

Supplementary bonding to all exposed and extraneous metalwork shall be installed in accordance with BS 7671 IEE Wiring Regulations. The items of equipment subject to bonding shall include but not be restricted to all piped services in bathrooms and any areas where difference in potential could cause danger to occupants. All supplementary bonding shall be connected to earth via adjacent power accessories circuit protective conductors. All terminations shall be via a proprietary earth clamp or threaded stud and a crimped lug.

### 1.3.9 Services to the Passenger Lift

The contractor shall supply and install a 3-phase and neutral power supply to serve the passenger lift terminating in a switchfuse located in a position determined by the lift supplier/manufacturer. The supply shall be derived from the Landlord's distribution board.

In addition to the main power supply, the contractor shall also install an unswitched spur and BT telephone line to terminate into a BT socket adjacent to the lift control panel. The contractor shall arrange for this line to be linked to the lift control panel and the lift company's central monitoring station to provide duplex speech.

### 1.3.10 SMALL POWER DISTRIBUTION

#### 1.3.10.1 General Small Power Installations

General small power comprises 13 Amp socket outlets, switch fused spurs and isolators etc all as associated with described equipment and all other power supplies.

Wall mounted accessories shall be provided in the areas as indicated on the drawings for general use wired on ring or radial circuits from the distribution board or consumer unit. All small power circuits shall be RCBO protected at the distribution board in accordance with BS7671 The 18<sup>th</sup> Edition of the IEE Wiring Regulations. Where circuits feed equipment that is likely to cause regular RCBO activation such as microwave ovens or cause inconvenience/damage in the event of RCBO activation such as alarms, fridges or freezers; these shall be suitably engraved: '**No RCD Protection**'.

All new faceplates and accessories shall be as follows:-

- Apartment Kitchens      MK Electric Edge in brushed stainless steel
- Remaining Apartment    MK Electric Logic plus
- Common Parts            MK Electric Logic plus
- Plantrooms & Risers      MK Electric Metalclad
- External                    MK Electric Masterseal

All cabling shall be LSF insulated contained in the systems described in [Section 1.3.5.1](#)

The contractor shall include to carry out all final connection wiring to fixed appliances such as the electric heaters and those in the kitchen. All final connection points shall be fully accessible so as to allow removal of the appliance without dismantling kitchen furniture. All appliances shall be capable of being isolated/ switched off from a readily accessible socket outlet or switch fused spur.

Final connection to equipment such as cookers, ovens, etc shall be in accordance with the appliance manufacturer's recommendations.

Cleaner's sockets, common parts electric panel heaters and electric car charge points are identified on the drawings. Circuitry and cabling for these shall be as shown on the schematics.

#### 1.3.10.2 **Space Heating & Hot Water Installation**

Space heating to the common parts and apartments will be via wall mounted Dimplex Monterey electric panel heaters with integral timer controls and thermostats. Heaters will be wired on ring mains as detailed on the schematic drawings. The timers on the panel heaters will initially set 0500 to 0800am and 1700 to 2200.

Space heating in the bathrooms will be via towel rails fed from the local general ring main. Control of the towel rails will be via local fused spurs complete with an integral 7-day timer. (<http://www.greenbrook.co.uk/timers-sensors-and-security-timer-and-fused-spur-combined-771>) Final connection to the towel rails will be via a flex outlet located 100mm from the towel rail.

Domestic hot water will be provided from an unvented cylinder located in the utility room. The cylinder will have 2no. immersion heaters. The peak immersion heater will be controlled by a local switch fused spur, the off peak immersion heater will be controlled by a local time clock and switch fused spur. The timeclock shall be set to switch on the immersion heater during the off-peak period.

Refer to the Appendices for full details of the Dimplex heating and hot water equipment.

