of 300°C for not less than 60mins;
- Come into operation automatically on activation by an automatic fire detection system conforming to BS5839-1:2013
- (To be operational under normal conditions as extract system as per fit out layout requirements – Fault condition to be as per detailed above – ten air changes per hour to each compartment served)

Replacement air will be provided by ductwork routed from atmosphere to the unit. This airflow path must be retained by the fit-out installer when they have completed their works. The fit-out installer is to ensure any fan and ancillary equipment is installed downstream of a smoke extract bypass that enables ten air changes per hour to be extracted from each compartment served.

General

The ductwork installation will be fire-resistant ductwork (according to BS 476 Part 24 and ISO 6944) and must maintain at least 75% of the cross-sectional area of the duct and include and retain stability, integrity and insulation. Fire resistance will not be less than 60min or equivalent (for stability, integrity and insulation) to the fire resistance rating of any compartment boundary that it passes, whichever is greater.

All fans associated with smoke extract systems to be wired in accordance with BS 8519 and to have life-safety generator backup.

The manufacturer will be a BSI registered firm for the design, manufacture, installation and commissioning of smoke control systems in accordance with ISO 9000. Proof of certification will be provided with tender submission.

The specialist company will be responsible for demonstrating and gaining Building Control approval for the ventilation system.

The system will require annual maintenance and testing. The supplier will include in the tender for a service visit and system test to be carried out one year after the system hand over.

6.16 BREEAM Rating/Credits

Design Parameters

Contractor to design and undertake construction of the works to achieve, as a minimum, a ‘Very Good’ rating under the BREEAM New Construction 2014 scheme.

The Contractor is responsible for achieving the target score of at least 55% for a BREEAM ‘Very Good’ rating. This commitment includes providing the necessary supporting evidences to fulfil the criteria required for all targeted credits,

including all 'Very Good' rating Mandatory credits within the BREEAM Assessment Tool (see accompanying Pre-Assessment), in order to obtain the final target score and official BREEAM certification.

Man04. 1 Commissioning and testing schedule and responsibilities

The Contractor will provide a schedule of commissioning and testing that identifies and includes a suitable timescale for commissioning and re-commissioning of all complex and non-complex building services and control systems and testing and inspecting building fabric.

The Contractor schedule will identify the appropriate standards that all commissioning activities will be conducted in accordance with, confirming that these activities will be carried out in accordance with current Building Regulations, BSRIA and CIBSE guidelines and/or other appropriate standards, where applicable.

For the building management system (BMS), the Contractor will be responsible for ensuring the following commissioning procedures are carried out:

Commissioning of air and water systems is carried out when all control devices are installed, wired and functional;
In addition to air and water flow results, commissioning results include physical measurements of room temperatures, off-coil temperatures and other key parameters as appropriate;
The BMS/controls installation is running in auto with satisfactory internal conditions prior to handover;
All BMS schematics and graphics (if BMS is present) are fully installed and functional to user interface before handover;
The occupier or facilities team is fully trained in the operation of the system.

The Contractor will be responsible for appointing an appropriate project team member(s) to monitor and programme pre-commissioning, commissioning, testing and, where necessary, re-commissioning activities on behalf of the client.

The Contractor will account for the commissioning and testing programme, responsibilities and criteria within their budget and main programme of works, allowing for the required time to complete all commissioning and testing activities prior to handover.

Man04. 2 Commissioning building services

The Contractor will appoint a specialist commissioning manager during the design stage. The specialist commissioning manager's responsibilities will include:

Undertaking design reviews and giving advice on suitability for ease of commissioning;
Providing commissioning management input to construction programming and during installation stages;
Management of commissioning, performance testing and handover/post-handover stages.

Man 05. 1 Aftercare support

The Contractor will ensure that there is (or will be) operational infrastructure and resources in place to provide aftercare support to the building occupier(s), which includes the following as a minimum:

A meeting programmed to occur between the aftercare team/individual and the building occupier/management (prior to initial occupation, or as soon as possible thereafter) to:

Introduce the aftercare team or individual to the aftercare support available, including the Building User Guide (where existing) and training schedule/content;

Present key information about the building including the design intent and how to use the building to ensure it operates as efficiently and effectively as possible;

On-site facilities management training, to include a walkabout of the building and introduction to and familiarisation with the building systems, their controls and how to operate them in accordance with the design intent and operational demands;

Initial aftercare support provision for at least the first month of building occupation, e.g. on-site attendance on a weekly basis to support building users and management (this could be more or less frequent depending on the complexity of the building and building operations);

Longer term aftercare support provision for occupants for at least the first 12 months from occupation, e.g. a helpline, nominated individual or other appropriate system to support building users/management.

The Contractor will ensure that there is (or will be) operational infrastructure and resources in place to co-ordinate the collection and monitoring of energy and water consumption data for a minimum of 12 months, once the building is occupied. This is done to facilitate analysis of discrepancies between actual and predicted performance, with a view to adjusting systems and/or user behaviours accordingly.

Man05. 2 Seasonal Commissioning

The Contractor will ensure that the following seasonal commissioning activities will be completed over a minimum 12-month period, once the building becomes substantially occupied:

Complex systems - Specialist Commissioning Manager:

Testing of all building services under full load conditions, i.e. heating equipment in mid-winter, cooling/ventilation equipment in mid-summer, and under part load conditions (spring/autumn);

Where applicable, testing should also be carried out during periods of extreme (high or low) occupancy;

Interviews with building occupants (where they are affected by the complex services) to identify problems or concerns regarding the effectiveness of the systems;

Re-commissioning of systems (following any work needed to serve revised loads), and incorporating any revisions in operating procedures into the operations and maintenance (O&M) manuals;

Simple systems (naturally ventilated) - external consultant/aftercare team/facilities manager:

Review thermal comfort, ventilation, and lighting, at three, six and nine-month intervals after initial occupation, either by measurement or occupant feedback;

Take all reasonable steps to re-commission systems following the review to take account of deficiencies identified and incorporate any relevant revisions in operating procedures into the O&M manuals.

Hea01. 4 Internal and external lighting levels, zoning and control

The Contractor will ensure that all fluorescent and compact fluorescent lamps are fitted with high frequency ballasts.

The Contractor will ensure that the internal lighting in all relevant areas of the building is designed to provide an illuminance (lux) level appropriate to the tasks undertaken, accounting for building user concentration and comfort levels. The Contractor will design and install a lighting design strategy that provides illuminance levels in accordance with the SLL Code for Lighting 2012 and any other relevant industry standard.

For areas where computer screens are regularly used, the lighting design will comply with CIBSE Lighting Guide 72 sections 3.3, 4.6, 4.7, 4.8 and 4.9. This gives recommendations highlighting:

Limits to the luminance of the luminaires to avoid screen reflections. (Manufacturers' data for the luminaires should be sought to confirm this.);

For up lighting, the recommendations refer to the luminance of the lit ceiling rather than the luminaire; a design team calculation is usually required to demonstrate this;

Recommendations for direct lighting, ceiling illuminance, and average wall illuminance.

The Contractor will ensure that all external lighting located within the construction zone is designed to provide illuminance levels that enable users to perform outdoor visual tasks efficiently and accurately, especially during the night. To demonstrate this, external lighting provided is specified in accordance with BS 5489-1:2013 Lighting of roads and public amenity areas and BS EN 12464-2:2014 Light and lighting - Lighting of work places - Part 2: Outdoor work places.

Internal lighting will be designed and installed to allow for occupant control (i.e. Light switches or controls for a particular area / zone of the building will be provided that can be accessed and operated by the individual(s) occupying that area or zone. Such controls will be located within, or within the vicinity of, the zone or area they control) in accordance with the criteria below for relevant areas present with the building:

In office areas, zones of no more than four workplaces;

Workstations adjacent to windows/atria and other building areas separately zoned and controlled;

Seminar and lecture rooms: zoned for presentation and audience areas;

Library spaces: separate zoning of stacks, reading and counter areas;

Teaching space or demonstration area;

Whiteboard or display screen;

Auditoria: zoning of seating areas, circulation space and lectern area;

Dining, restaurant, café areas: separate zoning of servery and seating/dining areas;

Retail: separate zoning of display and counter areas;

Storage areas.

Areas used for teaching, seminar or lecture purposes have lighting controls provided in accordance with CIBSE Lighting Guide 5.

Hea02. 1 Indoor air quality (IAQ) plan

The Contractor will ensure that an indoor air quality plan has been produced, with the objective of facilitating a process that leads to design, specification and installation decisions and actions that minimise indoor air pollution during occupation of the building. The indoor air quality plan must consider the following:

- Removal of contaminant sources;
- Dilution and control of contaminant sources;
- Procedures for pre-occupancy flush out;
- Third party testing and analysis;
- Maintaining indoor air quality in-use.

Hea04. 1 Thermal modelling

The Contractor will ensure that the thermal modelling has been carried out using software in accordance with CIBSE AM111 Building Energy and Environmental Modelling.

The software used to carry out the simulation at the detailed design stage should provide full dynamic thermal analysis.

The modelling should demonstrate that:

For air-conditioned buildings, summer and winter operative temperature ranges in occupied spaces are in accordance with the criteria set out in CIBSE Guide A Environmental design2, Table 1.5; or other appropriate industry standard (where this sets a higher or more appropriate requirement/level for the building type).

For naturally ventilated/free running buildings:

Winter operative temperature ranges in occupied spaces are in accordance with the criteria set out in CIBSE Guide A Environmental design, Table 1.5; or other appropriate industry standard (where this sets a higher or more appropriate requirement/level for the building type).

The building is designed to limit the risk of overheating, in accordance with the adaptive comfort methodology outlined in CIBSE TM52: The limits of thermal comfort: avoiding overheating in European buildings

A competent person (e.g. chartered building services engineer) should assess the suitability of existing building services and controls to identify any changes that may be required as a result of fit-out works (e.g. as a result of changes to internal layout, occupant density, additional equipment that may increase cooling loads etc.).

For air conditioned buildings, the PMV (predicted mean vote) and PPD (predicted percentage of dissatisfied) indices based on the above modelling should be reported, to the BREEAM assessor.

Hea04. 3 Zoning and Controls

The Contractor will ensure that strategy for proposed heating/cooling system(s) demonstrates that it has addressed the following:

Zones within the building and how the building services could efficiently and appropriately heat or cool these areas. For example, consider the different requirements for the central core of a building compared with the external perimeter adjacent to the windows.

The degree of occupant control required for these zones, based on discussions with the end user (or alternatively building type or use specific design guidance, case studies, feedback) considers:

- User knowledge of building services

- Occupancy type, patterns and room functions (and therefore appropriate level of control required)

- How the user is likely to operate or interact with the system(s), e.g. are they likely to open windows, access thermostatic radiator valves (TRV) on radiators, change air-conditioning settings etc.,

- The user expectations (this may differ in the summer and winter) and degree of individual control (i.e. obtaining the balance between occupant preferences, for example some occupants like fresh air and others dislike drafts).

- How the proposed systems will interact with each other (where there is more than one system) and how this may affect the thermal comfort of the building occupants.

- The need or otherwise for an accessible building user actuated manual override for any automatic systems.

Ene01. 1 Reduction of Energy Use and Carbon Emissions

At completion the Contractor will be responsible for carrying out energy modelling of the building using a method compliance with the National Calculation Method (NCM) and producing an Energy Rating and certificate.

The Contractor will be responsible for calculating an Energy Performance Ratio for New Constructions (EPCNC). When compared to the BREEAM 2014 New Construction benchmarks for energy performance, the EPCNC achieved will be 0.375 or better (corresponding to 5 credits or more) in the Ene01 section of the BREEAM 2014 scheme.

The modelling will be carried out using energy modelling software approved to demonstrate compliance with the energy efficiency and carbon emission requirements of the building regulations by an accredited energy assessor.

The Contractor will provide the relevant energy modelling outputs to the BREEAM Assessor to input into the BREEAM Ene01 calculator to determine the EPRNC and number of credits achieved.

Ene02. 1 Sub-metering of major energy consuming systems

The Contractor will install energy metering systems that enable at least 90% of the estimated annual energy consumption of each fuel to be assigned to the various end-use categories of energy consuming systems in accordance with CIBSE TM39 Building Energy Metering.

The energy consuming systems in buildings with a total useful floor area greater than 1,000m² are metered using an appropriate energy monitoring and management system.

The systems in smaller buildings are metered either with an energy monitoring and management system or with separate accessible energy sub-meters with pulsed or other open protocol communication outputs, to enable future connection to an energy monitoring and management system.

The end energy consuming uses will be identifiable to building users either through labelling or data outputs.

The following major energy consuming systems will be separately metered (where applicable):

- Space heating;
- Domestic hot water heating;
- Humidification;
- Cooling;
- Ventilation, i.e. fans (major, including fans in air handling units);
- Pumps;
- Lighting;
- Small power;
- Renewable or low carbon systems (separately);
- Controls;
- Other major energy consuming systems/plant where appropriate.

Energy meters will be located in an area of the building that allows for easy access to facilitate regular energy monitoring and readers by the building occupant/facilities manager. Typically, this will be the plant room, main distribution room or control room (where the building energy management system (BEMS) is installed).

Ene02. 2 Sub-metering of high energy load and tenancy areas

The Contractor will install an accessible energy monitoring and management system or separate accessible energy sub-meters with pulsed or other open protocol communication outputs to enable future connection to an energy monitoring and management system, covering a significant majority of the energy supply to tenanted areas. Meters must be installed on the energy supply to each separate tenanted unit or floor plate within the assessed development.

For developments consisting of one or more larger units (i.e. greater than 200m²), sufficient sub metering to allow for monitoring of the relevant function areas or departments within the unit must be specified, in addition to metering of the unit as a whole (e.g. separate metering for office areas (metered by floor plate) and catering facilities).

The installed meters will cover all types of energy supplied to a building area (function area / department / tenancy / unit), including electricity, gas, heat or other form of energy / fuel that are consumed as a result of the use of, and operations within, each relevant area.

Ene03. 1 External lighting

The Contractor will ensure that the average initial luminous efficacy of the external light fittings within the construction zone (the building being developed and its external site areas) will not be less than 60 luminaire lumens per circuit Watt.

All external light fittings will be automatically controlled for prevention of operation during daylight hours and presence detection in areas of intermittent pedestrian traffic. The external lighting control system will prevent operation during daylight hours through either a time switch or daylight sensor (a manually switched lighting circuit with daylight sensor or time switch override is also acceptable) in addition to providing presence detection in areas of intermittent traffic. (For

external lighting not fitted with presence detectors, time switches must provide automatic switch off of lighting after a specified curfew hour – except in cases where there is a specific requirement for lighting to be left on all night).

Ene06. 1 Energy consumption of transportation systems

The Contractor will appoint a lift specialist to carry out an analysis of the transportation demand and usage patterns for the building to determine the optimum number and size of lifts, escalators and/or moving walks.

The Contractor will also appoint the lift specialist to calculate the energy consumption, in accordance with BS EN ISO 25745 Energy performance of lifts, escalators and moving walks, Part 2: Energy calculation and classification for lifts (elevators) and/or Part 3: Energy calculation and classification for escalators and moving walks, for one of the following:

At least two types of system (for each transportation type required); OR

An arrangement of systems (e.g. for lifts, hydraulic, traction, machine room less lift (MRL)); OR

A system strategy which is 'fit for purpose'.

Where a regenerative drive produces an energy saving greater than the additional standby energy used to support the drives, regenerative drives will be considered.

The Contractor will specify the transportation system with the lowest energy consumption as identified in the energy consumption analysis.

Ene06. 2 Energy efficient features for transportation systems

For each lift, the following three energy efficient features will be provided:

The lifts will operate in a standby condition during off-peak periods;

The lift car lighting and display lighting will provide an average lamp efficacy, (across all fittings in the car) of > 55 lamp lumens/circuit Watt;

The lift will use a drive controller capable of variable speed, variable-voltage, and variable-frequency (VVVF) control of the drive motor.

Each escalator and/or moving walk complies with at least one of the following:

It is fitted with a load-sensing device that synchronises motor output to passenger demand through a variable speed drive; OR

It is fitted with a passenger-sensing device for automated operation (auto walk), so the escalator operates in standby mode when there is no passenger demand.

Wat02. 1 Water monitoring

The Contractor will install a water meter on the mains water supply to the building.

Any water-consuming plant or building areas, consuming 10% or more of the building's total water demand, will be either fitted with easily accessible sub-meters or have water monitoring equipment integral to the plant or area provided.

Each meter (main and sub) will have a pulsed or other open protocol communication output to enable connection to an appropriate utility monitoring and management system, e.g. a building management system (BMS), for the monitoring of water consumption.

If the site on which the building is located has an existing BMS, managed by the same occupier/owner (as the new building), the pulsed/digital water meter(s) for the new building must be connected to the existing BMS.

Wat03. 1 Leak detection system

The Contractor will ensure that a leak detection system capable of detecting a major water leak on the mains water supply within the building and between the building and the utilities water meter will be installed. The leak detection system will be:

A permanent automated water leak detection system that alerts the building occupants to the leak OR an inbuilt automated diagnostic procedure for detecting leaks will be installed;

Activated when the flow of water passing through the water meter/data logger is at a flow rate above a pre-set maximum for a pre-set period of time.

Able to identify different flow and therefore leakage rates, e.g. continuous, high and/or low level, over set time periods;

Programmable to suit the owner/occupiers' water consumption criteria;

Where applicable, designed to avoid false alarms caused by normal operation of large water-consuming plant such as chillers.

Wat03. 2 Flow control devices

Flow control devices that regulate the supply of water to each WC area / facility according to demand will be installed to minimise water leaks and wastage from sanitary fittings.

The flow control device will be one of the following:

A time controller, i.e. an automatic time switch device to switch off the water supply after a predetermined interval;

A programmed time controller, i.e. an automatic time switch device to switch water on and/or off at predetermined times;

A volume controller, i.e. an automatic control device to turn off the water supply once the maximum pre-set volume is reached;

A presence detector and controller, i.e. an automatic device detecting occupancy or movement in an area to switch water on and turn it off when the presence is removed;

A central control unit, i.e. a dedicated computer-based control unit for an overall managed water control system.

Mat04. 1 Insulation

The Contractor will ensure that all insulation materials installed for building services have an 'A+' or 'A' Green Guide Rating (www.thegreenguide.org.uk) and an Insulation Index equal to or greater than 2.5.

Wst03. 1 Operational waste

Where organic waste is to be stored/composted on-site, the Contractor will provide a water outlet adjacent to or within the facility for cleaning and hygiene purposes.

Wst06. 1 Functional adaptability

The Contractor will ensure that a building-specific functional adaptation strategy study has been undertaken by the client and design team by Concept Design (RIBA Stage 2 or equivalent), which includes recommendations for measures to be incorporated to facilitate future adaptation.

Functional adaptation measures have been implemented (RIBA Stage 4 or equivalent) in accordance with the functional adaptation strategy recommendations, where practical and cost effective.

Pol 01. 1 Impact of refrigerants

All systems (with electric compressors) will comply with the requirements of BS EN 378:2008 (parts 2 and 3) and where refrigeration systems containing ammonia are installed, the Institute of Refrigeration Ammonia Refrigeration Systems Code of Practice.

All installed systems using refrigerants will have Direct Effect Life Cycle CO₂ equivalent emissions (DELCO₂e) of ≤ 100 kgCO₂e/kW cooling/heating capacity.

OR

Only air conditioning refrigerant systems using refrigerants with a Global Warming Potential (GWP) ≤ 10 will be installed.

The Contractor will ensure that the systems using refrigerants have a permanent automated refrigerant leak detection system installed; OR where an in-built automated diagnostic procedure for detecting leakage is installed. In all instances a robust and tested refrigerant leak detection system must be installed and must be capable of continuously monitoring for leaks.

The installed system will be capable of automatically isolating and containing the remaining refrigerant(s) charge in response to a leak detection incident.

Pol 02. 1 NO_x emissions

All plant installed to meet the building's delivered heating and hot water demand will have a NO_x emission level (measured on a dry basis at 0% excess O₂) of ≤ 40 mg/kWh under normal operating conditions.

The Contractor will be responsible for reporting the direct and indirect NO_x emissions in mg/kWh and energy consumption in kWh/m²/yr arising from systems installed to meet the building's space heating, cooling and hot water demands to the BREEAM Assessor for inclusion in the BREEAM scoring and reporting tool.

Pol 04. 1 Reduction of night time light pollution

The external lighting strategy will be designed and installed in compliance with Table 2 (and its accompanying notes) of the ILP Guidance notes for the reduction of obtrusive light, 2011.