#### 1.3.11 **SATV, TV, BROADBAND & TELEPHONE CABLING SYSTEMS**

##### **Broadband & Telephone Cabling**

The BT Openreach DP box and incoming cable will be located in the ground floor plantroom, from this location, the contractor will supply and install a 100mm wide cable tray to run vertically up the riser to the third-floor ceiling void. At each floor a 50mm cable tray will run the length of each corridor terminating outside each apartment. From the tray termination position, the contractor shall supply and install a 20mm flexible conduit to the BT master socket location in the apartment utility room. The contractor shall supply and install 2no. recessed accessory boxes at this location.

From the DP box on the ground floor, the contractor shall supply and install a BT Approved 5-pair CW1308 cable to each apartment master socket. The cable will be terminated by BT Openreach at both ends.

From the accessory box adjacent to the BT Master socket, the contractor shall supply and install BT Approved 2-pair CW1308 cables to each of the secondary telephone outlet. All cables including those adjacent to the Master socket shall be terminated into a BT secondary socket outlet. The contractor will supply and install a patch lead to allow the master, and adjacent secondary socket to be connected together.

In addition to the telephone services to the apartments, the contractor shall supply and install a telephone line to the passenger lift. The cabling will be installed and left for connection by BT as described above.

Face plates shall match the small power accessories and the outlets and terminations shall be tested and certified in accordance with IEEE guidelines.

#### **TV, FM DAB System**

The Contractor shall install a fully integrated Sky +, TV, FM and DAB system to the positions indicated on the drawings. The contractor shall install all containment, cabling and accessory boxes for the systems in accordance with this specification.

All cabling shall be WF100 wired from an amplifier and splitter located in the third floor riser.

The termination locations points for the system are as indicated on the drawings and are to include all containment, conduit drops accessory back boxes and wiring.

At roof level and in a position agreed with the client and Architect, the contractor shall install a 600mm SATV dish, a digital aerial, a DAB aerial and an FM aerial. A multi-core cable shall connect the aerial array to the head end distribution equipment in the plantroom.

The contractor shall include to employ a CAI approved specialist to verify that all cables have been installed correctly and are damage free at the completion of first fix. The specialist shall further advise on suitable locations for the aerial array.

### **1.3.12 LIGHTING SYSTEMS**

All luminaires shall be as detailed in the Appendices. Positions are detailed on the 200 Series drawings. Internal lighting shall generally be as follows:-

- Recessed GU10 LED downlighters in apartment general rooms/areas.
- IP rated Recessed GU10 LED downlighters in apartment bathrooms.
- Recessed GU10 LED downlighters in corridors
- Circular Halo LED Wall lights in the stairwell
- LED vapour proof luminaires plantroom and risers.
- Emergency/Escape lighting to the common parts and circulation areas installed in accordance with BS5266 Part 1

Where luminaires are connected to dimmers, they shall be complete with dimmable drivers. The contractor shall provide samples of various LED colour lenses for approval by the architect.

#### 1.3.12.1 Lighting Wiring

Final circuits feeding lighting systems shall generally be carried out as clause 1.3.5.1 installation method b).

The installation shall be achieved as follows :-

#### 1.3.12.2 Luminaire Installation

Wiring shall be LSF/LSF insulated cables using a loop in method fixed to the building structure soffit or walls and installed flush down walls to accessories in flush areas. Luminaires in plantrooms and external areas shall be wired via PVC conduit.

Luminaires shall be wall and ceiling mounted in the positions indicated on the drawings.

Recessed luminaires mounted within plasterboard ceilings which are not below concrete slabs shall be complete with smoke/intumescent hoods or fire plates rated with the same fire protection as the adjacent ceiling. The contractor shall ensure that luminaires are installed greater than 150mm from any insulation or in accordance with the luminaire manufacturer's recommendation. Final connections to the luminaires shall be by heat resistant flex and proprietary maintenance free junction boxes.

The contractor shall provide a schedule of all specified luminaires to accompany the tender.

The completed lighting installation shall fully comply with the requirements of Building Regulations Part L.