All external lighting (except for safety and security lighting) will be automatically switched off between 23:00 and 07:00. All safety or security lighting provided that will be used between 23:00 and 07:00 will comply with the lower levels of lighting recommended during these hours in Table 2 of the ILP's Guidance notes. Illuminated advertisements, where specified, will be designed in compliance with ILE Technical Report 5 – The Brightness of Illuminated Advertisements.

Pol 05. 1 Reduction of noise pollution

The Contractor will ensure that where the building does have noise-sensitive areas or buildings within 800m radius of the site, a noise impact assessment in compliance with BS 7445 has been carried out and the following noise levels measured / determined:

Existing background noise levels at the nearest or most exposed noise-sensitive development to the proposed development or at a location where background conditions can be argued to be similar;

The rating noise level resulting from the new noise source.

The noise impact assessment must be carried out by a suitably qualified acoustic consultant holding a recognised acoustic qualification and membership of an appropriate professional body.

The noise level from the proposed site/building, as measured in the locality of the nearest or most exposed noise-sensitive development, is a difference no greater than +5dB during the day (07:00 to 23:00) and +3dB at night (23:00 to 07:00) compared to the background noise level.

Where the noise source(s) from the proposed site/building is greater than the levels described, measures have been installed to attenuate the noise at its source to a level where it will comply.

6.17 Controls Systems**Design Parameters**

The Contractor will design, supply, install, test, commission and set to work control systems within John Dalton House based on the Tender drawings and the controls Functional Scope of Works document.

7.0

Electrical Services

7.0 Electrical Services

7.1 General

Unless stated elsewhere in this specification, the Contractor will design, supply, install, commission, test, certify and set to work all systems detailed in this specification, employing suitable specialists where required. The Contractor will utilise the proposed design Tender information as the basis of design. The Contractor will develop this information through the RIBA stages of design to produce final construction information.

All installed/constructed systems are to be compliant with all guidance and regulations and form complete, safe and operational installations.

All required systems, fixings, fitting and accessories will be included for to form complete and fully operational installations. No mechanical, electrical or public health system in the buildings will be left without power/data upon completion of the site works.

The Contractor will develop proposed drawings and schematics. These are indicative only and do not provide final quantities of equipment required. The quantities of equipment shown on the proposed design drawings are shown to convey the design strategy/intent only. It is the Contractor's responsibility to ensure that the correct quantities of equipment are provided in order to comply with this specification.

The Contractor will include for the co-ordination of all mechanical, electrical, public health, specialist, architectural and structural systems and services throughout the new development.

The Contractor will include for making each space/ room within the development into an operational space fit for purpose unless detailed within the contract documentation and drawings. Where the Contractor is unsure of the room intent, then the Contractor will seek clarification and requirements from the contracts administrator. The Contractor will include for all services external to the buildings on the same basis.

The Contractor will provide a rewirable installation throughout the development. For example, where a cable rises or drops within walls to supply a flush mounted socket, outlet, switch, etc then the cable will be installed within a recessed galvanised steel conduit. This will allow that the cabling contained within can later be drawn out and replaced with new without the requirement of having to chase out the finished wall, acoustic linings, and then requiring re-plastering and re-finishing.

7.2 Underground Services

From the date of engagement, the Contractor will be responsible for continuing all liaisons with the statutory authorities from the point at which these liaisons have reached at that time. The Contractor will be responsible for re-applying for any expired quotations, ensuring they are satisfied with the supply capacities. The Contractor will be responsible for managing the process of acceptance of the quotations at the appropriate time, liaising as required with the utility companies, ensuring the design meets their requirements, and ensuring connections are made live at the appropriate time in accordance with the construction programme.

The Contractor will ensure there is an underground services survey undertaken, if required, prior to carrying out any underground services installation.

The Contractor will be responsible for determining the underground services routes, routes extensions and ducts quantities required, following the underground services survey results, in order to meet the electrical services requirements within the building, which will include but not be limited to:

- LV power mains from the substation into the building
- Communications/ Broadband services into the building
- External power/lighting
- External CCTV

- Spare ducts capacity of 25%

The Contractor will be responsible for liaising with ENW for determining the incoming HV supplies underground service routes, upon acceptance of the quotation and payment provided by the Client to ENW.

All ducts are to be coordinated with the structural engineer. All ducts are to be complete with draw wires.

All ducts will be buried in accordance with NJUG recommendations and will be self-draining away from the buildings and provided with sealed ends to avoid vermin.

As part of the Contractor's scope of works, they are also to provide the CA/Client with an underground GPR scan drawing to show the status of the underground conditions upon completion of their works. This will be provided as part of the O&M manuals.

7.3 HV Public Utility Supply

This section of the specification will be read in conjunction with:

- L.V. schematic - BSXX(61)0001
- All drawings and documentation issued as part of the Stage 4 Design Package

The distribution network operator (DNO) for the site is Electricity North West (ENW).

There is an existing ENW substation adjacent to the rear of the building at ground floor level, which is provided with a 6.6kV HV supply from the ENW network.

Load calculations have been completed for the development, which demonstrated that the substation needs to be upsized and upgraded to be adequately rated for the new function(s) of the building. It has been assessed that the hotel, the Shell and Core Tenant unit and the ground floor restaurant will require a 980 MVA supply, including 20% spare. The Contractor will undertake a load assessment for all the building to confirm the load requirement.

Application for the provision of new HV electrical supply/connection to serve the building and a transformer replacement by a larger one (980kVA) ~~will has been made~~ with the DNO and the quotation is available. ~~It will~~ need to be accepted and paid in full by the Client to secure the available supply. The Contractor will continue liaising with ENW and will manage the process of accepting the quotation in a time frame in accordance with the programme, in order to secure the upgraded HV supply to the existing ENW substation.

From the DNO's high voltage (HV) utility network, an upgraded 6.6kV HV electrical supply will be provided to the building, terminating in ENW owned substation at ground floor level. The upgraded transformer will reduce the voltage from 6.6kV HV to 400V LV.

The Contractor will liaise with ENW to determine the incoming HV underground service routes.

The Contractor will liaise with ENW to manage any changes required to the substation access via the service yard, at the rear of the building.

The existing substation building ~~area~~ is considered adequate to house the upgraded transformer, as well as all required associated panels. The Contractor will liaise with ENW and confirm that the current substation building meets the ENW space and civil requirements to house the new upgraded transformer.

The Contractor will make arrangements for a temporary power supply to Bill's, to ensure uninterrupted operation of the restaurant while the power disconnection/ substation upgrade is taking place. The Contractor will specify and coordinate the series of works to be undertaken to minimise Bill's operations' disruption.

7.4 LV Public Utility Supplies

This section of the specification will be read in conjunction with:

- L.V. schematic - BSXX(61)0001
- All drawings and documentation issued as part of the Stage 4 Design Package

The upgraded ENW transformer will serve an ENW owned LV switchgear, which is located within the ground floor substation building, adjacent to the transformer and will also be upgraded by ENW.

The new development will require 3 No. low voltage (LV) three-phase and neutral (400V / TPN) metered electrical supplies, taken from the on-site ENW owned LV switchgear that is located within the substation on the ground floor:

- 1No. metered LV singles supply of 820kVA for the hotel. The point of connection will be at the ENW LV cabinet within the ENW substation.
- 1No. metered LV supply of 80kVA for the Shell & Core Unit on the basement. The point of connection will be a modular metering panel on the basement, within ~~the LV switch room on the basement the tenant's premises, at a location that will need to be confirmed.~~ **the LV switch room on the basement.**
- 1No. metered LV supply of 80 kVA for the existing restaurant of Bill's. The point of connection will be a modular metering panel on the basement, located within the ~~Comms~~ **LV switch room on the basement.**

The existing substation building is considered adequate to house the upgraded ENW LV switchgear. The Contractor will liaise with ENW and confirm that the ~~current~~ substation building **will** ~~meets~~ the ENW space and civil requirements to house the new upgraded transformer and ENW LV switchgear.

7.5 Standby Diesel Generator

This section of the specification will be read in conjunction with:

- L.V. schematic - BSXX(61)0001
- All drawings and documentation issued as part of the Stage 4 Design Package

The building will be provided with a standby LV life safety/ fire-fighting/ essential supplies generator.

The new standby diesel life-safety generator will be located at roof level, to supply life safety/ fire-fighting services and essential equipment. The generator will be 110kVA standby rated and will be installed in an external location on the roof, within an acoustic standard enclosure, with acoustic performance of 70dBA at 1m as a minimum. The generator will be complete with but not limited to all controls, integral fuel tank, alternator, engine heater, battery charger, batteries, flue fan, flue, acoustic enclosure, etc for a fully functional system.

The diesel generator will include a day tank that will be sized to allow the generator to run autonomously for a minimum of 4 hours.

The generator will feed into a life safety panel board (PB/LS/RL/01) located in a weatherproof IP rated enclosure on the roof, adjacent to the generator's container. The enclosure will be fire rated for 120 min. The life safety panel board PB/LS/RL/01 will be rated at 250A, 36kA 1 sec and will be Form 3B, Type 2 construction equipped with one incomer and suitable number of outgoing ways, which will be fitted MCCB's.

All fire-fighting/ life-safety/ essential systems will have dual electrical supplies. The fire-fighting/ life-safety/ essential supplies will be backed-up by the generator via suitably sized automatic transfer switches (ATS's), fed from the main LV switchboard as well as the generator life safety panel board. The ATS's will be installed as close as possible to each of the final points of supply.

The generator will start automatically on detection of loss of power at any of the ATS's. The life safety generator is to be utilised for the for purpose of life safety only and will not be utilised to export power back into the DNO's energy network. All outputs from the generator will be connected to items of equipment being supplied via a 'break before make' ATS units so that power can't be transferred back into the DNO's energy network.

The generator will provide emergency power directly to the life safety/ fire-fighting/ essential equipment which includes but is not limited to:

- 2 Smoke Extract Fans (Duty and Standby) for smoke extract within the Hotel basement.
- 2 Smoke Extract Fans (Duty and Standby) for smoke extract within the Shell & Core Tenant basement premises.
- 2 Smoke Extract Fans (Duty and Standby) for smoke extract within the ground floor lobbies adjacent to the firefighting core
- 1 Air Handling Unit (AHU-04 Supply – for basement make-up air)

- 1 Fire Fighting Lift (Lift 03) within the fire-fighting core.
- 1 x 6-way Distribution Board (DB/FFC/RL/01) located on the roof, adjacent to Lift 03 overrun, that will supply lighting within the fire-fighting core and power to the Actuated Opening Vent (AOV) on the fire-fighting core – 9th floor and smoke extract fans control panels on the ground floor roof, adjacent to the smoke extract fans.
- 1 x 6-way Distribution Board (DB/PH/BL/01) located within the hotel basement pump room, that will supply the 2 4-drainage pumps (Duty and Standby, for Hotel and Shell & Core Tenant).
- 20% spare

In an event of a power loss, the generator will start-up and supply the drainage pumps, via the associated ATS and dedicated drainage pumps distribution board (DB/PH/RL/01).

In an event of a simultaneous power loss and fire, the generator controls will open the breaker supplying the drainage pumps distribution board (DB/PH/RL/01 – non life-safety/ fire-fighting equipment), to ensure that the generator can power the full load of all the life safety and fire-fighting equipment, including starting currents.

The Contractor will undertake a load assessment of all equipment attached to the life-safety generator. This will be based upon the final selection of manufacturers equipment. The Contractor will use this information to confirm the final generator size and provide a suitable installation that is fit for purpose. The calculation will allow for worst case electrical load on the generator. This is assumed to be on the flowing basis, however will be verified by the Contractor with the Building Control, the Fire Officer and will be in line with the final approved fire strategy:

- Smoke Extract Fan SEF-01 (Duty) running load (Fan serving the basement half where the fire was first detected)
- (Smoke Extract Fan SEF-02 (Standby) offline)
- Smoke Extract Fan SEF-03 (Duty) starting load (Fan serving the other basement half)
- (Smoke Extract Fan SEF-04 (Standby) offline)
- Smoke Extract Fan SEF-05 (Duty) running load (Fan serving the ground floor lobbies)
- (Smoke Extract Fan SEF-06 (Standby) offline)
- AHU-04 make-up air running load
- Lift 03 running load
- DB/FFC/RL/01 fire-fighting core lighting and smoke extract fans controls supplies

During a fire event, if there is a need for a changeover between the duty and standby smoke extract fans, the smoke extract fans control panels will be set to prevent the standby fan starting up until the duty fan completely shuts down, to avoid simultaneous occurrence of fault current (by the shutting down duty smoke extract fan) and starting current (by the starting up standby smoke extract fan).

The input and output power connections to and from the generator system will be isolatable locally (not integrally) to the generator so that the unit to be safely isolated for maintenance.

The generator set will be an automatic start/stop system. The generator system will be capable of automatically returning to the mains supply once re-established.

The Contractor will ensure that circuit breakers for the life safety systems are selected correctly for the system being supplied. Where a permanent neutral electrical power connection is required, the supplying circuit breaker(s) will not disconnect the neutral conductor. The Contractor will ensure that all circuit breakers will disconnect under overload or fault conditions in compliance with BS7671 while being supplied from the output of life safety generator.

The Contractor will ensure that the generator system noise dB rating does not exceed permissible levels as detailed in the building's planning conditions documentation and requirements and in the acoustic report.

The Contractor will ensure that the generator is correctly seated in its final installation location and that no undue vibrations are transmitted into the buildings structure.

To assist the future maintenance of the generator the Contractor will provide a complete schedule summarising the prime components of the assembled set. The schedule will be submitted as part of the O&M manuals.

To ensure that the generator's fuel is conditioned, the generator fuel tank will come complete with fuel polishing equipment, so as to maintain the fuel in the optimum condition before being used by the generator.

The generator fuel will be re-filled via jerry cans taken to the diesel generator location via the lifts to the 9th floor and via the stairs (Stair 01) from the 9th floor to the roof. A fuel spill kit will be provided within the generator enclosure.

All life safety system will comply with the current versions of:

- BS9999 - Fire safety in the design, management and use of buildings.
- BSRIA BG70 - Life Safety and Firefighting Power Supplies
- The Fire Strategy Report
- The Acoustic consultant's report

The Contractor will include for factory testing and witnessing of the generator.

The Contractor will include for the logistics required to install the generator in its final locations on site. (for example: delivery vehicle, craneage, pulling equipment, rollers etc).

The Contractor will be responsible for the final selection of the standby generator and associated equipment and controls. All equipment will be fit for purpose and suitably sized.

The Contractor will ensure that the standby generator complies with all local authority, Building Control and Fire Officer requirements.

The Contractor will ensure G59/G99 and G83 compliance, if applicable.

General LV Requirements

For general requirements, refer to the LV Distribution section of this specification.

Metering

For metering requirements, refer to the LV Distribution section of this specification.

The output of the life safety generator will be metered by a Schneider electric PM8000 series electrical meter.

Surge Protection

For surge protection requirements, refer to the LV Distribution section of this specification.

Containment

For containment requirements, refer to the LV Distribution section of this specification.

Both the primary and secondary supplies to the fire-fighting/ life safety equipment will be separated from each other by adopting diverse routes throughout the building. Refer to the containment layouts issued as part of the Stage 4 Design Package, for identifying the proposed diverse routes. The cables will only share the same fire compartment where supplying the item of equipment being served, if possible.

The Contractor will be responsible for the supply, installation, testing, commissioning, coordination and interfacing for all power/controls cabling along with the generator set control modules and associated switchgear. Life safety cables will be 2h armoured fire resistant, in compliance with the British Standards and ensure that the supply is maintained for two hours during a fire event in the building. They will be generally red in colour.

All life safety system cables and wiring will be contained on galvanised steel cable trays. No other services will utilise the secondary route of life safety containment.

All life safety system cables and wiring will be fixed to cable containment utilising metallic fixings. Plastic fixings are not acceptable.

Life safety/ fire-fighting/ essential equipment supply cables from the output of the generator life safety panel board (PB/LS/RL/01) will exit the panel board weather and fire proof enclosure at roof floor level. From there they will be

horizontally distributed around the roof to supply all life safety/ fire-fighting roof equipment and will be vertically distributed down the building up to ground floor high level, via Riser 03 (Comms riser). They will be horizontally distributed at ground floor high level via a diverse to the main supplies route, they will rise at the refuse area to first floor (to achieve diverse - secondary route supply to the smoke extract fans) and they will also drop from ground floor to basement within the riser that is adjacent to the Linen/ Bike Store area/ DDA WC on the ground floor, to provide a secondary supply to the drainage pumps distribution board DB/PH/BL/01.

7.6 Temporary Generator

A temporary generator will be required to maintain power supplies to Bill's restaurant, during the substation disconnection and upgrade, so as to minimise the disruption of the restaurant's operation and enable its normal operation.

The Contractor will ensure that the generator and the associated cabling are suitably sized to allow for Bill's load and for the length of cabling between the temporary generator the that supplies Bill's. All disconnection times of circuit breakers will be in compliance with BS7671.

The final location of the temporary generator will be determined by the Contractor in liaison with the Architect, the Services engineers and the Acoustics Engineers. The temporary generator will be positioned on site and left in situ without blocking any entry or escape routes into the building or any roads around the site.

The Contractor to allow for any screening required to ensure that during the period that the temporary generator will be operating, the noise levels at Bill's and the surrounding area are acceptable.

7.7 LV Distribution

Design Parameters

The Contractor will design, supply, install, test and commission an LV distribution system, in accordance with all the latest versions of the appropriate standards, including but not being limited to:

- BS 7671 - IET Wiring Regulations (including amendments)
- Electricity at Work Act 1989
- BS EN 50525-1 – Electric cables. Low Voltage energy cables of rated voltages up to and including 450/750 V
- BS EN 61439-1 – Low Voltage switchgear and control gear assemblies. General rules.
- BS EN 60947 – Low Voltage switchgear and control gear
- BS EN 61009-1 – Residual current operated circuit breakers with integral overcurrent protection for household and similar uses.
- BS EN 60529 - Degrees of protection provided by enclosures (IP code)

System Description

This section of the specification will be read in conjunction with:

- L.V. schematic - BSXX(61)0001
- All drawings and documentation issued as part of the Stage 4 Design Package

The Contractor will utilise these documents, layouts and schematics and expand upon theses as the basis of the LV systems design.

General

The new development will require 3 No. low voltage (LV) three-phase and neutral (400V / TPN) metered electrical supplies, taken from the on-site substation on the ground floor.

First LV supply of 820kVA will feed the main LV switch-board for the hotel, which will be located at **basement** ~~roof~~ level.

Second LV supply will be available to be connected in the future to a Mod156 fuse panel within the **basement switch room** ~~Shell and Core Unit's premises on the basement~~, to provide the anticipated required power of 80kVA, when a specific tenant is appointed.

Third LV supply will be 80 kVA and will be connected to a panel board (PB/BILLS) located within **the basement switch room** ~~Comms room~~ on the basement, to provide the two required power supplies to the two distribution boards of the existing restaurant of Bill's on the ground floor, via cables that will be routed at high level within the basement and rise straight into Bill's, at the same locations where they are currently rising as part of the previous power installation.

All the LV supplies from the ENW owned LV switchgear will drop within the substation to basement high level and will be routed through the basement ceiling within cable trays.

The supply to the hotel will be via LV singles cables, that will be provided by the Contractor, will drop from the ENW LV cabinet into the basement **LV switch gear** ~~and will be terminated into an ACB breaker panel enclosure, located within a suitable and accessible location in the basement.~~

The cabling from the bottom of the ENW LV switchgear to the **Hotel's LV switch gear on the basement** ~~ACB breaker panel~~ will not exceed 15m, which is the maximum permissible length of each cable, as per the ENW specification. They will be 400mm² or 630mm² copper PVC/AWA/PV singles. The Contractor to provide lugs suitable for the connection. The Contractor will size and provide a pit for cable access adjacent to the external wall of the substation. The Landlord's main incoming switch will be sited above this cable access pit and the ENW metering panel will be located adjacent.

~~The cabling from the ACB breaker within the basement will rise from basement high level all the way to the roof, were the LV switch room is.~~

The main LV switchboard MSB/01 will be located within the LV switch room, will be rated at 1600A, 50kA, 1 sec and will be a Form **3B 4B**, Type **2-6** construction equipped with one incomer, which will be fitted with an Air Circuit Breaker (ACB).