#### 1.3.12.3 Landlord's Areas & Emergency Lighting

Lighting in the circulation areas will comprise LED downlighters and wall lights. All will be controlled on a floor by floor basis via 360° PIR detectors located in the positions on the drawings. All circuits shall be derived from the landlord's distribution board and shall have an override timeclock to switch on all lights at night.

On all levels and in the positions indicated the contractor shall supply and install permanently illuminated emergency lights which will also act as safety lighting until the PIR detectors are energised. These are indicated on the drawings and shall be as the general downlights. Override switches shall be installed in the riser for isolation maintenance of all lighting circuits.

##### **Emergency Lighting**

Emergency lighting shall be installed to all circulation areas, escape routes and the plantroom to comply with BS5266 Part 1 and to a minimum standard of NM3. Luminaires in common parts shall be recessed LED downlighters, directional Exit signs or wall lights. Emergency lighting in all other areas shall be via the primary luminaires complete with a 3 hour NM3 battery backup and invertors. Test key switches shall be located in the Risers and main intake location.

The completed system shall be commissioned and certified in accordance with BS5266 Part 1 and the O&M manuals shall include a test and record log book.

#### 1.3.12.4 External Lighting

External car park, roadway and entrance luminaires will be as indicated in the positions on the Tender drawings and will be controlled by a time switch located in the electrical cupboard and a photo-cell located adjacent to the main entrance.

Binstore lights will be controlled by local PIRs each with dusk to dawn integral timers.

External lighting luminaires shall be as follows:

- LED vapour proof bulkheads in the binstore.
- Bollards to the roof recreation areas.
- Decorative LED column mounted lights and wall lights in the car park areas.
- IP Rated Recessed GU10 LED downlighters at the main entrance.
- Emergency/Escape lighting to the main and rear entrances installed in accordance with BS5266 Part 1

A quotation and data sheets for the external luminaires is included in the Appendices

### 1.3.13 FIRE SAFETY and PROTECTION SYSTEMS

#### 1.3.13.1 Apartment Smoke and Heat Detection

The Contractor shall include for supply and installation of a smoke and heat detection system compliant with BS5839 Part 6, Category LD2 to all apartments to the positions indicated on the drawings. The detectors shall be wired in LSF/LSF cables on a dedicated sub-circuit from the apartment consumer unit. All detectors shall be complete with rechargeable battery back up.

The systems shall be tested and certified in accordance with the full recommendations of the British Standard.

#### 1.3.13.2 Smoke Detection & Automatic Opening Vent (AOV) System

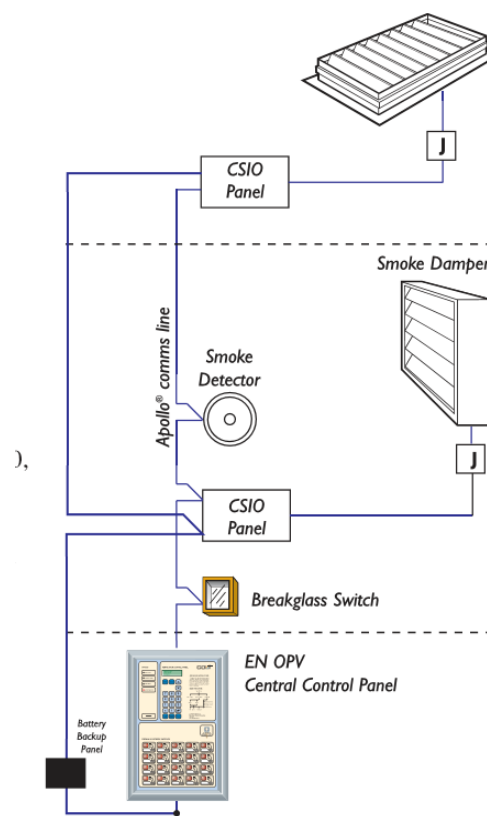
The Contractor shall include for supply and installation of an AOV system activated by smoke detectors all located in the positions indicated on the drawings. The system shall comprise a control panel located in the ground floor entrance complete with a 'break glass' override, smoke detectors, and an actuator linked to the AOV unit. The AOV unit will be specified by the architect. The system shall comply with the following standards:-

1. BS 9999, 2008 Code of practice for fire safety in the design, management and use of buildings
2. BS Code of Practice CP3 Chapter IV: Precautions against fire. Part I, flats and maisonettes (in blocks over two storeys)
3. BS 5588 Part I: 1990 British Standards Institution, fire precautions in the design, construction and use of buildings – code of practice for residential buildings

### 1.3.13.3 Fire Fighting Lobby Smoke Extract System

The corridor area adjacent the service cupboard on each floor is to be designated as a protected fire fighting lobby and as such will be ventilated via motorised smoke dampers, a fire rated extract shaft and run and standby extract fans located on the roof. All works will be carried out by a nominated specialist and it shall be the contractor's responsibility to provide all required electrical supplies to serve the control panel and the extract fan package set. All controls will be by the specialist and will be configured as follows.

#### TYPICAL CONTROLS CONFIGURATION



The electrical supply to the control panel will be located in the ground floor protected lobby and will comprise an unswitched fused spur.

The package fan set requires two electrical supplies, one primary derived from the landlord's distribution board and one secondary derived from a switchfuse connected directly to the incoming main serving the landlord's distribution board. The secondary supply will be wired in XLPE/SWA/LSF cable and will be contained in a galvanised steel trunking to the roof.

1.3.13.4 **Refuge Call System**

The Contractor shall include for supply and installation of a Refuge Call system on each floor comprising a recessed main control panel on the ground floor and recessed outstations on each floor in the positions indicated on the drawings. The system when completed shall comply with all relevant British Standards and the requirements of the Building Control Officer.

The system shall be as follows or similar:

<https://www.channelsafety.co.uk/dda-assistance-products/disabled-refuge-alarm-systems/channel-orbital-refuge-panel-options/>

### 1.3.14 SECURITY SYSTEMS

#### 1.3.14.1 Intruder Detection and Alarm System

The contractor shall install intruder alarms system to serve all ground floor apartments. Each system will comprise door and window contacts, Infra red/dual tech detectors, keypads, control panel and internal and external sounders all as detailed on the drawings.

Each system shall have the facility to be further connected to a British Telecom (BT) Redcare external monitoring system utilizing both land line and GPRS.

The contractor shall test and commission the system in accordance with NACOSS requirements and include to service and support the system for the first 12 months.

#### 1.3.14.2 Visitors Door Entry System

The contractor shall supply and install a door entry system to the positions indicated on the drawing. The system shall be both audio and colour video. All doors on the system shall be locked via transom mounted maglocks. These will de-energise when the controls are operated or if the mains power supply fails.

The external monitors located at each entrance shall be recessed and finished in stainless steel, internal monitors shall also be recessed and finished in stainless steel with a 4" colour monitor. The system shall be a CAME VRMSH5 (<https://www.came.com/uk/installers/solutions/came-bpt-intercom-systems/entry-panels/vr>)

The front and rear entrances shall be accessed via key fobs and an alphanumeric keypad. The key fob shall be time controlled. Egress shall be via an internal pushbutton. Adjacent to the push button, the contractor shall also supply and install a green emergency breakglass.

At Practical Completion, the contractor shall supply 100no. Key fobs for use by incoming tenants.

Access to the third floor amenity area shall be via a key pads linked to the same time, again the key pads shall be time controlled. Access back into the building shall be via external keypads. Both keypads shall have a green emergency breakglass.

The completed system will be commissioned and certified by the manufacturer or their appointed distributor.