The LV Switchboard will consist of a purpose made main L.V. switchgear panel containing current transformer, electrical sub-metering equipment for each incomer/ feeder and a main switch facility to accept the incoming low voltage supply cable(s). The main incoming sections will be fitted with a Volt Meter 3 x Ammeters (1per Phase) and Phase Indication lamps. The switchboard will also be provided with an individual utility meter to allow for monitoring of the total power consumption.

The main LV switchboard will be equipped with Integral Surge Suppression, completed with full mode active tracking. Surge Suppression to be Type 1 & 2.

The main LV switchboard will be equipped with **a breaker that will feed an external** ~~integral~~ Power Factor Correction (PFC) unit(s) **in the future, if required**, following measurements that will be taken by the contractor on-site when the building is operational, to determine the extent of power factor correction required before sizing the PFC unit to achieve 0.95 power factor.

Suitably rated withdrawable Moulded Case Circuit Breakers (MCCBs) will be fitted to the LV switchgear to allow LV (400V) three phase supplies to be distributed evenly throughout the building.

Allowance will be made for a future harmonic filter to be added, if required. The contractor will carry out site measurements for harmonics in order to provide a suitable sized harmonic filter.

The main LV switchboard will be provided with top cable entry and all main incoming and all outgoing supplies will be distributed from the top of the switchboard.

Three phase sub-main power supplies will be taken direct from the main LV switchboard section. Refer to the schematic for further details.

Secondary LV supplies will be provided from the life safety panel board that is located in a weather and fire proof enclosure adjacent to the generator and is fed from the generator, to serve certain fire-fighting and life-safety equipment, via Automatic Transfer Switches (ATS's). Refer to the standby generator of this specification.

The ~~2~~ **1**No. rising bus-bars will be 3-phase, rated at 630A, with designated earth connected to the main earth bar. On each floor, an amount of tap-off units from the rising busbar will be installed within the riser, equipped with integral MCCB's.

The tap-off units from the busbar will supply two split metered distribution boards **on the ground floor, one distribution board for small power** on each floor from ~~ground~~ 1 to 9, located within the electrical riser and **one distribution board on floors 2, 5, 8, to serve lighting at floors 1-3, 4-6, 7-9 respectively** and ~~small power to the front and back of house areas, as well as the guest rooms.~~ Tap-off units ~~from the ninth ground floor and first floor~~ will also supply a split metered distribution board for general power and lighting of the **roof and one board dedicated for mechanical supplies within the roof mechanical plant room** ~~basement and a Comms room distribution board, that will be both located within the main Comms room.~~

The 18-way mechanical panel boards PB/MECH/RL/01 and PB/MECH/RL/02, that will be located in the electrical ~~switch~~ **plant** room on the roof and will provide power to the condenser via TPN isolators, will be rated each at ~~630~~ **400A**, 36kA, 1 sec and will be Form 3B, Type 2 construction equipped with one incomer, which will be fitted with an MCCB and suitable number of outgoing ways that will be fitted with MCCB's. The panel boards will be equipped with Integral Surge Suppression, completed with full mode active tracking. Surge Suppression to be Type 1 & 2.

The 18-way mechanical panel board PB/MECH/RL/03, that will be located in the electrical ~~switch~~ **plant** room on the roof and will provide power to the air handling/ extract units via TPN isolators, will be rated at 400A, 36kA, 1 sec and will be Form 3B, Type 2 construction equipped with one incomer, which will be fitted with an MCCB and suitable number of outgoing ways that will be fitted with MCCB's. The panel board will be equipped with Integral Surge Suppression, completed with full mode active tracking. Surge Suppression to be Type 1 & 2.

Distribution boards will generally be located in the electrical risers/ **electrical plant rooms** / Comms room. The plant room distribution boards, MCC panels, ICT/Comms dedicated distribution board and the dedicated kitchen distribution board will be located within a suitable location/ cupboard in the associated room/ area that they serve. The distribution boards on the roof will be located within the electrical ~~switch~~ **plant** room, ~~the plant room~~ or within a suitable weatherproof IP rated enclosure. Surge suppression of type 2 to be provided to all roof mounted distribution boards.

The ICT/Comms board will be provided with a clean earth connection.

The Contractor will liaise with the specialists and the mechanical sub-contractors and confirm the mechanical plant load requirements.

All DBs will be of the lockable type and installed so that they are generally inaccessible to unauthorised access.

Each Distribution Board will comprise miniature circuit breakers (MCBs) and residual current circuit breakers with over current protection (RCCBs) outgoing ways, complete with appropriately rated integral isolators.

Circuit breaker settings will ensure selectivity and coordination under overload and short circuit conditions. For continuity all disconnect switches, panel boards, distribution boards, breakers etc. will be fabricated by the same manufacturer throughout.

All equipment will be selected or protected to withstand the expected fault currents.

All outgoing circuits serving mechanical loads will be provided with adequate means of protection where there is a higher risk of damage or are routed on roof/plant external areas.

All distribution equipment will come complete with circuit charts, labels indicating the origin of supply and the protective devices serving the equipment.

All final circuits will be fed from local DBs as shown on the drawings and as described in this document.

Warning notices and electrostatic floor insulation mats will be provided in any plant area adjacent to electrical switchgear / distribution equipment. All DBs and switchgear will be permanently identified with appropriate warning notices and safety posters designed to be visible and tamper proof.

All switchboards, panel boards and electrical distribution boards will contain a minimum of 25% spare ways and load capacity upon completion of works to allow for future systems to be connected.

All MCCB and ACB circuit breakers will utilise electronic trip disconnection devices. Thermal magnetic or other trip type devices will not be acceptable.

All MCCBs will be from the Schneider NSX series of circuit breakers or equal and approved.

All circuit breakers will be commissioned with correct operational settings prior to energising of circuits.

All circuits will be inspected, tested and certified prior to hand over by a competent NECEIC electrical tester.

All installed services will be compliant with the Cundall materials and workmanship specification.

All installations will be compliant with Building Regulations.

All switchboards, panel boards, mechanical control panels, distribution boards and equipment isolators will be installed with a Traffolyte label fixed to a visible face of the item. The label will include:

- Identification of system (Example – ‘Plant room DB/MECH/RL/01’, ‘MCP/CW/BL/01’, ‘AHU-01’)
- Device Location (Example - Roof)
- Supply Circuit reference (Example – MSB-12/PB/MECH/RL/03)
- Supply cable size and type (Example - 35mm² XLPE/LSZH/SWA)
- CPC cable size and type (Example – 4mm² separate, integral)
- Voltage
- Earth loop Impedance

All spare outgoing ways of electrical distribution systems will include proprietary manufactured blanking plates.

For continuity all LV distribution switchgear, equipment and accessories will be fabricated by the same manufacturer throughout.

All systems will be installed allowing for suitable access, maintenance and replacement in compliance with current version of the IET Guidance Note 1 - Selection and Erection.

Submain cables will be provided with a suitably sized SWA/XLPE/LSZH copper CPC if required for compliance with the current version BS7671. CPC requirements and size will be determined by the Contractor.

All cables installed throughout the development will be LSZH type cables. No other cable types will be permissible.

Design Calculations

A minimum of 1 month prior to installation for electrical services within the development, the Contractor will submit calculation results for the LV systems design to the services engineer for review. These calculations will be to verify design compliance with this specification, regulations and guidance documentation. For the LV systems, calculations will be undertaken using either Amtech Pro Design or Hevacomp Connect. Calculation results will include but not be limited to:

- Cable calculation results for the selection all submain cables, busbars - Current version of BS7671 18th Edition
- Cable calculations results for the selection all final circuit cables - Current version of BS7671 18th Edition
- Compliance of circuit breaker disconnection times for all systems - Current version of BS7671 18th Edition.
- Compliance of sequential circuit breaker selectivity and cascading for all systems (both time and energy based).
- Suitability of circuit protective devices fault current rating with fault current at the location of connection to the LV network.
- Suitability of switchgear and L.V. distribution systems fault current rating at the location of connection to the L.V. network.
- Complaint disconnection of all life safety/ fire-fighting/ essential systems upon fault while connected to and powered from the output of the life safety systems generator.

The Contractor to liaise with ENW to obtain the external impedance at the point of connection and the Network’s primary fault information. The Contractor to use these values as the electrical system’s parameters, while conducting the above-mentioned calculations and studies.

Metering

All electrical L.V. services will be metered in compliance with the current version of Building Regulations Part L and TM39 Building Energy Metering. Throughout the building separate energy, sub-meters will be provided to monitor in-use energy consumption and to achieve the BREEAM Energy credit Ene-2.

All meters will be Modbus compliant, in order to enable their future integration and connection to a BMS system, should this requirement occur in the future.

As a minimum, sub-meters will be provided to monitor the following electrical systems:

- All mechanical boards, MCP panels and major plant equipment (e.g. Air Handling Units, Smoke Extract Fans, Condenser Units etc.)
- Split metered Lighting and Power at DB's
- Lifts
- Incoming LV supplies to all distribution boards/ panel boards/ switchboard
- All outgoing ways of the main LV switchboard and of all panel boards
- Generator incomer
- Incoming supplies fed from the ENW owned LV switch gear
- Kitchens and all associated works and plant

The Contractor to refer to the LV schematic BSXX(61)0001 for indicative quantities of meters/ sub-meters and to confirm them.

Generally, all energy sub-meters will be located in an area of the building that allows for easy access to facilitate regular monitoring by the buildings staff and facilities manager. The energy sub-meters will typically be located local to the major items of plant or will be integral to the DBs and switchgear.

Unless specified elsewhere in this specification, all meters will be from the Schneider range of electrical meters, as PM8000 or equal and approved for the main LV switchboard incomer and as PM5000 range or equal and approved for all the other downstream meters. All meters will include but not be limited to provide readings for:

- Amps per phase and neutral
- kW Hours
- Voltage
- Max demand Amps per phase
- Power factor

All meters to be provided with a RS485 outlet.

All split power and lighting distribution boards will be metered so that lighting and power are metered separately.

All meters will be supplied and installed with suitable current transformers.

All meters will be fully set-up and commissioned prior to integration into any site wide integrated system.

All items of plant and other systems with an energy requirement of 50kW or greater will be supplied via an energy meter as detailed above.

The Contractor will include for the commissioning and programming of all meters.

The Contractor to confirm that there is no current BMS interface requirement for all services, including metering, that are installed within the building.

See electricity generation plant/ life safety systems sections for life safety systems metering.

Surge and Transient Over Voltage Protection

Surge protection and transient over voltage protection will be provided to switchboard/ panel boards MSB/1, PB/LS/RL/01, PB/MECH/RL/01, PB/MECH/RL/02, PB/MECH/RL/03.

The Contractor will provide surge protection and transient over voltage protection to any distribution systems supplying plant and equipment outside the equipotential zone. For example:

- Distribution boards supplying external lighting and power.
- Distribution boards supplying electrical plant and equipment installed externally to the main building.
- Distribution boards/ MCP panels supplying mechanical plant and equipment installed externally to the main building.
- Distribution boards supplying equipment/ small power/ lighting on the roof.
- Distribution boards where the equipment's transmission or receiver antenna is located outside the equipotential zone.
- Distribution boards serving IT and telecoms systems
- Any distribution board/ panel board installed externally to the building.

The Contractor to confirm following a lightning protection risk assessment whether surge and transient over voltage protection is required for the rest of the distribution boards/ panel boards.

Containment

This section of the specification will be read in conjunction with the Cundall Stage 4 containment layouts. The Contractor will expand upon these layouts to form complete containment systems for all cabling.

The Contractor will determine the exact incoming service positions, where the cables connect to the building, including incoming HV/ LV cabling, external power/lighting, external CCTV and incoming communications/ broadband cabling. Separate dedicated ducting will be provided to each of the above. The Contractor will determine the number and size of ducts required, allowing for 25% spare ducts, too.

From the various incoming service positions, the life safety generator, the substation, the LV switch room and the Comms room, a network of primary main and submain low voltage (LV) and Comms/ data/ controls containment services consisting of cable trays ~~and~~ baskets ~~and trunkings~~ will be provided throughout the development, routed within back-of-house areas, ceiling voids and service distribution risers, where possible, to the item of equipment or distribution served.

All LV main and submain XLPE/SWA/LSZH cables, will be contained on cable ladder or galvanised steel perforated cable tray throughout the development. No cables will be left uncontained. All LV main and submain cabling will be run on a combination of vertical and horizontal containment systems, routed through ceiling voids and service risers, where possible. Main/ submain cables will have a minimum cross-sectional 25mm².

Final circuits for general small power and lighting will be wired using ~~twin and earth~~ ~~single~~ LSZH cables or XLPE/SWA/LSZH.

~~Twin and Earth~~ ~~Single~~ LSZH copper cables will run in galvanised steel ~~wire basket~~ ~~trunking~~ for the primary routes or in galvanised steel perforated tray for external cabling. Final connections to outlets and equipment will be provided by surface mounted conduits.

LSZH ~~twin and earth cables~~ ~~singles~~ will be used for general power and lighting.

~~XLPE/SWA/LSZH cables~~ ~~LSZH twin and earth cables~~ will run on galvanised steel ~~wire cable basket~~ ~~perforated cable tray~~ and will be used to supply the commando sockets to which the Qbi Pods will be connected.

~~XLPE/SWA/LSZH cables will run on galvanised steel perforated cable tray for external final circuits or circuits within plantrooms.~~

Final (secondary) containment to lighting switches, sockets and ancillary outlets will be installed using PVC conduits in concealed areas for singles and galvanised conduits in exposed/plant areas. Armoured cables can be directly clipped on the structure.

All containment system will include a minimum spare capacity of 25% which will be available upon completion of the site works.

All containment will be suspended using ridged fixings and drop rods. The Contractor will utilise proprietary manufactured containment systems, fixing, fittings and accessories only. All containment will be supported utilising rigid suspensions only and wire suspensions will not be acceptable.

Containment systems will be sized to ensure that support spacing distances are consistent with the requirements of the smallest size cable installed. Cable fixing components will be provided and installed fully in accordance with the manufacturers recommendations for all cabling installed and in accordance with BS7671.

Containment systems will be complete with manufactured bends, tees, end caps, earth links and cable retainers. Where services pass through walls or floors, the Contractor will install an approved fire barrier where required.

A minimum of 150mm spacing will be provided between data cable baskets and other non-enclosed containment and services.

All metallic containment will be earthed and will form complete wireways. The manufacturers copper earth link accessories will be fitted between adjacent lengths of tray and between fittings externally so the links are easily visible.

Generally, extra heavy duty/ heavy duty/ medium duty cable tray, ~~trunking~~ and basket will be used for all cabling. Refer to the containment layouts for further details.

Where sub-main cables terminate directly to equipment isolators they will be adequately supported and fixed to cable tray or ladder as detailed previously to within 400mm of the outlet point concerned. Additional cable cleating or other necessary support will be provided for the final connection. All such fixing will be made to support structures of suitable rigidity.

All containment will be deburred with sharp edges removed and smoothed so that cables cannot be damaged during installation on or within the containment system.

LV submain cable containment will be designed and sized so that all cables are installed in side by side flat touching or trefoil formation.

All installed cables will be suitably fixed to containment systems with metal fixings.

Conduit will be complete with boxes, couplers, and saddles and will be installed to the manufacturer's recommendations. Conduit will be a minimum of 20mm diameter and a maximum of 32mm diameter.

Care will be taken to remove all burrs and sharp edges from threading. All exposed threads and marks to galvanised conduit will be covered in zinc galvanizing paint immediately after installation. Bends in PVC conduit will only be formed using suitable bending radius and spring or using the manufacturer's proprietary bends.

All containment and cable routes will be installed in a neat and unobtrusive manner. Where possible, all containment will be run concealed within the building fabric, utilising suspended ceiling voids, service risers and building fabric for a fully flush installation. In the areas with no ceiling where containment will be exposed and suspended, a Unistrut metal framing system or similar will be used, to enable a robust services installation and suspension at suitable heights, as well as easy access for maintenance.

Throughout all areas, especially where ceiling voids are not provided, the containment systems will be installed as necessary to minimise the appearance of the services and ensure a complete and competent appearance to the system.

All containment and cable routes, and access to these, will be co-ordinated and agreed with the Architect.

Where cables are required to drop down walls, these will be run in conduits that are flush mounted into the structure, or surface mounted within the plant rooms/ risers. Conduits in partitioned walls will be galvanised steel or metallic flexible conduit.

A system of 3-compartment, PVC dado trunking will be utilised to serve general small power data outlets in areas where a high density of power and data outlets are requested (i.e. in the Office at the basement level etc.). This trunking will be wall mounted.

Cleaners sockets will be wall mounted, at 10m intervals, flush.

IT cables will be installed on designated Data/ Security/ CCTV/ Controls/ TV three compartment galvanised steel cable basket.

Fire alarm/ disabled refuge cabling will be installed on designated galvanised steel cable basket for major runs on the ground floor and riser, with final connections to equipment either clipped direct to the structure or wired using conduits (as applicable). On the basement, roof level and guest rooms floors, the horizontal distribution of fire alarms cables to be via the Data/ TV/ Security basket, where fire alarm cables shall be installed on the side of the Data/TV/Sec Basket.

Fibre cables will be installed on dedicated galvanised steel cable basket.

Accessories will be white plastic on dado trunking or flush wall mounted in most areas, with metal clad accessories in plant room areas and ceiling voids.

In order to install all containment and cabling, the Contractor will include for all required Builders work, including:

- Making good, seal and fire stop, where required
- Chases to walls
- The careful lifting, removal, cutting and replacement of floor tiles
- Notching and/or drilling of structural joists

All Builders' work will be agreed with the Architect, Structural Engineer and Main Contractor prior to any work being carried out.

Power Factor Correction

The Contractor will include for providing, if required, a power factor correction installation which will maintain the building power factor at 0.95 or closer to unity.

The power factor correction will be incorporate detuning reactors in series with the power factor correction capacitors ensure that series resonant frequency does not occur at a harmonic of the mains supply.

The power factor correction capacitors will switch at a maximum of 50kVAR steps.

Distribution Boards

General power and lighting to the development will be provided by distribution boards throughout the development.

All boards will be rated for maximum fault current at the location of connection to the L.V. network.

All boards will be 24 ways, unless otherwise stated. Refer to the LV schematic.

The distribution boards will be rated at 250A, three-phase.

Supplies to all distribution boards will be metered. Where the distribution board supplies power and lighting, then the distribution board will be split power and lighting type with metering of power and lighting separately at the distribution board location.

Unless otherwise stated, distribution boards will generally be in designated service risers / distribution cupboards. Refer to the LV schematic and the containment layouts for further details.

The Contractor will wire the lighting and power supplies from the relevant distribution board sections to suit the space planning layout and the lighting and small power requirements for the various areas.

All distribution board outgoing ways will include a typed label which identifies equipment served and location of equipment being served.

All outgoing distribution board circuit protective devices will be rated for 15kA fault withstand.

Upon completion of the works, all DB's will be equipped with laminated circuit charts/labels indicating but not limited to the following:

- The origin of the DB's supply,
- The areas served from that DB,
- The protective device serving each circuit,
- The modular socket reference serving each circuit and
- The type of circuit supplied i.e. lighting/power.

See small power and lighting sections of this specification for further details including cable types, circuit breaker types and additional requirements.

Busbars

Power will be distributed from the roof to the lower floors mainly via ~~2No.~~ **1No.** 630A TP+N copper rising mains busbar system.

~~These busbars are set out as follows:~~

- ~~• Busbar 1 (BB1) extends from the 9th floor to the 5th floor and supplies these floors.~~
- ~~• Busbar 2 (BB2) extends from the 4th floor to the Ground Floor and supplies these floors, as well as basement general power and lighting (DB/LP/BL/01) and Main Comms racks power within the basement (DB/COM/BL/01).~~

The All-busbar will be rated to a minimum of 32.1kA fault current withstand for a period of 1 second.

The All-busbar will be supplied with proprietary manufactured end feed units, tap-off units, fixing, fittings and supports.

All tap-off units will be surface mounted on the busbar and will incorporate MCCB protection with electronic trip devices. Supplies from the tap-off units will be XLPE/LSZH/SWA copper cables.

The All-busbar will be isolatable at the base of the busbar. Isolation can be either by an isolator supplying the busbar end feed or be integral isolator incorporated into the busbar end feed.

All end-feed and tap-off units will be steel enclosure type.

MCCB Panel boards

The MCCB panel boards will be TPN, 18-way, Schneider Electric Powerpact 4 or equal and approved panel boards to Form 3B, Type 2 standard.

The panel boards will be rated to a minimum of 36kA fault current withstand for a period of 1 second. The Contractor will calculate fault current at the location of connection into the L.V. distribution network and ensure that the provided panel board and associated systems are suitably rated.

The panel board input and output circuits will be protected by electronic trip MCCB circuit breakers.

The panel boards will be equipped with Integral Surge Suppression, completed with full mode active tracking. Surge Suppression to be Type 1 & 2.

Accessories and Finishes:

The installation of accessories throughout the development will generally be flush, except within switch rooms, plantrooms, ceiling voids and service risers where a surface installation is permitted or where flush installations using dado-trunking is to be provided.

The Contractor will refer to the Architects and Interior Designers specifications and layouts for accessory colours/types/finishes. Should this information not be available, then the Contractor will price on the following basis:

- Plant areas - Metal clad

- Front of house areas - Brushed steel

Where possible, the location and mounting height of all accessories will be installed in accordance with the standard specification clauses and in compliance with the latest DDA and Part M requirements. The Contractor is responsible for agreeing the mounting heights of all accessories with the Architect.

Throughout the Client's demise, all small power accessories will be provided with printed circuit identification labels.

Plant and Equipment

The Contractor will include for providing all power supplies to all plant and equipment. This includes control panels and ancillary systems as required. The Contractor will liaise with the mechanical Sub-contractor to determine the final power supplies required for any mechanical plant.

All items of plant will be supplied via a suitably sized and rated isolator located adjacent or attached to the item of plant being served. All Isolators will be suitably IP rated for the environment that they are operating in.

7.8 General Small Power

Design Parameters

The Contractor will design, supply, install, test and commission a small power distribution system in accordance with all the appropriate standards, including but not being limited to:

- BS 7671 - IET Wiring Regulations (including amendments)
- Electricity at Work Act 1989
- BS EN 50525-1 – Electric cables. Low Voltage energy cables of rated voltages up to and including 450/750 V
- BS EN 61439-1 – Low Voltage switchgear and control gear assemblies. General rules.
- BS EN 60529 - Degrees of protection provided by enclosures (IP code)
- BS EN 60947 – Low Voltage switchgear and control gear
- BS EN 61009-1 – Residual current operated circuit breakers with integral overcurrent protection for household and similar uses.

System Description

General

This section of the specification will be read in conjunction with the associated proposed small power drawings and documentation, as well as the architects' layouts and specifications.

The Contractor will provide a small power installation throughout the new building/ facilities. These installations will include but not be limited to providing:

- Cleaner's sockets
- General 230V double or single socket outlets
- Fused connection units supplying various items of equipment throughout the buildings, such as hand dryers, fan coil units, overdoor heaters etc.
- Supplies to electrical systems/services
- Supplies to mechanical systems/services
- Supplies for fire alarm systems
- Supplies for security systems

- ~~Supplies for intruder alarm systems~~
- Supplies for other/ specialist systems and equipment
- Isolators/double pole isolators supplying various items of equipment throughout the development

The Contractor will design and provide small power installations throughout the building to meet the requirements of the occupants as well as meet the architect's aspirations. The Contractor will review the architects' layouts and provide small power installations to all areas of the new buildings. All rooms will be fully serviced. Small power socket outlets will be provided throughout the hotel to suit general task and ICT use, to meet the Client's expectations, the Qbic Outline M&E specification and room datasheet requirements.

The Contractor will design complete small power installations throughout the building which will be fit for purpose and meet the requirements of that room/space. For example, if a room is denoted as being an office, then the Contractor will ensure that this area is provided with small power installations to allow this space to operate as a fully functional office.

The Contractor will be responsible for liaising with all the relevant specialists and will provide all necessary cabling, containment and power supplies to enable all systems to be installed and made operational. Refer to all sections of this specification for further information associated with each system.

The Contractor will provide power to all electrical, mechanical, public health, architectural, structural and specialist systems. No system requiring electrical power will be left in an inoperable state upon completion of the site works.

A number of sockets and outlets have been provided on the small power drawings. These items will be provided to each room on this basis. The Contractor will design based upon this information and will expand upon this to form complete installations.

The quantity of small power outlets, etc. on the proposed small power drawings identifies the minimum quantity required for general use. The Contractor will also allow for sufficient quantities of power outlets, etc. as required for the correct operation of all systems. E.g. lighting controls, AOVs, access controls, etc. may also require small power depending on the final design and equipment selection. All outlets required for the correct operation of these and other systems will also be provided.

Each guest room will be provided with prewired modules (pods) that will have incorporated all socket outlets required as per the Hotel Standards. Supplies to these modules will be provided via a dedicated wall mounted 32A 16A SPN commando socket per each guest room, located behind the bathroom mirror at high level, that will be fed from the local DBs within the electrical riser on each floor. Each prewired module will be plugged into the commando socket. The contractor will test the final circuits/ socket outlets on the pod, once the installation is complete and the pods are plugged into the commando socket outlets.

Small power to the Restaurant and Kitchen equipment will be provided from the dedicated kitchen distribution board, located on the basement, within the back of house kitchen area. The contractor will ensure that any required connections to all kitchen equipment and appliances are confirmed by the catering specialist prior to installation.

General purpose socket outlets will be distributed throughout all areas for general/ cleaning purposes. The provision will be such that in no instance would a cleaning appliance require more than 10 metres of flex and arranged to prevent the need to trail a flex through a doorway to carry out any operation. Consideration will be given for a 'Tee'd' earth bar on cleaners' sockets, to prevent cleaners using general power outlets.

Each meeting room will be provided with a 3-compartment floor box, as shown on the small power layouts, that will be fed from below. This will provide some power supplies flexibility; refer to the meeting rooms small power arrangements for further small provision within the rooms.

All items of fixed equipment requiring power will be supplied via a suitable fused connection unit or isolator installed adjacent the item of equipment being served.

The Contractor will include for all cabling, containment and accessories required to make complete, safe and operational small power installations.

The Contractor will include for making all electrical connections to final circuit equipment. (for example, connecting an electric water heater into the supplying isolator or fused connection unit.)

Final connection to all items of equipment will be complete with accessories, accessory mounting boxes and compatible accessory plates.

Where the LV power installation requires penetrations through walls / floors, the fire and acoustic integrity of the walls / floors affected will be made good upon completion. All major penetrations required for the electrical services will be fully coordinated and programmed into the erection of the building structure.

Where items are mounted externally these will be wired in a completely weatherproof installation ensuring that the enclosures are IP65 rated.

All power supplies will be derived from the distribution board local to each of the areas, as shown on the small power layouts.

Upon completion of the works, all new small power services will be tested and commissioned in accordance with the industry standards and system requirements.

Calculations

For design calculation requirements, see the L.V. distribution section of this specification.

Accessories

Generally, socket outlets, FCUs, switches and accessories will be flush mounted and supplied from within the fabric of the building. This is with the exception of plant and riser spaces where they will be surface mounted metal clad.

Unless otherwise stated within this report, the mounting heights of socket outlets, switches and controls will meet the minimum DDA requirements and will be co-ordinated fully with the furniture layouts. Final setting out of the fittings and mounting heights to be agreed with the architects, the Interior Designers and the Client, and to meet the hotel standards.

Dual earth socket outlets will be provided throughout all areas of the development. Circuits serving socket outlets will be wired in accordance with section 543 of the BS7671, IET Wiring Regulations.

All fused connection units and isolators will be labelled indicating designation of use.

All socket outlets will incorporate face plates which contrast visually with their backgrounds to comply with AD Part M.

The Contractor will refer to the Architects and Interior Designers specifications and layouts for accessory colours/types/finishes. Should this information not be available, then the Contractor will price on the following basis:

- Plant areas - Metal clad
- Front of house areas - Brushed steel

The Contractor will ensure that all switches, sockets and accessories are released from the walls and protected so that the decorators do not get paint on them and then reinstated upon completion of decoration.

Containment

~~Twin and Earth single~~ LSZH copper cables will run in galvanised steel ~~wire basket~~ ~~trunking~~ for the primary routes or in galvanised steel perforated tray for external cabling. Final connections to outlets and equipment will be provided by PVC conduits in concealed areas ~~for singles~~ and galvanised conduits in exposed/plant areas.

XLPE/SWA/LSZH cables will run on galvanised steel perforated cable. Armoured cables can be directly clipped on the structure.

All cables recessed into walls will be contained in galvanised steel conduit. Installing cables in a wall utilising capping is not permissible.

All cables installed within partition walls will be protected by galvanised steel conduit. No cables will be clipped direct within partitions.

The Contractor will utilise proprietary manufactured containment systems, fixing, fittings and accessories only. All containment will be supported utilising rigid suspensions only (wire suspensions qill not be acceptable).

General small power wiring to external equipment will be in galvanised steel perforated cable trays.

All containment system will include a minimum spare capacity of 25% which will be available upon completion of the site works.

Refer to the LV Distribution – Containment section of this specification for further details.

Circuits and Protection

Final circuits will be supplied/protected by Miniature Circuit Breakers (MCBs) or Residual Circuit Breakers (RCBOs, generally 30mA, 40ms) type protective devices within the distribution boards. RCBO protection will be provided for all circuits as recommended by BS7671 (18th Edition). All 230V small power socket outlets will be protected by 30mA RCBOs.

The small power installation will be a fully concealed installation and all protective devices will be selected to withstand overload and fault current conditions. Where wall mounted outlets are to be provided they will be flush mounted. Ceiling mounted socket outlets will be surface fixed to the structural slab within the ceiling void.

All MCB circuit breakers installed within the distribution board will be rated for 15kA fault current withstand, as per BS EN60947-2.

All RCBO circuit breakers installed within the distribution board will be rated for 10kA fault current withstand, as per BS EN 61009-1.

General small power wiring within the development will be in the form of LSZH ~~single~~ ~~twin and earth~~ cables.

General small power wiring to external equipment and to ~~command sockets~~/ isolators will be in the form of SWA/XLPE/LSZH copper cables.

Small power ring main circuits will be protected by 32A 30mA type B RCBOs and will have a minimum circuit conductor size of 2.5mm².

Small power radial circuits will be protected by 20A 30mA type B RCBOs and will have a minimum circuit conductor size of 4mm².

Circuits deemed to be highly inductive will be protected by type “D” miniature circuit breakers.

Circuits primarily utilised for IT power will include high integrity earthing.

A maximum of 2 work stations will be supplied from one ring main circuit.

Builderswork

In order to install all containment and cabling, the Contractor will include for all required builders work, including the provision of suitable core holes and grommets through desk/counter worktops and holes for floor mounted service boxes and grommets.

Schedule of Rates

The Contractor will provide a per unit installed schedule of rates for additional electrical socket outlets and accessories. The schedule will include a cost for both the addition and omission of items. This will be utilised for costing additional installations during the contract works. For avoidance of doubt, the Contractor will provide full and complete installations throughout the new buildings/ facilities as part of the contract and price for these accordingly. The schedule of rates will be for the addition or subtraction of electrical systems and accessories during the construction period.

The schedule of rates will include:

- Double switched socket outlet
- Single switched socket outlet
- Fused connection unit
- Double pole isolator supplied from distribution board
- Four pole isolator supplied from distribution board/ panel board.

7.9 General Lighting and Lighting Controls

Design Parameters

The Contractor will design, supply, install, test and commission a lighting system, in accordance with all the appropriate standards, including but not being limited to:

- BS 7671 - IET Wiring Regulations (including amendments)
- CIBSE Code for Lighting
- CIBSE Guide LG3
- CIBSE Guide LG7
- BS EN 12464-1 – Lighting of Workplaces, Indoor Workplaces
- ILE Requirements

System Description

General

This section of the specification will be read in conjunction with the associated lighting drawings and documentation, as well as the architects layouts and specifications.

The quantity of luminaires shown on the Cundall design layouts are to be confirmed by the Contractor. The Contractor will provide sufficient quantities of luminaires in each location to achieve the required lux level, uniformity, etc, as laid out in this specification and guidance documentation.

The Contractor will provide a complete new Dali addressable lighting installation throughout all areas of the development. Details of back of house and emergency luminaires are generally shown on the lighting layouts. For front of house areas, the Contractor will see the interior designer's requirements and expand upon them to form complete and compliant lighting installations. The Contractor to refer to the lighting layouts for the demarcation of areas where lighting

fittings form part of the Interior Designers' package. The Contractor to refer to the lighting layouts for the Front of House areas that it is proposed to enhance the lighting levels with additional fittings. The Contractor will ensure that the proposed lighting systems and lighting levels are suitable for the environment in which they are to be installed. The Contractor will share the front of house luminaire selections and will agree with the MEP Designers, the Interior Designers and the Architects on the final luminaire selection.

All luminaires and lamps are to be commercial grade LED types. The complete new installation will consist of luminaires, containment, cabling, Dali head end systems, lighting control modules (LCM's) and lighting controls to suit the space planning indicated on the lighting and project specific layouts and documentation utilising localised switching, presence/absence detection and daylight dimming. The internal lighting will generally consist of LEDs with Dali addressable dimmable control gear.

The lighting installation will provide a uniformly lit glare free working environment, fundamentally focusing on the importance of task lighting and vertical illumination. The lighting scheme will utilise high efficacy LED luminaires which will provide a high quality lit environment adhering to the relevant guidance documentation.

For each area type the design average maintained illuminance will be in accordance with relevant CIBSE, BSEN and BCO guidance. E.g. glare, uniformity, vertical illuminance, ceiling illuminance and LOR etc.

The lighting will be designed and installed in accordance with the relevant building regulation requirements and with consideration to the recommendations of the CIBSE, the British Standards and the ILE requirements.

The Contractor will prepare Technical Submissions for the luminaires and controls to the Client, Architect, Services Engineer. The Contractor will not place any orders for these items prior to them being signed off by all parties.

The Contractor will organise for samples of all proposed luminaires to be provided and arrange suitable demonstrations of the sample luminaires to the Client side team for approval prior to ordering.

Calculations

Lighting calculations will be undertaken for all areas of the proposed site works in compliance with the relevant guidance. Where no lighting calculation is available for a luminaire, if the Contractor proceeds to install this type of luminaire, then the Contractor does so at risk. Should the lighting in the space not correctly illuminate the space, then the Contractor will rectify this at their own cost. Incorrect lighting of the spaces includes but is not limited to over-lighting the space, poor uniformity of lighting, under-lighting the space and causing excessive glare within a space.

A minimum of 1 month prior to installation for electrical services within the development, the Contractor will submit calculation results for all lighting installations within the development to the services engineer for review. These calculations will be to verify design compliance with this specification, regulations and guidance documentation. For the lighting systems, calculations will be undertaken using either Dialux, Relux or IES lighting design packages. Lighting results will include:

- Heat map of room with a suitable scale of lux levels
- Average Lux level achieved
- Average uniformity achieved
- Reflectance values and finishes colours utilised for the design
- Maintenance factor utilised for the design
- Utilisation factor utilised for the design
- Power consumption for scheme
- Luminaire power consumption
- Lumens per circuit Watt

The internal lighting installations will be designed, supplied, installed, tested and commissioned in accordance with all the appropriate standards.

Circuits and Circuit Protection

General lighting wiring within the development will generally be in the form of XLPE/LSZH ~~single-core~~ **twin and earth** copper cables in galvanised steel **wire basket** trunking and steel conduit for final connections. Cabling to external lighting to be armoured XLPE/SWA/LSZH installed on galvanised steel tray.

All cables installed within partition walls will be protected by galvanised steel conduit.

Final circuits will be supplied/protected by 10A Miniature Circuit Breakers (MCBs) or Residual Circuit Breakers (RCBOs and RCDs) type protective devices, Type C. RCBO protection will be provided for all circuits as recommended by BS7671 (18th Edition).

Lighting circuits will have a minimum circuit conductor size of 1.5mm². Heat proof flexible cables from plug-in ceiling roses to the luminaires will be a minimum of 0.75mm².

Lighting circuits shown on the DB schedules and the lighting layouts will need to be confirmed by the Contractor so as to take into account the exact specifications of the lighting fittings proposed by the Interior Designers. With the information that is currently available, only indicative lighting circuits have been shown.

Lamps and Luminaires

The following criteria will apply for the selection of lamps and luminaires:

- Lamp Life - all lamps will be selected for long lamp life. LED lighting typically has a life span of 50,000 hours (L70 or better). The lighting calculations of the selected fitting will take into account the lamp degradation and appropriate maintenance factor.
- Luminaire Selection – refer to all Cundall proposed lighting layouts and specifications for luminaire types. The Contractor will ensure that the final design solution is long life, fit for purpose and in compliance with guidance documentation as detailed above. All linear luminaires will have a light output ratio of 80% or more. All down lights will have a light output ratio of 70% or more. All surface mount luminaires will have a light output ratio of 50% or more
- Energy Efficiency – the general lighting system will achieve an efficacy that will exceed all requirements of the latest Part L building regulations.

The lighting will be designed and installed to allow the BREEAM Health & Wellbeing credits Hea.4 & Hea.5 and the BREEAM Energy credit Ene.4 to be claimed. Lighting will be designed with consideration to the recommendations of the CIBSE, the British Standards and the ILE requirements

LED lamps utilised in luminaires will be procured from the main LED suppliers and manufacturers. E.g. Whitecroft, Thorn, Zumtobel etc. All luminaires will be provided with a 5-year return to base warranties or better. Where a colour temperature of lamp is specified by the Interior Designer or Architect, then the colour temperature of all of that type of fitting will be within a 2-step macadam range. This is to prevent having two fittings in close proximity which have a noticeable difference in appearance.

The Contractor will issue technical details of all luminaire and lamps to the services engineer and CA prior to ordering the lamps. In particular send through, as a minimum, details of the luminaire/ lamp output colour temperature, colour rendering, colour stability, ambient temperature operating range, lamp life, lumen output at 50,000 hours (L) and LED chip failure rate (B).

All luminaires to have changeable gear tray and replacements / replacement parts will be readily available via multiple local electrical wholesalers.

Domestic grade or unbranded lamps will not be acceptable and will be replaced by the Contractor at the Contractor's expense.

Final luminaires and luminaire Wattages are to be determined by the Contractor. Any proposed changes to the luminaire manufacturers or products specified are to be reviewed by the Interior Designers, the Architects and Services Engineer. The alternative manufacturer and individual luminaires is then subject to a review and approval process. No alternative luminaires will be ordered / utilised without prior approval.

Submit all necessary details including but not limited to the following for the manufacturer/ product review:

- Luminaire photometry
- Lamp manufacturer and performance details (refer to LED specifications in System description section)
- Lumen Output, Beam Diameter, LOR, Circuit Watts, Ra, CCT, Lamp Lumen Failure (L), LED chip Failure (B) etc.
- Lux level calculation including vertical and horizontal lux plots
- Glare calculations
- Product construction and material details of luminaire
- Product dimensions
- Fixing details
- Light Output Ratios
- Luminaire optics performance
- All comparison data of the specified and alternative luminaires.
- Luminaire availability and lead times.

Provide evidence to Architect and Services Engineer that the preferred lighting manufacturers have been contacted for project quotes based on the tender issue lighting layout drawings.

Provide all comparative data listed above for the original and proposed alternative luminaires put forward for review by the Interior Designer, the Architect and Services Engineer.

All luminaires will be selected to complement the buildings architecture. The type of luminaires specified will be chosen to suit the ceiling type/finish.

The internal lighting will generally consist of low energy consumption, low maintenance modular recessed luminaires with long life lamps and high frequency electronic Dali addressable ballasts. Primarily energy efficient LED lamps will be used throughout.

Luminaires in bathrooms and toilets will be suitably IP rated for their environment. The minimum level of IP rating will be to IP44 in these areas. Luminaires located within Zone 1 or Zone 2 of a shower or above zone 1 or 2 will be rated IP65 or above.

The Contractor will ensure that all fire safety / fire-fighting systems are suitably illuminated. Luminaires within the fire-fighting core to be supplied via a DB that is backed-up from the generator, to comply with BS 9999.

Provide appropriate interface units where the lighting systems are required to link to other systems such as lighting controls.

Luminaires will generally incorporate Dali addressable control gear. All luminaires will be controllable by the Dali addressable head end system. Where non-Dali luminaires are utilised (due to not being available in the proposed luminaire type only), then a suitable interface will be provided for the switching/dimming of these luminaires.

All luminaires will be disconnectable from the lighting circuit either by plug connection into an LCM or plug via trunking or ceiling mounted connector.

The Contractor will set out all luminaires and will undertake coordination of the luminaires with all other services and structure to ensure that there are no clashes.