#### 1.3.14.3 CCTV System

The contractor shall supply and install an IP based PIR activated Day/Night CCTV system with cameras located in the positions indicated on the Tender drawings. The system shall be cabled in Category 6 UTP cables and wired into a Digital Video Recorder (DVR) (Pentaplex or equal and approved) mounted in the Service cupboard. The system shall support 1.3 Mp dome cameras (Sony Exmor or equal and approved). Power to cameras shall be line driven therefore POE splitters shall also be included.



The system shall be suitable for viewing over the internet and an IT outlet and power supply is indicated on the drawings.

The system shall include all software applications to allow the images to be viewed via any PCs or tablets. The system shall have its own static IP Addresses to allow monitoring from an external source such as a central monitoring station or mobile cell phone. In addition to the above the contractor shall also supply and install an additional Naz-Drive digital recording device complete with a removable 2 TeraByte storage facility.

#### **1.3.15 DEMONSTRATION OF SERVICES/INSTRUCTIONS**

The electrical contractor shall include for one complete demonstration and instruction in the operation of all electrical services as detailed and described in the specification to be witnessed by the consulting engineer. A separate demonstration shall be included to the client at times to be agreed with the Architect.

#### **1.3.16 TESTING AND COMMISSIONING**

On completion of each part of the installation the electrical contractor shall carry out testing in accordance with BS7671 IEE Wiring Regulations, BS5839 Part 6 Fire Alarms in Domestic Premises and Section 6.0 of this Specification.

In addition, manufacturer's final tests and commissioning shall be carried out on the Intruder Alarm, Door Entry system, CCTV system and all other installed systems.

The results shall be noted on test sheets including readings of short circuit tests, IP, earth fault loop tests (ZE), volt drop and alarm audibility.

Prior to the carrying out of any testing the electrical contractor shall give reasonable notice to the Engineer in order that he may have the option of witnessing the tests. The results of all tests shall form part of the operating and maintenance instructions.

The electrical contractor shall include for commissioning the installation and for instructing the client in the current operating and maintenance of all plant and equipment.

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## Section 2 - MANAGEMENT AND INSTALLATION

### 2.1 Project Establishment

#### 2.1.0 DEFINITIONS

Contractor	-	Means the mechanical and or electrical contractor or Sub-contractor carrying out the design and installation of the works.
Main Contractor	-	The contractor whose tender is accepted for the building works.
Engineer or Consulting Engineer	-	Means the representative of the consulting mechanical and electrical engineers.
Contract Administrator	-	Means the Employers Agent or Project Manager.

#### 2.1.1 REGULATIONS AND STANDARDS

The contractor shall ensure that the installation complies fully with and are certified in accordance with all relevant regulations and standards as follows:-

1. All sections of this specification
2. The requirements and recommendations of the electricity, gas, water, drainage and telecom utility providers.
3. All applicable British Standards and European Codes of Practice current at the time of installation.
4. All statutory requirements and local bye-laws.
5. BS:7671 Requirements for Electrical Equipment of Buildings including all appendices and amendments current at the time of installation.
6. The Building Regulations and requirements of all statutory bodies.
7. The requirements of the Local Environmental Health Officer and the Control of Pollution Act.
8. Recommendations, Guides, and Technical Memorandum published by the Chartered Institute of Building Services Engineers.
9. Construction Design and Management Regulations. (where applicable)
10. Requirements of the Health and Safety at Work Act.
11. Requirements of the Local Authority, Planners and Licensing Officers.

12. The Factories Act and The Electricity at Work Regulations.
13. Local Water Requirements and Regulations 1992 (amended).
14. Local Authority drainage requirements.
15. Gas Safety Regulations.
16. The Clean Air Act.
17. The Electricity supply Act.
18. The Shops, Offices and Railways Premises Act 1963.

Should any query arise regarding the interpretation of the tender/contract documents, then the engineer shall have the final ruling.

The contractor shall include for any necessary liaison with the relevant Statutory Authorities i.e. Building Control, Fire Officer and Environmental Health.