The Contractor will check all suspension or fixing heights of all lighting and lighting control elements prior to ordering and installing. Final suspension heights will be as agreed with the Architect and the Interior Designer. Safety considerations will always take precedence.

Automatic daylight dimming will be incorporated into all spaces throughout the various areas, where light ingress through windows provides suitable light levels in those spaces. Natural daylight will be supplemented by the general lighting arrangement for correct illumination of the space. All controls must be zoned in relation to fenestration and internal partitioning to make maximum use of natural day lighting, where applicable.

Replacement parts for all luminaires utilised will be readily available via a local supplier ensuring that should a luminaire fail that it can be repaired in less than 24 hours.

Prior to handover, the Contractor will provide 5% or 10 total (whichever is the least quantity) of each luminaire type as spare to the Client. These will be for ongoing maintenance. This is to ensure that spares are readily available to hand. This will be for utilisation following the defects and liability period and when the luminaire manufacturer's warranty has expired. These will not be utilised by the Contractor during the defects and liability period unless the Contractor provides a new identical replacement.

All spaces will be suitably illuminated so as to ensure that occupants can safely utilise all spaces for their intended purpose. In addition to this, so that the Client cannot be held liable due to poor illumination of a space should an accident occur there.

The Contractor will ensure that all switchboards, distribution boards, panel boards and control panels are illuminated as required by all relevant documentation.

All luminaires will be suitable to connect to the lighting control system. The Contractor will check prior to ordering that all luminaires are compatible and will deliver a complete system.

The Contractor will provide containment, supports, fixings, housings and all builders work associated with the lighting required to supply a complete installation.

The Contractor will include for all setup and commissioning required to make the lighting systems fully operational and functional.

Provide all dimmable lighting with gradual dimming allowing luminaires to be dimmed from 5%-100% output in 1% increments.

All luminaires and lighting controls systems will be available at the time of the site works. All orders will be ordered considering lead times to ensure no delays to the site works occur. The Contractor will ensure that factory shutdowns are taken account in the lead times.

Consideration will be given when positioning PIRs used specifically for presence detection. These PIRs will be positioned so that they detect a person entering a room or about to enter a space, however should be suitably positioned so that they do not detect a person passing by a room or space.

All lighting and lighting controls system will be accessible for ease of maintenance and replacement. No lighting controls will be installed in a location where they cannot be removed without damage to the buildings fabric/finishes. The Contractor will provide access hatches as required to ensure that no lighting or associated systems are inaccessible.

Accessories and Finishes:

The installation of accessories throughout the development will generally be flush mounted, except within switch rooms, plantrooms and service risers where a surface installation is permitted or where flush installations using dado-trunking is to be provided.

Generally, the extent of visible services will be minimised as far as possible however in areas where exposed soffits are to be provided, luminaires (and other ceiling items such as sensors and fire alarm detectors) will need to be surface

mounted or suspended. There are no proposals to cast conduits into the slab, hence any surface fixed luminaires, sensors and controls in these areas will need to be wired using surface exposed conduits and trunking.

The Contractor will refer to the Architects and Interior Designers specifications and layouts for accessory colours/types/finishes. Should this information not be available, then the Contractor will price on the following basis:

- Plant areas - Metal clad
- Front of house areas - Brushed steel

The Contractor will ensure that all switches and accessories are released from the walls and protected so that the decorators do not get paint on them and then reinstated upon completion of decoration.

The Contractor will refer to the Architects and Interior Designers specifications and layouts for accessory colours/ types/ finishes.

Where possible, the location and mounting height of all accessories will be installed in accordance with the standard specification clauses and in compliance with the latest DDA and Part M requirements. The Contractor is responsible for agreeing the mounting heights of all accessories with the Architect.

All lighting switches and controls will contrast visually with their backgrounds to comply with AD Part M.

All lighting controls will be of the same type and manufacturer and be suitable to connect to the lighting control system. The Contractor will check prior to ordering that all lighting control equipment and all luminaires are compatible and will deliver a complete system.

Plant Rooms/Spaces

Luminaires in plant rooms and plant spaces will be ingress protection rated to IP56 or above.

The Contractor will provide a general lighting scheme in all plant spaces. Upon completion of the plant spaces, the Contractor will include for providing additional luminaires to supplement the general lighting. These additional luminaires will be utilised to illuminate areas where large items of plant or any other system is causing shadowing and reduced illumination.

The Contractor will insure that all control panels, electrical distribution systems, plant maintenance locations, plant maintenance hatches are suitably illuminated.

These spaces will be illuminated to 150Lux (200Lux at control panels) on average. Uniformity will be 0.4.

Lighting in plant spaces will be manually switched. After a period of 1 hour, the lighting in the room will dim to 50%; after an additional 10 minutes the lighting will switch off (this is to give anyone working in the plant space warning that the lighting is about to switch off).

Basement Office Area

The offices' lighting will primarily be illuminated in the theme of LG7 utilising recessed fittings.

Lighting through office area will be provided by luminaires with anti-glare diffusers/ optics.

Lighting within the office will achieve 350-500 lux, at 0.6 uniformity.

The Contractor will ensure that all control panels and electrical distribution systems are suitably illuminated.

Lighting controls will incorporate absence detection. Manual lighting controls will be provided in conjunction with automatic lighting controls. These systems will comprise PIR sensors that switch the luminaires off when the room has been vacant for a period of 15 minutes. The system will include wall mounted control switches at the entrance to each space so that staff have manual control of the lighting in that particular area.

Ground Floor Meeting Rooms

Lighting in these areas is designed by the Interior Designers – refer to the lighting layouts for demarcation.

The Contractor to refer to the lighting layouts for any proposed additional fittings that are to be installed to enhance the lux levels within the rooms.

The Contractor to liaise with the Interior Designers to confirm the proposed additional fittings to be installed in the meeting rooms are acceptable from an aesthetics point of view.

Lighting in meeting rooms will be dimmable and will have the option to independently switch off rows of lighting adjacent the wall screens.

Lighting in meeting rooms will have the option to independently switch off/ dim the luminaires within each separate area that can be isolated with the available folding partitions.

The dimming controls to meeting rooms will include scene setting suitable for three typical scenarios;

- Video conferencing
- Focused tasks (500 lux)
- General meeting (300 lux)

Front of House Corridors

The lighting in these areas will be designed by the Interior Designers – refer to the lighting layouts for demarcation.

Lighting controls in the corridors will be by PIR presence detection and will incorporate daylight dimming where/if applicable.

Lighting in corridors will be wired utilising interleaved circuits so that should a circuit breaker disconnect, the corridor will remain illuminated in a limited fashion.

Lux levels will be 100 Lux with a uniformity of 0.4

Back of House Corridors

Lighting will be provided throughout the corridors – refer to the lighting layouts for different types of lighting fittings and mounting methods, within the various circulation areas throughout the building.

Lighting controls in the corridors will be by PIR presence detection and will incorporate daylight dimming where/if applicable.

Lighting in corridors will be wired utilising interleaved circuits so that should a circuit breaker disconnect, the corridor will remain illuminated in a limited fashion.

Lux levels will be 150 Lux with a uniformity of 0.4

Guests Rooms

Lighting will be provided as part of the prewired pod within each individual guest room.

Lighting within the guest rooms will be achieved via luminaires integrated into the pod and prewired. They will be provided by Abacus. Supplies to these luminaires will be provided by the contractor via a power circuit. A dedicated power circuit per room will supply one commando socket within each guest room. The circuits will be taken from the local DBs on each floor. Each pod will be plugged into the commando socket, via which both small power and lighting will be achieved for every guest room.

Lighting controls in these areas will be generally by manual light switches.

Main entrance, restaurant and bar area on Ground Floor

The lighting will be designed by the Interior Designers – refer to the lighting layouts for demarcation. Additional fittings are proposed to be installed to enhance the lux levels at the bar areas where food preparation is taking place.

The lighting design within the lounge/ restaurant/ bar will provide lighting that will allow the users of the space to relax. The lighting fittings colour temperature in these areas to be 3500K. Within the bar/restaurant area there will be some feature lighting added to the space.

The luminaire types proposed by the Interior Designers will be connected to and controlled by the Dali lighting controls system.

The lighting design and controls concept for these spaces will be confirmed by a specialist in coordination with the interior designer.

Generally, PIR presence detection will be provided to all open plan areas.

Lighting in the immediate entrances will be on during periods of darkness or during poor lighting conditions where levels of light drops below the prescribed Lux levels. These will be controlled by a photocell connected to the Dali lighting control system.

These spaces will be illuminated to meet the requirements of the Architect and Interior Designer at 200Lux average, 0.4 uniformity.

Staircases

Lighting will be provided throughout the staircases, this will generally be by wall mounted surface luminaires.

Staircase lighting will be controlled via PIR's. These will be mounted at high level in the staircase at each main landing and will cover all entrances to the staircase.

Staircases will be illuminated so that each floor tread is illuminated to an average of 150 Lux across the floor tread with a uniformity of 0.4.

Lighting in the staircase within the fire-fighting core will be supplied from the firefighting distribution board at the roof.

All lighting and controls wiring in the stair core will be 2-hour fire rates soft skinned cables recessed with the fabric of the building.

The lighting in the stair cores will meet the current requirements of BS9999 - Fire Safety in Design, Management and Use of Buildings and BRSIA BG70 - Life Safety and Firefighting Power Supplies.

Toilets

Luminaires in the toilets will be generally recessed downlights with ingress protection rated to IP44 or above.

Average lux levels will be 200 Lux with a uniformity of 0.4.

Lights within the toilets will be controlled via automatic PIR local occupancy detectors.

All Other Areas

These spaces will be illuminated as per the requirements as set down in relevant guidance documentations. Also, refer to the lighting layouts and luminaire schedule for luminaire types and control types.

Lighting within the back of house areas will comprise of functional fittings.

Surface mounted IP rated luminaires will be provided to plant rooms, storage and external areas.

Plantrooms will be controlled via manual switches.

Lobbies and stores will be controlled via PIR presence detectors which will automatically control the lighting in those spaces.

Dali Lighting Control system

A Dali addressable lighting control system will be provided to control all lighting of the development. This system will be comprised of a programmable Dali head end controller, local Dali area controllers and associated controls. The head end system will be programmable and controllable by IP interface. The Contractor to confirm the number of head end controllers required and their final positions.

The lighting controls will ensure that the operational requirements of each area are efficient and practical in their use. The lighting controls will allow occupants to control the immediate area/space providing that the controls do not affect security and safety. Controls within the majority of areas will incorporate PIR presence & absence detectors, manual light controls and daylight sensing devices.

The provision and spacing of controls and PIRs will comply with Building Regulations Part L.

Dimmable luminaires and controls will be provided to the reception, lounge, bar areas, as well as where windows are provided on the Ground floor, to facilitate daylight dimming.

PIR detectors are to be capable of accepting local switching connections and will be fully adjustable from 1 minute to 60 minutes. Initial settings at commissioning stage of these PIRs will be 15 minutes.

Occupancy detection will switch the lights off after a period of 15 mins, after the sensor fails to detect movement.

All lighting controls must be of the same type and manufacturer and all luminaires must be suitable to connect to the lighting control system.

The operation of all lighting controls will be intuitive. Switches and controls will include engraved labels stating their function/ purpose.

The lighting control system will automatically detect the status of all luminaires. Should a lamp or luminaire fail, then the system will provide an error status for that luminaire and then notify the building manager and maintenance staff of the error. Error notifications will be transmitted by email. Email addresses will be programmable into the head Dali lighting controls system by the building manager and site maintenance staff.

The Contractor will include for demonstration of the lighting controls system to building occupants and maintenance personnel. In addition, the Contractor will include for the hotel manager/ maintenance staff to receive full training on how to programme, setup and trouble shoot the Dali lighting system to allow for later maintenance. Following this, these personnel should have at a minimum, the ability to:

- Add new luminaires to the system and integrate/ programme them.
- Remove luminaires from the system.
- Replace an existing faulty luminaire.
- Update the graphical interface.
- Fault find, Identify and correct any issues.
- Re-programme existing luminaires
- Set luminaire timers for automatic switching
- Add remove and programme switches and controls

~~The Dali Controls system will also automatically undertake all emergency lighting testing within the entire building in compliance with the current edition of BS5266. All duration testing of luminaires will be undertaken so that testing of luminaires occurs on different days and times so that no areas will be left entirely without emergency lighting should it be required following a duration test.~~

~~All emergency luminaires will be equipped with emergency lighting control gear and integral 3-hour duration batteries. The ballast will be Dali EM Pro type ballast as will be interfaced with the Dali lighting controls system.~~

The Dali lighting control system will be provided with its own network system for the connection of all floor controllers, area controllers to the main Dali head end lighting controller. Requirement will be to the lighting controls manufacture's requirements.

The Dali floor controllers will be connected to the luminaires, emergency luminaires, and lighting controls by a Dali network. Dali cabling types will be as per the lighting controls manufacturer's recommendation.

The Contractor will ensure that the lighting control system is interfaced with the building data network. Details and network addresses will be agreed with the Client's ICT data network specialist. The Dali system will include suitable security so that only staff and authorised parties can gain access. This may include the lighting controls manufacturer by means of an external gateway to allow fault finding and maintenance to be undertake remotely.

The Contractor will agree the lighting controls strategy and PIR time settings for each area with the Architect, the Interior Designers and the Client.

The Contractor will ensure that all Dali controllers are not overloaded and have a minimum of 20% spare capacity for later connection of additional Dali luminaries and controls. When counting Dali addresses, the Contractor will note that emergency Dali luminaries generally require 2 Dali addresses (one address is required for the general lighting control gear and one for the emergency lighting control gear attached to the luminaire). General luminaires, controls and emergency directional Dali emergency signage generally only require 1 Dali address.

The head end system will comprise a desk or rack mount PC and associated controller cards and programs. This system will be procured from the lighting controls manufacturer.

Schedule of Rates

The Contractor will provide a per unit installed schedule of rates for additional luminaires and controls. The schedule will include a cost for both the addition and omission of items. This will be utilised for costing additional installations during the contract works. For avoidance of doubt, the Contractor will provide full and complete installations throughout the development as part of the contract and price for these accordingly. The schedule of rates will be for the addition or subtraction of electrical systems and accessories during the construction period.

The schedule of rates will include:

- Additional luminaires of each type
- Additional lighting controls and switches per type (No. of gangs and ways)
- Additional DALI controls and LCMs

7.10 Emergency Lighting

Design Parameters

The Contractor will design, supply, install, test and commission an emergency lighting system, in accordance with all the appropriate standards, including but not being limited to:

- BS 7671 - IET Wiring Regulations (including amendments)
- CIBSE Code for Lighting
- LG-12
- BS 5266 – Emergency Lighting
- BS 1838 – Lighting Applications. Emergency Lighting

System Description

This section of the specification will be read in conjunction with the associated lighting drawings and documentation, as well as the Architects and Interior Designers layouts and specifications.

The Contractor will provide a complete emergency lighting system throughout the hotel to fully comply with the requirements of BS 5266 and BS EN 1838. The emergency lighting system will be integrated with the general lighting and will consist of a combination of integral and standalone emergency luminaires. The Contractor will provide sufficient quantities of luminaires in each location to provide the required lux level, etc, as laid out in this specification and guidance documentation.

All generic lighting clauses from the General Lighting section of this specification will apply to this section also.

The emergency lighting installation will be designed, supplied, installed, tested and commissioned in accordance with all the appropriate standards. The Contractor will provide an emergency lighting system that clearly and unambiguously indicates all escape routes internally and externally as required and described on the Fire Strategy, provides illuminance along such routes and the immediate external areas of escape routes so as to allow safe movement towards and through all exits. The emergency lighting layout will be co-ordinated with the fire and emergency escape strategy. Emergency luminaires will be located above fire-fighting and first aid equipment, exit signs will be installed at each change of direction and over each emergency final exit door. Additionally, a non-maintained bulkhead luminaire will be provided external to each final exit door.

The Contractor will provide escape route directional signs to supplement fixed signage, and where a direct line of sight to an exit is not possible, to direct persons towards a final escape exit. Illuminated exit signs will be provided to meet the European Signs directive format. All signage will be the same throughout the building to ensure that the exit signage comply with BS:5266.

In accordance with BS 5266, high risk areas will be provided with emergency illumination to a minimum of 10% of the general lux level or 15lux minimum. High risk areas will be considered to include, but not limited to:

- Plant rooms
- Control panels
- Distribution Boards/ Panelboards
- Kitchen / Bar/ Food preparation areas (Basement and Groundfloor)

All emergency luminaires will be equipped with emergency lighting control gear and integral 3-hour duration batteries with their associated charger units able to fully recharge batteries within 24-hours. ~~The ballast will be Dali EM Pro type ballast as will be interfaced with the Dali lighting controls system.~~

Where luminaires are not suitable for the incorporation of emergency conversion packs and batteries, then the Contractor will utilise recessed/flush mounted Dali addressable LED dedicated emergency luminaires in addition to the general lighting luminaires. These luminaires will be wired onto the same lighting circuit as the local general lighting luminaires. The emergency luminaires will contain 3 hour batteries and will work in conjunction with the Dali head end system. Battery packs will be either integral to the luminaire or located immediately adjacent to it in the ceiling void, accessible from below.

The Dali floor controllers will be connected to the luminaires, emergency luminaires, and lighting controls by a Dali network. Dali cabling types will be as per the lighting controls manufacturer's recommendation.

~~All emergency lighting will be automatically tested by the Dali lighting control head end system.~~

Emergency testing of all emergency lighting will be with **a local self-test system and manual recording of the testing data/results** ~~the Dali head end controller~~. Testing of luminaires will be programmed to occur 'out of hours'. ~~The system will automatically email the results of the emergency lighting test to the facilities maintenance management.~~

The complete emergency lighting system will consist of a combination of:

- Self-contained, Maintained luminaires linked to adjacent lighting circuits.
- Self-contained, Non-maintained integral battery/inverter units within the normal lighting luminaires.
- Self-contained, Non-maintained integral battery/inverter units within designated emergency luminaires.
- Maintained and Non-maintained illuminated exit signs (illuminated exit signs will be provided to meet the European Signs directive format).

The emergency lighting layout and the location of all escape signage will be co-ordinated with the Architect's layouts and will generally, provide:

- Emergency lighting and exit signs along all emergency escape routes.
- Anti-panic emergency lighting throughout all office and open plan areas
- Additional emergency lighting to highlight particular hazards, changes in direction, fire alarm panel etc.
- Emergency bulkhead luminaires above each final exit door (both internal and externally).

All Illuminated exit signs will be provided to meet the European Signs directive format.

All luminaires will be complete with changeable gear tray.

The Contractor will carry out the detailed calculations of the emergency lighting system in accordance with the above and submit technical submittals for comment and Client/architect/ services engineer approval prior to ordering.

The Contractor will organise for samples of all proposed luminaires to be provided and arrange suitable demonstrations of the sample luminaires to the Client-side team for approval prior to ordering.

Calculations

The Contractor will carry out lighting calculations in the same manner as described in the General Lighting section of this specification.

7.11 External Lighting

Design Parameters

The Contractor will design, supply, install, test and commission an external lighting system, which will be extended in accordance with all the appropriate standards, including but not being limited to:

- BS 7671 - IET Wiring Regulations (including amendments)
- CIBSE Code for Lighting
- LG-06
- BS EN 12464-2 – Light and Lighting. Lighting of Work Places. Outdoor Work Places
- BS 5489 – Road Lighting
- ILE Requirements

System Description

This section of the specification will be read in conjunction with the associated lighting drawings and documentation, as well as the architects, landscape architects and interior designers layouts and specifications.

The Contractor will provide sufficient quantities of luminaires in each location to provide the required lux level, etc, as laid out in this specification and guidance documentation. A complete external lighting installation will be provided to cover the building roof external areas (general and emergency lighting at roof walkways) and the building perimeter.

The lighting will be designed and installed to allow the following Health & Wellbeing BREEAM credit Hea-5 and the Energy BREEAM credit Ene-4 to be claimed. Lighting will be designed with consideration to the recommendations of the CIBSE, the British Standards and the ILE requirements. The scheme will comply with ILE guidance on avoidance of obtrusive light.

All generic lighting clauses from the General Lighting section of this specification will apply to this section also.

For each area, the designed average-maintained illuminance will be as detailed in the relevant CIBSE and BSEN guidance, including parameters for glare and uniformity. Building Regulations Part L2a will be adhered to regarding efficacy and controls.

The Contractor will carry out the design of the external lighting system in accordance with the above and submit technical submittals for comment and Client/architect approval prior to ordering.