The contractor shall include for liaison with the utility service providers for electricity, gas, water, drainage and telecoms regarding the programme of works for new supplies to the contract.

Upon completion of the works the contractor shall demonstrate the systems to the Relevant Authority representatives and make any modifications or alterations required if the installation fails to meet their requirements.

#### **2.1.2 DUTIES OF THE ENGINEER**

The engineer is responsible for setting the performance standards of the Mechanical and Electrical Engineering Services as described in this specification and drawings.

#### **2.1.3 DUTIES OF THE CONTRACTOR**

The contractor shall be responsible for the design and installation of the Mechanical and Electrical Engineering Services described by this specification.

The contractor shall execute the whole of the works to meet the requirements for the systems outlined in the specification and drawings. The installation shall comply with all relevant legislation, industry standards, recommendations and good practice.

The contractor shall supply the design, management, administration, engineering skills, supervision and labour necessary to complete the works in a professional manner.

The contractor shall ensure that the systems designed and installed under his works are co-ordinated and integrated with the building and other contractor installations and that they are interfaced as necessary to ensure the correct operation of the premises as a whole.

The contractor shall submit a selection of design calculations and information, drawings and samples as soon as practicable and allow adequate time for engineer's comments and to comply with the requirements of the contract programme.

The contractor shall provide all builderswork information necessary to accommodate the works within the building and its structure. This shall include the following :

- Plant and equipment dimensions weights and dynamic loading
- Acoustic information relating to the plant and equipment
- Dimensioned vertical and horizontal ducts, risers and hole sizes and positions

The contractor shall supply and deliver all materials plant and equipment to site, unload, store, hoist and place in position, fix and support, erect and connect, and protect during the contract.

The contractor shall test, commission and set to work all installations, materials, components and plant.

The contractor shall demonstrate the systems and provide user training.

The contractor shall provide as installed information and maintenance manuals.

The contractor shall guarantee the complete works for a period of twelve months from the date of practical completion and repair defects and faults in the systems or equipment during this period and until the defects list is signed off by the Engineer.

#### **2.1.4 SUPERVISION**

The Contractor shall appoint a competent design management and supervision team to execute works. All personnel shall have the appropriate qualifications training and experience to execute their tasks safely and to the highest professional standards. Each operative level shall be adequately supervised and controlled.

#### **2.1.5 SITE CONDITIONS**

Contractors should visit the site to gain knowledge of the accessibility and of the existing site conditions affecting design, labour, protection of existing services, carriage, unloading and storage of materials.

Contractors shall satisfy themselves as to the staging, scaffolding, tools, storage, accommodation etc., required for the proper execution of the contract.

Any claims by the contractor arising from lack of knowledge of the above will not be allowed.

### 2.1.6 INFORMATION TO BE PROVIDED AT THE TIME OF TENDER

In addition to any other information requested within the general contract conditions applicable to this tender, the following information must be provided by the contractor at the time of tender.

- Technical Specification
- Detailed tender analysis and breakdown
- List of proposed Manufacturers including name and catalogue reference or type, and the expected delivery date for all items of plant and equipment on which their tender offer is based from the preferred lists in Section 5.
- List of proposed sub-contractors
- List of all attendance's required by the main contractor.
- Schedule of any design alternatives and savings proposed with complete documentary information (note alternatives and savings must be outside tender sum)

### 2.1.7 DESIGN, DRAWINGS AND CALCULATIONS

The Contractor shall prepare and submit design calculations and drawings for the whole installations covered by this contract.

### 2.1.8 WORKING DRAWINGS

The contractor shall provide working drawings for the whole installations covered by this contract. The drawings shall be prepared using the current release of AutoCad and the contractor shall provide 2 paper copies and digital copies of each drawing and any subsequent revision.