The Contractor will organise for samples of all proposed luminaires to be provided and arrange suitable demonstrations of the sample luminaires to the Client-side team for approval prior to ordering.

All luminaires are to have changeable gear trays.

Installation

All external lighting luminaires will be wired in cabling suitable for the environment in which they are to be installed, via either multicore XLPE/SWA/LSZH cabling or LSZH ~~twin and earth cables~~ ~~sheathed copper singles~~ in galvanised steel conduit for a fully flush installation concealed within the building fabric. Generally external luminaires will be wired on multiple circuits to avoid the loss of light to whole areas in the event of a main/circuit failure.

The Contractor will agree all luminaire locations and setting out with the architect prior to ordering and installation.

All external lighting will be wired to the distribution boards available on the associated floor level (Ground floor or Roof). All lighting circuits will be protected by type C RCBO devices of 10A rating with cabling of 1.5mm² minimum conductor size.

All wall mounted luminaires will be fed by back entry. Cable runs on the outside of the building will generally not be permitted and as such dedicated lighting circuits supplying external wall mounted luminaires will be fed from local DBs internal to the building. Dedicated circuits will ensure that the wall mounted luminaires can be isolated should any future modifications be required to that circuit.

Controls

All luminaires will be DALI compatible and will be controlled via the same DALI lighting controls system described in the General Lighting section of this specification.

All external lighting (except for those required for safety and security lighting) will be controlled via a variable digital time clock or daylight sensor with manual override facility, to prevent operation during daylight hours, in accordance with the Building Regulations (BREEAM credit Ene-4). All external lighting (except for safety and security lighting) will be capable

of being automatically switched off between 2300hrs and 0700hrs. The Contractor to confirm with the Client and the lighting specialist the lighting controls strategy.

If safety or security lighting is provided and is required to be used between 23:00 and 07:00, then this part of the lighting system will comply with lower levels of lighting as recommended (during these hours) in Table 2 of the ILP's Guidance notes (BREEAM credit Pol 7).

The external lighting will be designed for compatibility with the site wide CCTV system ensuring that the external lighting provides the correct illuminance levels and colour rendering for the correct operation of the CCTV system.

Calculations

The Contractor will carry out lighting calculations in the same manner as described in the General Lighting section of this specification.

7.12 ICT Infrastructure and Structured Data Cabling

Design Parameters

The Contractor will liaise with the Client's Data specialist (Haventrust) to design, supply, install, test and commission any associated system in accordance with all the appropriate standards, including but not being limited to:

- BS EN 50173 – 1 Information Technology – Generic Cabling Systems. General Requirements
- BS EN 50174 – 1 Information Technology – Cabling Installation Specification & Quality Assurance
- BS EN 50174 – 2 Information Technology – Cabling Installation, Installation Planning and Practices inside Buildings
- BS EN 50174 – 3 Information Technology – Cabling Installation, Installation Planning and Practices outside Buildings
- BS EN 6701 – Telecommunications equipment and telecommunications cabling. Specification for installation, operation and maintenance
- To Cat6a, Cca.S1a.d1.a1 IT cabling specification
- BS 6259 – Code of Practice for the design, planning, installation, testing and maintenance of sound systems
- BS EN 60728-1 – Cable networks for TV signals, sound signals and interactive services

System Description

A complete new structured cabling (comms/data) installation will be provided throughout the building, to serve the development with individual data points. The Contractor will liaise with the Client and the specialist data installation Sub-contractor to provide a complete installation to meet the requirements of this specification. The Contractor to refer to the Small Power and Data layouts and to the Containment layouts issued as part of the Stage 4 Tender Issue for minimum data ports and ICT infrastructure requirements.

Incoming telecommunication (BT) /ICT fibre optic service ducts will be provided to serve the new development. The Contractor to liaise with the Client and the Data/ Communications specialist to determine which private network broadband provider will be employed and to confirm the incoming data/ communications services routes.

The incoming service ducts will be routed into the building at a suitable location and into the Comms room, which will be located at basement floor level

The Contractor to allow as a minimum for the following incoming ducts:

- 2 No. Ø90mm BT ducts,
- 2 No. Ø100mm Private Network Broadband provider ducts
- 2 No. Ø100mm spare ducts

The main Comms room on the basement will have 2 No. core racks/ cabinets to which all sub-comms cabinets on other floors will be connected via multimode fibre optic cables, that will run in dedicated galvanised steel basket. There will be a sub-comms cabinet on the first floor and a sub-comms cabinet on the 6th floor, each located in the sub-comms riser

(Riser 03) on the respective floor level. The fibre network route will be provided via the electrical service risers, as shown on the containment layouts.

The premises connectivity system, or distribution system, will become the shared physical medium that allows telephones, printers, personal computers (PCs) and all other IP communications devices to communicate with each other throughout the hotel through a combination of cables, adapters, connectors and other equipment such as wireless access points.

The main comms cabinets will serve CCTV, Wifi, AV, TV, Security and Controls data/ communications requirements for ground floor and basement.

The sub-comms cabinet on the 1st floor will serve CCTV, Wifi, AV, TV, Security and Controls data/ communications requirements for floors 1-5.

The sub-comms cabinet on the 6th floor will serve CCTV, Wifi, AV, TV, Security and Controls data/ communications requirements for floors 6-9 and roof.

The ICT system provided by the Contractor will include:

- Cabling containment system, comprising of 3 compartment galvanised steel wire cable basket and dedicated fibre optic cables galvanised steel wire basket
- Structured cabling
- Data outlets
- Patch panels for the connection of the structured cabling linked to the data outlets
- Incoming ducts for incoming fibre supplies (Fibre by others) and draw-pits
- Patch panels for the connection of the incoming fibre cabling
- Fibre cabling to connect each of the sub-comms cabinets to the main comms cabinets on the basement
- Patch panels for the connection of the comms cabinets at the upper floors to the main comms cabinets on the basement
- Power supplies to comms/ sub-comms cabinets

Active equipment (comms/ sub-comms cabinets/ racks), switches, UPSs, Wifi access points and connecting patch leads to the patch panel will be provided by the hotel operator.

The Contractor to allow for two fibre cables to connect each of the sub-comms cabinets to the main comms cabinets on the basement. The Contractor to confirm with the data specialist that the link between the main comms cabinets and the sub-comms cabinets is via fibre.

IT cables throughout the development will be CAT 6a, Cca.S1a.d1.a1, in compliance with BS6701, with RJ45 outlets provided to the offices, staff rooms, check-in/ lounge/ bar area, kitchen, back of house areas, meeting rooms, guests rooms and anywhere else required.

The number of outlets in each area will vary according to the function of the work area and the Qbic specification requirements. Data outlets will be provided for the AV systems, the security systems, access control, CCTV, assistance call systems and any other systems requiring a data connection.

The installation of a W-LAN system will be made by the Landlord. Data outlets will be provided throughout the development to ensure Wi-Fi coverage at all areas. The I.T. specialist has provided the number of outlets required for Wi-Fi connection.

The quantity of data outlets in all areas and the overall IT strategy and network/ data/ telecommunications requirements have been agreed with the IT specialist team of the Client and the Client. The Contractor to re-confirm the data outlets requirements with the IT specialist and the Client. The quantity of the RJ45 data outlets will be in compliance with the Client's requirements, the rooms' datasheets and the data specialists' specification.

Workstations data minimum requirements:

- For a standard workstation, provide two RJ45 outlets
- For point of Sale workstations, provide four RJ45 outlets
- For each check-in desk, provide three RJ45 outlets

- For each printer, provide two RJ45 outlets

Guest rooms data provision will be limited to one data port per room for the TV, that will be installed by the Contractor behind the bathroom mirror. The Contractor will terminate the data cabling of each prewired pod into this data port.

All outlets will be labelled and fitted with spring loaded sliding shutters to prevent the ingress of dirt and dust.

Refer to the associated small power and data layouts issued as part of the Stage 4 Tender Issue for minimum quantities of data outlets within each room/ area.

The complete system will be tested and commissioned in accordance with industry standards and test results will be provided.

Generally, all electrical supplies, services and containment will be wired as described in Low Voltage Distribution section of this specification

All new cable ways and containment will be sized to suit Cat 6a, Cca.S1a.d1.a1 I.T. cabling and the relevant bending radius of all cabling, including 20% spare capacity.

Provide suitable power supplies to serve the system, as required. The Contractor to confirm with the I.T. specialist what are the power requirements for each comms cabinet.

The Contractor to confirm with the I.T. specialist that there are no power supplies requirements for the Wifi points throughout the development and that all Wifi points will be PoE.

The Contractor will refer to the data specialist specifier/installer's specification and allow to fully comply with the requirements. In the event of any discrepancies between the data specialists' information and this specification, the Contractor will raise these during the tender period for clarification, otherwise the most onerous requirements in terms of cost and programme will be deemed to have been allowed for.

All outlets will be labelled and fitted with spring loaded sliding shutters to prevent the ingress of dirt and dust.

The Contractor will confirm that all RJ45 outlets are installed within a 90m cable length of the nearest onsite cabinet.

The Contractor will provide a separate itemised cost in the tender return for adding or omitting a single RJ45 outlet and associated cabling to/from the project.

The Contractor will provide a separate itemised cost in the tender return for adding or omitting a double RJ45 outlet and associated cabling to/from the project.

7.13 Facilities for the Disabled

Design Parameters

The Contractor will design, supply, install, test and commission any associated system in accordance with all the appropriate standards, including but not being limited to:

- Disability Discrimination Act (DDA) 2004
- BS EN IEC 60118-4 – Electroacoustics. Hearing Aids. Induction-Loop Systems for Hearing Aid Purposes. System performance requirements
- BS 7594 – Code of Practice for Audio-Frequency Induction-Loop Systems (AFILS)

7.13.1 Induction Loop System

The Contractor will reconfirm with the Client that there is no requirement for a hard-wired induction loop system.

There will be one portable infra-red type induction unit for each of the following areas:

- One induction loop for the ground floor – check-in/ bar area
- One **Four** induction loops for the other ~~per each guest rooms floors for each of the Full Access Bedrooms.~~

Each induction loop system will be utilised by the hard of hearing using their personal hearing aids switched to the "T" position.

7.13.2 Disabled Refuge Call System

The Contractor will provide an emergency voice communication point on all refuge points at stairwells above/ below ground floor level for emergency evacuation purposes.

Each refuge will sound locally whilst providing lamp indication and reset push button.

Each refuge will be provided with a call button to facilitate a full two-way communication system with corresponding communication points to a main disabled refuge panel, adjacent to the fire alarm panel, at the fire-fighters entrance within the fire-fighting core.

The communication points will be brushed stainless steel and recessed flush into the building fabric.

All power supplies, etc. will be provided for a fully functioning system., complete with 72-hour battery back-up.

The system will be provided in accordance with the Fire Strategy, Building Control and Fire Officer requirements and will comply with BS 5839.

Fault monitoring of the disabled refuge call system will be provided to monitor the system for line faults, power supply failure and battery charger failure with remote contacts connected to the bar area/ basement office control panel for fault warning.

Provide independent master and slave stations respectively, complete with microphone, in-built loud speaker, separate fault, busy and call indicators and all call control switches.

The main refuge system reception panels will have indicator lamps for the following:

- System Healthy
- System Fault
- Clear indication of each occupied refuge

The Contractor to provide wiring for disabled refuge call system, with cables with white LSZH sheath of size to be determined by the system manufacturer, on cable basket with the fire alarm system cabling.

7.13.3 Disabled Toilet Alarm System

DDA WC Alarm Systems will be provided in all staff, public and private guestroom DDA WC's.

As a minimum the systems will include but will not be limited to:

- An overdoor LED indicator and tone generator unit
- A disabled alarm reset unit
- A call point/pull-cord combined with reassurance lamp
- A main central control panel

The central alarm indicator panel will be located at the main bar area. The disabled alarm system in each area will be powered from a local power pack unit with integral battery back-up, to support 72-hour operation of the system. The unit will be located within the ceiling.

The disabled call system will report back to the main panel when activated.

The pull cord will be ceiling mounted located within the reach of the toilet, wash hand basin and the shower, with the reset unit located adjacent. The reset unit will consist of a flush mounted metal plate with reset button incorporating an amber

reassurance lamp. An over door alarm LED indicator and tone generator will also be provided. Assistance alarms may only be reset at a local alarm reset button under the pull cord within the facility.

7.14 Public Address System

There is no Public-Address System requirement.

7.15 Audio Visual Systems/TV/Radio

Any radio, TV and AV content will be provided over the IP network. The AV specialists (Loud and Clear) have provided draft requirements of the AV system. The I.T. specialist (Haventrust) have confirmed the data infrastructure will be adequate to accommodate all supplies to the AV systems. The Contractor to confirm the final requirements with the AV specialist, the I.T. specialist and the Client.

Suitable containment, power supplies, cabling and data links/ outlets to be provided for a complete audio-visual/ TV system each designated room/ area.

The system will comprise of screens of a size to suit the room served ceiling loudspeakers, small power, data and coaxial points.

A TV digital aerial will be provided on the roof of the building. An integrated reception system will be provided to allow specific landlord, hotel guests and Shell and Core tenant to receive free to air digital TV signal.

TV services will be fed by foam filled CT100 cabling via a boosted distribution amplifier that will be housed within the electrical riser of each floor.

Additionally, an IP Television system will be provided to distribute television signals on each floor via the sub-comms panels, using Cat 6A structured wiring system.

The system must also output a digital DVB-C signal and has to correspond with the planned TV-sets. A conversion in to an analogue TV signal impairs the quality and is therefore not permitted.

TV services, cabling, containment and equipment will be located within the basement staff room (1No.) and the ground floor meeting rooms (5No.), with power, CT100 and Cat6A, Cca.S1a.d1.a1 structured wiring system designed to suit the floor plan and proposed TV locations. This will need to be confirmed with the Interior Designers. Each TV screen will require one double socket outlet, 2 data ports and one coaxial outlet. The AV specialist will provide the TV screens and the local TV volume controllers (one for each TV screen). The Contractor will provide the required outlets and the TV and TV volume controllers associated cabling within 3 compartment galvanised steel wire Data/ Security/ TV basket.

TV cabling and containment to the Qbi Pods within the guest rooms will be provided by the Contractor. The Contractor will also provide one data outlet and one coaxial outlet to each guest that will be behind the bathroom mirror. The Contractor will terminate the data and TV cabling of each prewired pod into these base built outlets.

Speakers will be provided by the AV specialists within the meeting rooms, the ground floor bar/ restaurant area and the front of house circulation area on the basement (adjacent to the front of house toilets). Refer to the small power and data layouts for speakers' positions. The Contractor will provide (within 3 compartment galvanised steel wire Data/ Security/ TV basket) the dual core screened 1.5mm² cabling required for the speakers at high level that will be terminated by the AV specialist.

The speakers' controls will be linked to the main Amplifiers equipment, located within the basement Comms room. There will be local speakers controls behind the bar.

The link and cabling between the TV screens audio output and the speakers within the meeting rooms to be installed by the AV specialists.

7.16 CCTV

Design Parameters

The Contractor to employ a CCTV specialist to design, supply, install, test and commission CCTV system in accordance with all the appropriate standards, including but not being limited to:

- NACOSS Code of Practice
- BS EN 50132 – Alarm Systems. CCTV Surveillance systems for use in security applications
- BS 8418 – Installation and remote monitoring of detector-activated CCTV Systems. Code of Practice

The system will be designed and installed by a NACOSS Gold approved designer/installer.

System Description

The Contractor to liaise with the Client and CCTV specialist to provide a complete Closed-Circuit Television (CCTV) system that suits the Client's requirements and will allow the monitoring of the following areas as a minimum:

- All entrance and exit doors for guests, employees and goods
- All circulation and lift lobbies areas on all floors
- Entrances to lift cars
- Staircases on ground floor only
- Bar/ Restaurant area
- Lounge area
- Meeting Rooms
- ~~Linen/ Bike store~~
- Refuse area
- Comms room
- ~~Basement office~~
- ~~Basement stuff room~~
- External perimeter of the building

The Contractor will re-confirm the extent of the system with the Client.

The CCTV system will be designed, supplied, installed, tested and commissioned in accordance with all the appropriate standards, including Secured by Design recommendations.

The system will be designed and installed by a NACOSS Gold approved designer/installer.

Upon completion of the works, the complete system will be tested and commissioned by the specialist Contractor in accordance with industry standards and system requirements.

The CCTV system will be an IP based system and will include High Resolution, dedicated colour CCTV cameras, monitors and image recorders. The system's main switches will be located in the comms room as well as within the sub-comms cabinets on each of the 1st and 6th floor.

The CCTV system will be supported by hardware and software that is easy to customise, adjust and control by the user without the need for specialist input.

A main CCTV control console will be provided within the basement management office.

The fixed monitor and controls will be positioned in such a way that they cannot be viewed by unauthorised persons. The location of the fixed CCTV monitor and controls will be coordinated with the latest furniture layouts. The CCTV control consoles will consist of the following as a minimum:

- 2no HD colour monitors
- Keyboard
- Joystick

The CCTV system will include image recording equipment to be located in the main server racks in the main comms room. The Contractor will liaise with the I.T. specialist regarding the amount of space required in the racks to ensure sufficient racks are provided throughout.

The system will operate in colour and will be provided with a digital image memory capable of recording up to 48 hours of video. The system will continuously record and provide automatic back up to DVD, that will be stored either on site in the main comms room or at a remote monitoring/ receiving centre, linked via a red care line.

The system will utilise the Scati Lab system (or similar and approved) for video management and remote management applications. The images from the CCTV cameras will be recorded onto a Network Digital Video Recorder (DVR) with sufficient capacity to store all images for 30 days. The system will be flexible such that the recording times can be altered to suite the operational requirements of the hotel.

CCTV cameras will be a combination of Pan, Tilt, Zoom (PTZ) and fixed cameras to suit the area being covered. The system will act as a deterrent and will be suitable for identification and for evidential purposes. Refer to the Security layouts for cameras types and positions and confirm with the I.T. specialist and the CCTV specialist.

All CCTV cameras will be high definition colour fixed domes/PTZ and generally of the following quality:

- External building perimeter – PSDB Standard Recognition of unknown persons at 20m.
- Internal entrance/exit lobbies – PSDB Standard: Recognition of a known person at 2m.
- Circulation corridors, other – PSDB Standard: Crowd Control/General Surveillance

External Cameras viewing the site will be sympathetic to the adjacent land and neighbouring premises in their sensitivity. The CCTV system and management of its use must be strictly controlled and setup to avoid intrusion into private activities which do not impact on the site. Cameras located to view the building entrances and/or monitor the site will be located away from the perimeter where possible. This will be to enable better viewing of the building perimeter, improve the image on the screen and avoid external site intrusion

All CCTV monitor components will be provided with integral 24-hour battery back-up so the system will continue to function in the event of a loss of power. All the CCTV equipment that is PoE (including all cameras) will be backed up by a suitably sized UPS, that will ensure the cameras remain energised during loss of main supply for an autonomy time of 15 min or 30 min, depending on final agreement with the Client. Suitably sized UPS systems will be provided by the I.T. specialist.

The Contractor to liaise with the I.T. and CCTV specialists and ensure the UPS is suitably sized to provide the back-up required.

The Contractor will provide suitable power supplies, RJ45 data points, containment and connections to support the installation.

The IP based CCTV system will be run over the structured cabling system described in the ICT section of this specification. Cat6a data cables will be taken around the building as required to serve the equipment.

Generally, containment will be routed in the ceiling void or be suspended by trunking where there is no ceiling (e.g. ground floor). Cabling will be installed within a 3 compartment galvanised steel wire Data/ Security/ TV basket, with earthed metal dividers provided throughout its length to segregate system cabling from all other services. Final connections to outlets and equipment will be provided by conduits, concealed in ceiling / wall voids and the building fabric.

The system will be designed and installed to provide a minimum of 25% spare capacity for additional devices to be added in future.

The system will be provided with facilities for off-site remote monitoring of the system, such as RedCare or equivalent.

The Contractor will ensure that the CCTV specialist will liaise with the Architect and Interior Designer to agree on the positioning and style of all visible hardware.

7.17 Access Control

Design Parameters

The Contractor will employ an access control specialist to design, supply, install, test and commission an access control system in accordance with all the appropriate standards, including but not being limited to:

- NACOSS Code of Practice
- PD 6662 – Scheme for the Application of European Standards for Intrusion and Hold-up Alarm Systems
- BS EN 50133 – Alarm Systems. Access control systems for use in security applications
- Security provisions will be designed in accordance with ACPO Secured by Design where possible

The system will be designed and installed by a NACOSS Gold approved designer/installer.

System Description

The Contractor will install a complete new access control system that will restrict unauthorised access into the building in conjunction with the overall security and operational strategies for the building. The Access Control System will be integrated with the Intruder Alarm.

The systems will be designed, supplied, installed, tested and commissioned in accordance with all the appropriate standards, including Secured by Design recommendations.

The main access control panel will be located within the basement office. Additional access control head ends will be provided within the Comms room and the Comms risers (Riser 03) on each floor. From the access control panel cables will be taken around the building, as required, to serve the access control equipment that is mains powered. The access control equipment that is battery powered will communicate with the main access control panel via the access control head ends, with a network-based communication.

The access control system will be provided with intercom and proximity cards readers.

The door access and access control to the guests' rooms, linen store, luggage store, basement office, Comms room and various store rooms within the basement (including but not limited to drink store, dry store, prep room, cold room) will be via proximity card readers and electronic door locks, battery powered only. The access controls will consist of:

- Proximity card/ reader on the non-secure side of the door
- Electronic lock mounted within the door frame, compatible with the door handle
- Fire alarm interfaces as required in the Fire Strategy

For exit/emergency exit, the door handle itself will release the locking mechanism to avoid the need for push button/emergency break glass points. This system will be fail safe and still enable escape through the doors in the event of a power failure. The Contractor will liaise with the architect to ensure the door handle and associated ironmongery is compatible with the system.

The access control system to Back of House circulation areas, external doors, lifts, offices, roof will be main powered networked access controlled, completed with battery back-up to ensure operation is maintained if there is a loss of main supply. Plantrooms/ risers will just have manual locks. The access controls will consist of:

- Proximity card reader on the non-secure side of the door
- Electronic lock on each door leaf on the secure side of the door
- Press to exit push button on the secure side of the door
- Emergency break glass on the secure side of the door
- Fire alarm interfaces as required in the Fire Strategy

For exit/emergency exit, the push button/ emergency break glass points will be used respectively. This system will be fail safe and still enable escape through the doors in the event of a power failure.

External card reader at the main guest entrance will enable guests' access during out of hours. The main entrance will be linked to the bar area via an audio only intercom system, to enable the guests to communicate with a staff member in case they forget their access cards during out of hours.

External card reader at the rear staff entrance will enable staff's access during out of hours. External card reader at the bike store entrance and the refuse area entrance will enable staff's access during all hours. All these three entrances will be linked to the bar area via an audio and visual intercom system, to enable staff/ delivery personnel to communicate with a hotel staff member in case they forget their access cards during out of hours or they require access for goods delivery.

It is expected that staff will be at the reception/ check-in unit 24 hours a day.

The Contractor to confirm there is no requirement for any remote access control override. The contractor will need to coordinate the interface between the door controllers and the access control system. The access-controlled door will automatically release during working hours and fire alarm activation.

The two guests' lifts (Lift 01 and Lift 02) will incorporate a card reader within the lift car, powered via the lift controls. When the card is presented at the reader, the guests will be able to select the floor destination dependent on where their room is. There will be an external card reader for Lift 01 on the ground floor, at the rear entrance side, to be used by the staff to gain access to the lift from the external side. There will be an external to the lift car card reader on each floor for the fire-fighting/ goods lift on each floor, that will allow access only to staff. The external card readers for the lifts will be powered via dedicated access control head ends located within the comms riser (Riser 03) on each floor and within the luggage store on the ground floor. Fire alarm interfaces will be installed, as required in the Fire Strategy, that will ensure that the two guests lifts return to ground floor during an event of a fire, while the fire-fighting lift access control system will enable free access for the fire-fighters to use.

The Contractor will provide suitable power supplies, RJ45 data points, containment and connections to support the installation. Power supplies will be derived from the local distribution boards and will include all final connections, cabling and containment to suit the specific requirements of the system.

Generally, all electrical supplies, services and containment will be wired as described in Low Voltage Distribution section of this specification. The Contractor will be responsible for liaising with all the relevant specialists and will provide all necessary cable containment and power supplies to enable the system to be installed and fully operational.

Generally, containment will be routed in the ceiling void or will be suspended in trunking where there is no ceiling (e.g. Ground Floor). Cabling will be installed within a dedicated 3 compartment galvanised steel wire cable basket for Data/ Security/ TV, with earthed metal dividers provided throughout its length to segregate system cabling from all other services. Final connections to outlets and equipment will be provided by conduits concealed in ceiling / wall voids and the building fabric or surface mounted conduits within the plant rooms/ back of house areas.

Local dedicated 230 volt power supplies via un-switched fused connection units will be provided to serve equipment as required. Unless otherwise stated, all final power circuits serving the system will be radial.

The system will be designed and installed to provide a minimum of 25% spare capacity for additional devices to be added in future.

The Contractor will ensure that the system continues to function throughout any interruption of the normal electricity supply that powers it. The complete system will be provided with integral 24-hour battery back-up.

The Contractor will ensure that the system does not prevent persons from escaping in the event of a fire. The system will be interfaced with the fire alarm system. All escape-controlled doors and lifts will be provided with a fire alarm interface. Refer to the fire alarm section of this specification for further details.

The system will allow the authorised user to easily add, suspend, cancel, or change the access control information and authorisations of any person or groups of people.

The Contractor will provide a system that efficiently utilises a secure data network operating on TCP/IP protocol as the medium for transmitting all access control and control data between the components of the system. The access control system will be IP-addressable and communicate between all access point controllers and the central controller via network.

The Contractor will liaise with the I.T. specialist (Haventrust) regarding the amount of space required in the comms racks to ensure sufficient racks are provided throughout and to ensure complete compatibility with the IT system.

Every time a card is presented to a token reader, the reader will give both visual and audible indication of acceptance or rejection of the card.

Every time a card is presented to a reader, the system will record the accurate time and date of the event, the unique identification of the card, the identification of the reader, and whether access has been denied or granted. This information will be stored securely in an event log which is not affected by interruption of the mains power supply.

The system will sound a local buzzer in the basement office where the access control panel is located and will generate an alarm signal when an access point is forced open without access being granted by the system.

All alarm signals will be recorded in a secure log.

The user will be able to view, control, and set up the system at any time through any personal computer connected to the computer network. Access to these functions will be controlled through authorisation codes. The user will be able to view the status of all networked access points, obtain an accurate and up-to-date list of all persons present in the building, view any event log and alarm log and retrieve all access control and related data based on search criteria such as card identification, card reader and time period.

Guests checking-in will be issued with a card after the visitor's details are entered into the access control database. The guests' access card will be automatically programmed based on the information entered and the authorisation details selected by the hotel staff. All guests' cards will automatically expire at the programmed checking-out time.

Mounting locations and heights of all access control equipment will be provided to allow their use by wheelchair users and to comply with DDA requirements.

All devices will be tamper proof.

The Contractor will re-confirm the extent of the access control system with the Client.

Upon completion of the works, the complete system will be tested and commissioned by the specialist Contractor in accordance with industry standards and system requirements.

The Contractor will provide a separate itemised cost in the tender return for adding or omitting 1no. solenoid type access-controlled door equipment and associated cabling, etc.

The Contractor will provide a separate itemised cost in the tender return for adding or omitting 1no. mag-lock type access-controlled door equipment and associated cabling, etc.

7.18 Security Detection and Alarm System

There is no requirement for a Security Detection and Intruder Alarm System.

There is a requirement for panic alarm push buttons at the bar and the basement office where the CCTV monitor will be installed, combined with sounders at the bar and basement office. Upon triggering the system, alarm signals will be relayed to the bar and basement office respectively.

The Contractor to design, supply, install, test and commission a system as described above, in accordance with all the appropriate standards.

Design Parameters

~~The Contractor will employ a security specialist to design, supply, install, test and commission a security detection and alarm system in accordance with all the appropriate standards, including but not being limited to:~~

- ~~— NACOSS Code of Practice~~
- ~~— PD 6662 — Scheme for the Application of European Standards for Intrusion and Hold-up Alarm Systems~~
- ~~— EN 50131 — European Standards for Intruder Alarm Systems~~
- ~~— BS EN 50133 — Alarm Systems. Access control systems for use in security applications~~
- ~~— Security provisions will be designed in accordance with ACPO Secured by Design where possible~~

~~The system will be designed and installed by a NACOSS Gold approved designer/installer.~~

System Description

~~The Contractor will install a multi-zone Intruder Alarm System that will cover all the ground floor entrances and ground floor folding doors, in order to give protection from unauthorised intrusion into the buildings. The system will be fully addressable and integrated within the access control system, with the main intruder alarm panel located at the ground floor luggage store, and will be programmable on site to suit the operational procedures of the hotel.~~

~~The Contractor will liaise with the Client to confirm the extent of the system and determine the final intruder alarm requirements.~~

~~The intruder detection and alarm system will be zoned to allow each ground floor entrance to consist a separate zone. Therefore, it will be possible to disable certain zones while other zones are armed. The exact zoning requirements will be agreed between the Contractor and the Client.~~

~~The intruder alarm system will comprise of fully monitored detection devices incorporating:~~

- ~~— Door contacts on all external doors/ folding doors~~
- ~~— Grade 3 Dual Technology movement detectors in levels above ground floor to be limited, except for the vulnerable locations that will need to be covered e.g. first floor windows adjacent to accessible ground floor roof areas, that might give external access.~~
- ~~— Panic alarm push buttons at the bar and the basement office where the CCTV monitor will be installed, combined with sounders at the bar and basement office.~~

~~Upon triggering the system, alarm signals will be relayed to the bar and basement office.~~

~~The Contractor will provide redcare cables for remote security alarm monitoring.~~

~~The system will be designed, supplied, installed, tested and commissioned in accordance with all the appropriate standards including BS 4737 Parts 1, 2, 3, NACOSS and Secured by Design recommendations.~~

~~The system will be installed by a certified UKAS accreditation body.~~

~~The system will be designed and installed to provide a minimum of 25% spare capacity for additional devices to be added in future.~~

~~All devices will be tamper proof.~~

The Contractor will provide suitable power supplies, containment and connections to support the installation. These supplies will be derived from the local distribution boards that are proposed to be installed, will be battery backed-up and will include all final connections, cabling and containment to suit the specific requirements of the system.

The associated cabling will be generally installed within containment that will be routed in the ceiling void or be suspended by trunking where there is no ceiling (e.g. ground floor. Cabling will be installed within a 3 compartment galvanised steel wire Data/ Security/ TV basket, with earthed metal dividers provided throughout its length to segregate system cabling from all other services. Final connections to outlets and equipment will be provided by conduits, concealed in ceiling / wall voids and the building fabric.

Local dedicated 230 volt power supplies via un-switched fused connection units will be provided to serve equipment as required. Unless otherwise stated, all final power circuits serving the system will be radial.

Generally, all electrical supplies, services and containment will be wired as described in Low Voltage Distribution section of this specification. The Contractor will be responsible for liaising with all the relevant specialists and will provide all necessary cable containment and power supplies to enable the system to be installed and fully operational.

~~The system will be designed and installed to ensure that a minimum of 25% spare capacity is still available on the existing onsite Intruder Alarm system for additional devices to be added in future.~~

~~The Contractor will provide a separate itemised cost in the tender return for adding or omitting 1 no. door's intruder alarm device and associated cabling, etc.~~

7.19 Fire Detection and Alarm

Design Parameters

The Contractor to liaise with a fire alarm specialist will design, supply, install, test and commission a fire detection and alarm system in accordance with all the appropriate standards, including but not being limited to:

- BS 5839 – Fire Detection and Fire Alarms for buildings
- BS 9999 - Fire Safety in the Design, Management and Use of Buildings. Code of Practice
- BS EN 54 – Fire Detection and Fire Alarm System
- The Fire Strategy
- The Local Authorities/ Local Fire Brigade's/ Fire Officer's requirements
- The Building Control's requirements
- DDA requirements
- BS 6387 – Test method for resistance to fire cables required to maintain circuit integrity under fire conditions

System Description

This section of the specification will be read in conjunction with:

- The Fire Strategy
- All other design intent drawings and documentation.

The Contractor will ensure that the requirements of the Fire Strategy document are fully complied with, even where the requirements are not specifically referenced in this specification.

The installation will achieve an L1 classification as proposed within the Fire Safety Strategy Report and defined in BS 5839, Part 1, whilst also meeting the requirements of the Fire/Building Control Authorities and those of DDA 2004/ Equality Act.

An open protocol analogue addressable fire alarm system designed to continually monitor the buildings fire status will be installed in conjunction with the overall fire strategy for the hotel. The fire alarm system will consist of multi-criteria optical smoke detectors (ionisation if required), fixed temperature heat detectors, rate of rise heat detectors, manual break glass call points, electronic alarm sounders, visual alarms (flashing beacons), strobes, pagers, interface units to be located throughout and central control/indicator devices and all other ancillary equipment necessary.

Automatic detection will be provided in any ceiling voids that have a depth of 800mm and above.

Automatic detection to be provided within each supply duct that provides fresh air to the guest room floors – smoke detectors to be provided at the top of each supply duct within each riser, at roof level.

Rate of rise heat detectors will be used if required in the in the kitchen on the ground floor and the bar area with food preparation on the ground floor.

The DDA 2004 requires a greater independence for those with hearing impairments, and so visual strobes will be provided along on escape routes and within DDA guest rooms or toilets, to cater for the hard of hearing. Mounting

heights of the break glasses will be to the DDA mounting heights. The full access bedrooms will also be provided with fire alarm vibrating pillow pads.

The Contractor will provide suitable power supplies, containment and connections to support the installation. Refer to the other sections of this specification for further details. Power supplies to the detectors/ alarms will be via the fire alarm panel and the fire alarm repeater panel, which are supplied from the main LV, and will include all final connections, cabling and containment to suit the specific requirements of each system.

All cabling will have a red LSZH sheath and will be fixed in a neat and tidy manner and secured with manufacturer's purpose made accessories. The complete system will consist of a totally segregated installation with wiring concealed.

All devices will be provided with permanent address label references affixed to the outlet base and be clearly visible from a position standing on the floor beneath.

The Contractor will be responsible for liaising with the relevant specialist and will provide all necessary cable containment and power supplies to provide a fully functioning system in compliance with this specification.

It is not envisaged that public address or sound amplification will be required.

System Architecture

A main fire alarm panel will be located on the ground floor in the fire-fighting core, adjacent to the fire fighters entrance. The fire alarm panel will be capable of identifying the point of origin and denoting where any fire alarm device has been activated. An output signal will be provided to a Redcare line. An output signal will be provided to a Redcare line, provided by the contractor, that will enable remote fire alarm monitoring. A Fire Alarm Repeater Panel will be located adjacent to the main entrance on the 1st floor.

The main fire alarm panel (FAP) and the repeater fire alarm panel (FARP) will be supplied directly from the LV switchgear on the roof via dedicated red coloured and lockable MCCBs and will be provided with integral 72-hour battery back-up. Supply cabling will be fire rated, of the type of FP200.

Vertical loops will be taken up the risers to serve each floor. Horizontal loops will be taken around the floor level.

The system will be designed and installed so that the number of devices on each loop has a minimum of 20% spare capacity for additional devices to be added in future. No loop will be more than 80% loaded.

The system will be designed and installed so that the number of loops required leaves 25% spare capacity in the fire alarm panels for additional loops to be added in future.

Alarm Activation

The Fire Strategy will define which areas will need to be evacuated in the event of an alarm activation. The Contractor will ensure that the fire alarm specialists' design is aligned with the Fire Strategy.

During an evacuation event, any access-controlled doors located on escape routes will allow safe egress from the building via push release or green break glass units. The Contractor will liaise with the Client to determine whether the access-controlled external doors will be kept secure during an evacuation event. Any fire doors on magnetic door hold open devices will also be released to allow the correct use of fire doors on escape routes.

The alarm activation and evacuation strategy cause and effect will be developed by the Contractor and agreed during detailed design in accordance with the requirements of the Fire Engineer, Fire Officer and Building Control.

The Contractor will ensure the fire alarm panel/ fire alarm repeater panel is provided with a manual override key switch to prevent the shutting down of plant and override of lift during testing periods. If the fire alarm panel is not provided with a

manual override key switch, testing will be scheduled for out of work hours.

Provide sufficient quantities of fire detection and alarm equipment to provide full coverage of the buildings, as required according to the classification of the system, which is proposed within the Fire Strategy document. Any quantities shown on the indicative design intent drawings are purely for the purposes of conveying the design intent/strategy and not intended to show the final quantities required. Provide sufficient quantities of sounders to achieve the sound levels required, with special care for areas where the noise levels are likely to be high e.g. bar/ restaurant area, plant areas.

Control Requirements and Interfaces to other Systems

The Contractor to provide all interfaces necessary to control the operation of other systems, to assist safe egress from the buildings and to protect sensitive equipment under fire/evacuation condition, in accordance with the Fire Strategy.

The system will interface with, but not limited to, the following systems, where applicable:

- Mechanical equipment outstations
- Motorised fire smoke dampers
- Electronic access controls and security systems
- Door hold open devices (door détentes)
- Fire-fighting/ Goods lift (Lift 03)
- Guests lifts (Lift 01 and Lift 02)
- Disabled refuge panel
- Disabled refuge positions
- Disabled alarm panel
- Smoke extract fans and associated controls
- Incoming gas solenoid valve
- Generator
- Boilers
- Fire curtain adjacent to the ground floor lift lobby
- Actuated opening vent
- Bill's existing fire alarm panel
- Basement kitchen fire suppression system
- **Audio/ video system**

The final location and quantity of the interfaces will be determined by the Contractor.

Override controls for the lift doors will need to be considered to enable the fire service to check that the lifts are clear. Once safety checks have been provided the lift doors will shut in order to preserve their fire seal.

The Contractor to confirm with the Fire Strategy which are the electrically powered locking mechanisms that will return to the unlocked position on operation of the fire alarm system or loss of power. The Contractor will liaise with the Client to determine whether the access-controlled external doors will be kept secure during an evacuation event. All access-controlled doors located on escape routes will be provided with a manual door release unit complying with BS EN 54-11 on the side approached by people making their escape, to allow safe egress from the buildings. Any fire doors on magnetic door hold open devices will also be released.

The Contractor will ensure that the fire alarm system is provided with facilities for off-site remote monitoring of the system, such as RedCare or equivalent.

There is no sprinkler system requirement.

Installation

The complete system will consist of a totally segregated installation wired using fire rated cables, in compliance with the current British Standards. Generally, cables will have an overall red LSZH sheath and will be fixed in a neat and tidy manner and secured with manufacturer's purpose made accessories.

Upon completion of the works, the complete system will be tested and commissioned by the specialist Contractor in accordance with industry standards, Fire Strategy requirements and BS 5839-1, Section 5, Clause 39. The purpose of commissioning is to configure and verify that the system operates correctly as per the specification, Fire Strategy document and any other requirements.

The Contractor will provide suitable power supplies, containment and connections to support the installation. The fire alarm devices will be supplied from the fire alarm panel and fire alarm repeater panel, which will be directly powered from the main LV switchboard on the roof via dedicated red coloured and lockable MCCBs and will include all final connections, cabling and containment to suit the specific requirements of the system. The FAP and FARP will be provided via with integral 72-hour battery back-up.

Supply cabling will be fire rated, of the type of FP200. The cables will be installed on a dedicated galvanised steel wire cable basket system. Generally, containment will be routed in the ceiling void or will be suspended where there is no ceiling. Final connections to equipment will be provided via galvanised surface mounted steel conduits.

Local dedicated 230volt power supplies via un-switched fused connection units will be provided to serve the main fire alarm equipment as required, including the fire alarm panel, the fire alarm repeater panel and colour graphics pc within the basement office. Unless otherwise stated, all final power circuits serving the system will be radial.

Generally, all electrical supplies, services and containment will be wired as described in Low Voltage Distribution section of this specification. **Fire alarm galvanised steel wire basket will be installed on ground floor and electrical riser, for the supplies to the fire alarm system components and disabled refuge system components, while on the basement, roof level and guest rooms floors, the horizontal distribution of fire alarms cables to be via the Data/ TV/ Security basket, where fire alarm cables shall be installed on the side of the Data/TV/Sec Basket.** The Contractor will be responsible for liaising with all the relevant specialists and will provide all necessary cable containment and power supplies to enable a fully functioning system.

The fire alarm detection system will be fully coordinated with the proposed lighting and mechanical services within the building.

7.20 Earthing and Bonding

Design Parameters

The Contractor will design, supply, install, test and commission an earthing arrangement in accordance with all the appropriate standards, including but not being limited to:

- Requirements for Electrical Installations – IET Wiring Regulations BS7671 (including amendments)
- BS 7430 – Code of Practice for Protective Earthing of Electrical Installations

System Description

The existing earth nest will be tested to the relevant standards and if suitable will be retained.

The earthing and bonding system will provide all functional earthing including main and supplementary equipotential bonding. The main earthing network will be connected to the lightning protection earthing system in such a way as to keep to a minimum the number of parallel paths to earth.

All relevant metal construction elements including structural steelwork, gas pipes, water pipes and lightning protection systems will be earthed and bonded as required by the associated standards (BS7671:2008, IET Wiring Regulations 18th Edition and BS 7430).

The earthing installation will comprise of all conductors, conduits, trunking, cross bonds and separate individual circuit protective conductors to form the complete system.

The Contractor will verify and test the earthing arrangement including all main equipotential bonding installations to ensure satisfactory bonding is provided between the main earth bar, the incoming services and the building structure.

Within the zone formed by the main equipotential bonding, local supplementary bonding connections will be made to metal parts, to maintain the equipotential zone. Those parts will comprise:

- Extraneous conductive parts
- Metal sinks and equipotential bonding below sinks
- Heating ductwork, all pipe work and hot water systems
- Waste pipes (if metallic)
- Exposed water pipes
- Metallic screens etc.
- Simultaneously accessible parts.
- Metal handrails bonded to structure.
- Metal conduits, cable trays, trunking, etc.
- Bonding of any metal ceilings.

The system consists of the following elements:

All final circuit and sub-main circuit protective conductors will be installed in accordance with BS7671, to provide high integrity final circuit earthing facilities within the final circuit distribution boards.

Earthing of the final circuits containment will be provided to metal wire ways carrying the cabling i.e. metal conduit, trunking, trays, basket, ladder racks etc.

All final sub-circuiting will have full sized CPC's. Where these are separate cables, they will have to be low smoke zero halogen insulated green/ yellow single core copper conductors and will run in the same containment system as the phase and neutral conductors.

The Contractor will provide and install solid earth bonding strapping and connection between sections and systems applied.

Earthing of sub-main distribution equipment will be achieved by bonding all the extraneous panel metalwork to the panel earthing bars, including armour of the incoming cables.

All metalwork, boards etc. will be bonded together within the riser cupboards.

All bonding in toilet areas and stairway handrail will be concealed.

A clean earth system will be provided in the Main Comms room in the Basement.

There will be separate earth system for the standby diesel generator.

Suitable test links to be provided to facilitate testing in accordance with BS 7671, the IET Wiring Regulations.

7.21 Lightning Protection

Design Parameters

The Contractor will employ a lightning protection specialist to carry out a risk assessment in accordance with BS EN/IEC 62305 to ascertain the requirement for a new lightning protection system or the extension of the existing lightning protection system as well as the level of protection required.

The Contractor to provide a copy of the risk assessment carried out by the specialist Sub-contractor to the employer.

The specialist Contractor will design, supply, install, test and commission a new lightning protection system, if required, in accordance with all the appropriate standards, including but not being limited to:

- Requirements for Electrical Installations – IET Wiring Regulations BS7671 (including amendments)
- BS EN/IEC 62305 – Lightning Protection Standard

The specialist Contractor will be an approved installer and member of the National Federation of Master Steeplejacks and Lightning Conductor Engineers.

System Description

A lightning protection system will be provided, if necessary, to protect buildings and contents.

The air termination network will comprise of a grid of PVC covered 25x3mm aluminium tapes fixed to the underside of the roof via proprietary fixings, with finials distributed along the roof ridge.

The lightning protection building down conductors will utilise the structural steelwork wherever it is practicable to do so, and test points will be located at the connections to the structural steel. Where this is impractical, the down conductors will comprise of PVC covered 25x3mm aluminium tapes concealed behind the building cladding. Test points are to be located externally at low level.

All equipment located externally will require bonding. The top of each column will be bonded to the air termination network at roof level. A bond will be taken at low level at each column to connect the steel column to a 25x3mm tape, which will run externally to a concrete inspection chamber containing an earth rod.

The earth termination network will consist of earth rods and tapes at the appropriate intervals around the buildings' perimeter. Earth rods will be connected to the down conductor and will be complete with concrete inspection pit and a test joint. These will be positioned in coordination with the landscape architect. Any existing earth rods that might be retained should be tested for compliance with all the relevant standards.

A connection from the lightning protection system to the main earth terminal will be provided, as well as a connection to the separate earth network of the standby generator.

Surge Suppression devices of Types 1 and 2 will be installed at the main LV switchgear and Surge Suppression of Type 2 will be installed at all downstream external or roof mounted distribution boards, to comply with BS EN 63205.

External Transient Over Voltage Protection devices will be provided to the main LV switchboard as well as to the TV aerial, any external/ roof mounted distribution boards, any panel boards or electrical distribution boards serving major items of IT or telecoms hardware, e.g. Main Comms cabinets, patch panels etc, in order to protect electronic equipment from the secondary effects of lightning.

The whole lightning protection system will be tested for compliance with BS 62305.

7.22 PV Solar Panels System

The Contractor to liaise with a PV solar specialist to design a solar panel system installation that will extend over a minimum area of 40m² on the hotel roof.

The power generated by the PV system will be utilised to supplement power to the development; it will not be exported to the Grid.

The Contractor will include for factory testing and witnessing of the PV solar system.

The Contractor will include for the logistics required to install the PV solar system in its final locations on site. (for example: delivery vehicle, craneage, pulling equipment, rollers etc).

Design Parameters

Performance of PV panel's must satisfy the following requirements, in accordance with the Energy Performance analysis to achieve EPC A:

- Module nominal efficiency: >19%
- Electrical conversion efficiency: >95%
- Array size: 40m²
- Array orientation: South
- Array inclination: 30° from horizontal

The Contractor will be responsible for the final selection of the PV solar system's components. All equipment will be fit for purpose and suitably sized. In the case that final As Built performance levels do not meet minimum values set out, the Contractor will be responsible for offsetting energy savings and performance by enhancing other elements of the design and installation accordingly to achieve an EPC A rating.

The Contractor will ensure that the power generation system complies with all local authority, Building Control and Fire Officer requirements.

The Contractor will ensure G59 and G83 compliance, if applicable.

General LV Requirements

For general requirements, refer to the LV Distribution section of this specification.

Metering

For metering requirements, refer to the LV Distribution section of this specification.

The output of the PV solar plant will be metered by a Schneider electric PM5000 series electrical meter.

7.23 Vertical Transportation

Refer to the separate Vertical Transport Specification (document reference 1017000-SPC-VT-001), [Platform Lift Specification \(document reference 1017000-SPC-VT-002\)](#) and [Service Lift Performance Specification \(document reference 1017000-SPC-VT-003\)](#) for further details.

8.0

Sustainability

8.0 Sustainability

8.1 Overview

This section addresses the environmental aspects of the John Dalton House development. It covers a wide range of sustainability matters including energy efficiency, carbon emissions, and general issues included in BREEAM.

The following sections outline the relevant matters and methodologies in developing a building of a high standard of sustainability. The results of the assessments here within show that all mandatory performance criteria are being achieved based on the Stage 4 design. If any of the system values identified in this report are not achieved during later stages of the design and construction then the results reported here will no longer be valid, and some criteria might then be at risk of failing to meet the set targeted criteria. Therefore, it is important that the systems, minimum efficiencies and any other inputs stated within this report are adhered to.

8.2 Planning Requirements

Below is an outline of the most pertinent planning requirements, particularly regarding energy and emissions. Full policy requirements can be found in the document '1017000-RPT-SY-001 - Energy and Environmental Standards Statement – Rev B' (04 May 2018).

8.2.1 National Policy

The National Planning Policy Framework (NPPF) was published in March 2012 and states a clear presumption in favour of sustainable development. The NPPF supports the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change, and encourages the reuse of existing resources, including conversion of existing buildings, and encourages the use of renewable resources. The key focus of the NPPF is to support local and regional planning authorities.

8.2.2 Local Policy – Manchester City Council

Manchester City Council's Core Strategy was adopted in July 2012 and is the key development plan within the Local Development Framework.

Policy EN4: Reducing CO₂ Emissions by Enabling Low and Zero Carbon Development

The Council will seek to reduce fuel poverty and decouple growth in the economy, growth in CO₂ emissions, and rising fossil fuel prices, through the following actions:

- All developments must follow the principle of the Energy Hierarchy, being designed to reduce the need for energy through design features that provide passive heating, natural lighting and cooling;
- To reduce the need for energy through energy efficient features such as improved insulation and glazing;
- To meet residual energy requirements through the use of low or zero carbon energy generating technologies;
- Wherever possible new development and retrofit projects, including energy generation plant, must be located and designed in a manner that allows advantage to be taken of opportunities for low and zero carbon energy supplies;
- Where possible new development and retrofit projects will be used as a mechanism to help improve energy efficiency and provide low and zero carbon energy supplies to existing buildings;
- Where appropriate new development and retrofit projects will be required to connect to and/or make contributions to low or zero carbon energy schemes and/or to incorporate provision to enable future connection to any existing / potential decentralised energy schemes;
- The use of building materials with low embodied carbon in new development and refurbishment schemes;

Policy EN6: Target Framework for CO₂ reductions from Low and Zero Carbon Energy Supplies

The target framework applies to residential developments of 10 or more units, or non-domestic developments of at least 1000m². It relates to three broad development locations and their potential for low and zero carbon, decentralised energy. The areas are defined as follows:

- Target 1 Network development areas: Locations where the proximity of new and existing buildings, the mix of uses and density of development provide the right conditions to support district heating (and cooling).
- Target 2 Electricity intense areas: Locations where the predominant building type has an all-electric fit-out such as retail units and leisure complexes.
- Target 3 Micro-generation areas: Locations where lower densities and a fragmented mix of uses tend to mean that only building scale solutions are practical.

Non-domestic CO ₂ emissions reduction targets	
Table 12.2	
Target	% Minimum requirement
Target 1: Network development area	CHP/district heating anchor or connection or where not feasible, a 15% increase on Part L 2010
Target 2: Electricity intense buildings (Applies to commercial uses with a high proportion of emissions from electricity use (>45 kg CO ₂ /m ²))	+10% increase on Part L 2010
Target 3: Micro generation area	+15% increase on Part L 2010

John Dalton House falls under Target 3: "Micro generation area" due to the redevelopment being a single building construction with no access to a district network.

The 2013 revision to Part L of the Building Regulations was a key milestone towards the government's target for zero carbon buildings. New (carbon dioxide) emission rate targets were published in November 2013, which equated to a 9% (aggregate) improvement over the Part L 2010 standard for non-domestic buildings.

As a consequence of this reduction in emission rates required by current building regulations (Part L 2013), the revised Policy EN6 target CO₂ emission reductions for new non-domestic developments equate to 6% beyond Part L 2013.

However, as the proposals for John Dalton House include for the refurbishment of an existing structure, the project should therefore be assessed under Building Regulation Part L2B which is concerned with conservation of fuel and power in existing non-domestic buildings. The EN6 targets (which relate to new buildings) do not therefore apply to this redevelopment. However, the principles established within Policies EN4 and EN6 will nonetheless be adhered to.

8.3 Energy Strategy

In accordance with the Manchester Core Strategy and the Guide to Development in Manchester SPD planning requirements, the following Energy Statement has been developed for the proposed John Dalton House redevelopment. This energy strategy follows the energy hierarchy set out in the Manchester Core Strategy document.

Passive and energy efficiency measures contributing to the energy strategy include:

- The building's envelope will undergo a major refurbishment, substantially upgrading it from the current fabric. Low u-values, g-values, and air leakage rates will significantly reduce the buildings heating and cooling requirements.
- Glazed areas in the façade along with horizontal brise soleil are designed so that solar gain is restricted during summer, minimising the cooling loads, but enabling low angle sun to provide free heating in winter.

- The energy efficiency measures employed in the redevelopment include high efficiency multi-split VRF systems for heating and cooling throughout the majority of occupied areas; high efficiency natural gas boilers for back of house heating; and, high efficiency thermal wheel heat recovery on the majority of AHUs to greatly reduce the demand on heating plant.
- Central Air handling units (AHUs) are specified to have specific fan power (SFP) efficiencies significantly lower than the maximum 2.6 W/l/s allowed in refurbishment projects.
- An innovative solution has been devised for the domestic hot water (DHW) system, which accounts for the majority of this hotel building's energy consumption and carbon emissions. A CO₂ heat pump will be used to preheat mains water, up to approximately 50°C, leaving only a small portion of the load to be generated by the more carbon intensive direct gas fired boilers. This system setup enabled a substantial reduction in predicted carbon emissions (compared to a traditional boiler only setup), which is illustrated in the following Part L section.
- High efficacy lighting coupled with occupancy sensing to reduce emissions associated with lighting. There is no feasible opportunity for daylight dimming on this project.
- Electrical and mechanical systems will be tightly monitored, metered and controlled with a full Building Management System (BMS). This will enable energy use to be tracked and opportunities for efficiency improvements to be made.

Decentralised measures considered for the development:

- No district heating network is available near to the site for a feasible connection.
- CHP was discarded as an option for the building due to limited space in the plantrooms, and air quality issues.
- Therefore, no decentralised energy system is proposed for the redevelopment.

Consideration of Low and Zero Carbon technologies found:

- Variable refrigerant flow (VRF) technology will be used for space heating and cooling around the majority of the development. This type of system enables thermal energy to be moved around the building between spaces with varying thermal requirements, hence saving energy in heat generation. The inclusion of VRF enabled significant emission savings, which is demonstrated in the following section.
- A small area of photovoltaic (PV) panels will be included on the roof in the available space not occupied by major roof-mounted plant. Up to 40m² of PV with a module efficiency of at least 17.0% will provide a small amount of clean electrical energy for the development's electrical load, displacing more carbon intensive grid electricity.

The table below outlines the fabric and fixed building services efficiencies included in the Stage 4 Part L model:

Fabric details	Final Stage 4
Ground floor average area weighted thermal conductivity (U-value) (W/m ² .K)	0.25
External wall average area weighted thermal conductivity (U-value) (W/m ² .K)	0.28
Roof average area weighted thermal conductivity (U-value) (W/m ² .K)	0.18
Pedestrian entrance doors thermal conductivity (U-value) (W/m ² .K)	1.80
Windows thermal conductivity (U-value) (inc. frame) (W/m ² .K)	1.60
Windows glazing total solar transmission (G-value) (%)	0.40
Windows glazing visible light transmission (VLT) (%)	0.70
Windows frame factor (%)	0.10
Air permeability @ 50 Pascals (perimeter zones only) (m ³ (h.m ²))	5.00

HVAC details	Final Stage 4
Bedrooms/ensuites Electric ASHP heating SCoP	4.08
Bedrooms/ensuites Electric ASHP cooling SEER	3.86
Ground and Basement floors electric ASHP heating SCoP	3.00
Ground and Basement floors electric ASHP cooling SEER	3.00
Gas boilers seasonal efficiency	94.76%
Bedrooms/ensuites ventilation central SFP	2.03 W//s
Bedrooms/ensuites ventilation heat recovery sensible efficiency	73.0%
Bedrooms/ensuites ventilation ductwork leakage classification	Not tested
Bedrooms/ensuites ventilation AHU leakage classification	Not tested
Ground floor ventilation central SFP	1.94 W//s
Ground floor ventilation heat recovery sensible efficiency	73.0%
Basement floor ventilation central SFP	1.45 W//s
Basement floor ventilation heat recovery sensible efficiency	73.0%
Kitchen ventilation central SFP	1.94 W//s
Kitchen ventilation heat recovery sensible efficiency	None

DHW details	Final Stage 4
CO ₂ heat pump preheat efficiency	1.52
Gas boilers seasonal efficiency	96.4%
CO ₂ heat pump to gas boilers load ratio	80/20
DHW storage volume (L)	2285
DHW daily storage losses (kWh/(l.day))	0.00453
DHW secondary circulation losses (W/m)	8.98
DHW secondary circulation loop length (m)	232
DHW secondary circulation pump power (kW)	0.228
DHW time switch	No

Electrical details	Final Stage 4
Luminaire efficacy (luminaire lumens / circuit Watt) – bedrooms/ensuites	80
Luminaire efficacy (luminaire lumens / circuit Watt) – retail, bar, circ	80
Luminaire efficacy (luminaire lumens / circuit Watt) – offices, staffroom, kitchen, WCs	110
Luminaire efficacy (luminaire lumens / circuit Watt) – plantrooms, stores	130
Presence detection lighting control (all other zones manually switched)	offices, circ, WCs, changing rms,
Lighting occupancy sensor time switching	No
Lighting Constant illuminance control	No
Daylight dimming	No
Lighting metering	Yes
Lighting out of range values	Yes
Lighting parasitic powers (W/m ²)	0.1
Power factor correction	<0.9
Pumps speed	Variable
HVAC metering	Yes
HVAC out of range values	Yes

Photovoltaics	Final Stage 4
PV array size (m ²)	40
Minimum module nominal efficiency	17.0
Array inclination from horizontal	30°
Array orientation from North	180°
Module electrical conversion factor	0.95

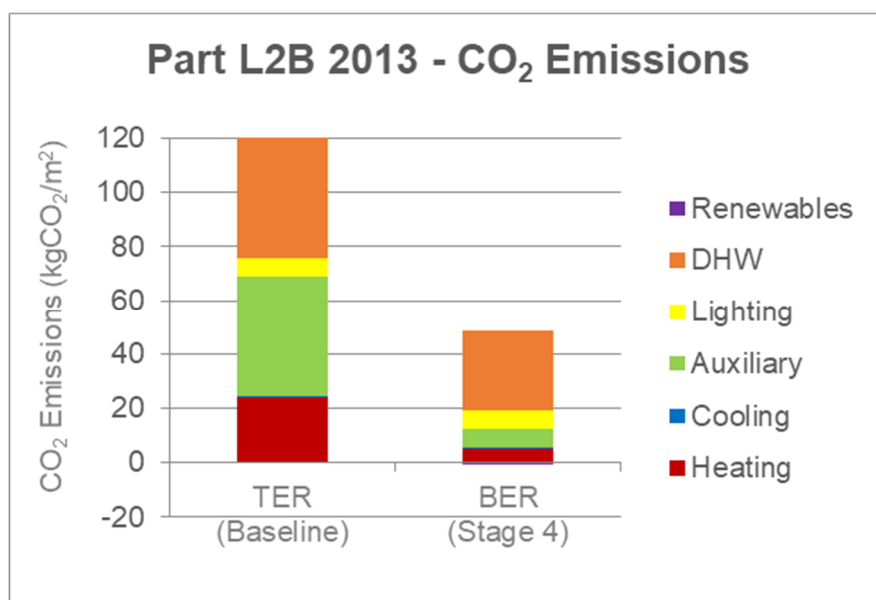
8.4 Part L Results

As this development is a refurbishment including an extension which contributes less than 25% of the overall floor area, the assessment must be made under Part L2B – Conservation of fuel and power in existing buildings other than dwellings – of the UK Building Regulations. This assessment methodology requires a 'Baseline' building be developed that is representative of the existing building. For this exercise, default fabric and fixed building services efficiencies were assumed based on the existing building's era of construction. Results from this model formed the Target Emissions Rate (TER) under Part L2B. The actual proposed building design was then modelled separately, the results from which formed the Stage 4 Building Emissions Rate (BER). These results and are presented in the figures below. The assessment found that the Stage 4 design is passing both Part L and the relevant planning requirements for emissions.

The proposed design was also simulated to determine its likely Energy Performance Certificate (EPC) rating, which expected to be a 'B'.

The Part L results also inform the calculation for the ENE01 Reduction of Emissions credit under BREEAM. In this case, the Stage 4 design does not enable any credits under ENE01.

Part L2B 2013	TER (Baseline)	BER (Final Stage 4)
Heating	23.93	4.89
DHW	53.90	29.21
Cooling	0.45	0.84
Auxiliary	44.61	6.79
Lighting	6.91	6.92
Renewables	0.00	-0.35
Total	129.80	48.30
Improvement		62.8%
Part L Status (BER<TER)		Pass
Planning Status (>6%>Part L 2013)		Pass
EPC Rating		B



8.5 BREEAM

The engineering services designs are being developed on the understanding that a BREEAM 'Very Good' rating should be attained.

Refer to the separate BREEAM TrackerPlus report document outlining the project position at this point in the design development.

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