Working drawings shall include:-

- a) General dimensioned layout drawings of the complete works.
- b) Detailed layouts showing the location of all plant and equipment including service routes, switch rooms and plant rooms.
- c) Key area sectional layouts in risers, floor and ceiling voids.
- d) Assembly drawings of all factory built equipment and site built assemblies.
- e) System diagrams and circuit wiring diagrams for all installations and equipment.

The contractor shall also prepare detailed dimensioned layout drawings showing final connections to equipment.

The contractor shall ensure that adequate space is provided for servicing and maintenance of all equipment and indicate this on the drawings.

If during the progress of the contract, modifications are required to be made to the works, the contractor shall submit revised drawings showing the modifications.

The contractor shall be responsible for any discrepancies, errors or omissions in the above mentioned drawings, whether these drawings have been commented on by the engineer or not.

Comments given by the engineer to any drawing shall in no way relieve the contractor from his liability to complete the works in accordance with the tender specification and drawings or exonerate him from any part of his guarantee.

#### **2.1.9 MANUFACTURER'S DRAWINGS**

The contractor shall provide to the engineer for comment two copies of manufacturing construction drawings giving all information, including dimensioned details of all equipment and manufactured components prior to commencing manufacture.

Manufacture of relevant items of plant and equipment shall not commence until the engineers comments have been actioned on the relevant manufacturing drawing.

#### **2.1.10 BUILDERSWORK DRAWINGS**

The contractor shall provide to the engineer and contract administrator for comment two copies of fully dimensioned drawings to an approved scale, of builderswork requirements in connection with this contract. Drawings shall show detail of plinths, holes, bases, and builderswork details.

The contractor shall provide to the engineer full particulars of static and dynamic loading including moments, and dimensions and positions of foundations and plinths, and/or fixings necessary for the support and accommodation of all equipment to be supplied under this contract, so that adequate provision may be made. Builderswork drawings shall be fully dimensioned showing location of holding down bolts, details of anti-vibration mountings and secondary support steelwork.

#### **2.1.11 CONSTRUCTION DRAWINGS**

Once the design calculations, working, manufacturers and builderswork drawings have been commented upon and finalised, they shall be issued marked as construction drawing and circulated to all relevant parties. The contractor shall include for three paper and one digital copy of drawings.

#### **2.1.12 APPROVALS**

##### **Building Regulations**

The design and installation of the building services shall meet or exceed the requirements of the Building Regulations. The contractor shall include for the necessary provision of information and negotiation with the approving body to achieve building regulations approval and certification. The design contractor shall be responsible for all works and design time associated with calculations and submission to achieve building regulations approvals including liaison with architect and Standard Building Energy Assessment Method or SAP calculations.



## Planning

The design and installation of the building services shall be arranged and achieve or meet the planning approval. The contractor shall include for any design requirements to meet planning regulations and shall provide the architect with any information or drawings required for submission to the planners.

### 2.1.13 ACOUSTICS

The contractor shall ensure that all plant, equipment and components provided meet the appropriate recommended internal and external acoustic design criteria as laid down in the CIBSE Guides to current practice.

### 2.1.14 PATENTS

The contractor shall indemnify the employer against all claims, cost or expense in connection with any patented, copy-righted or protected article supplied by the contractor or his sub-contractor and used on or in connection with the works. Including any payments or royalties shall be included in the contract price and paid by the contractor to whosoever they may be due.

In the event of any such claims being made on the employer, in connection with such patented articles, he shall immediately notify the contractor who shall, at his own expense, conduct any negotiations or litigation in connection.

### 2.1.15 THE CONSTRUCTION (DESIGN AND MANAGEMENT) REGULATION 2015

The construction design and management (CDM) Regulations 2015 (if applicable) will apply to all members of the construction team. As a Design contractor it is important that the contractor is aware of his duties to ensure successful management of Health and Safety during the construction work.

The key design duties can be outlined as follows:-

- . Alert clients to their duties.
- . Consider during the development of designs the hazards and risks which may arise to those constructing and maintaining the structure
- . Design to avoid risks to health and safety so far as is reasonably practicable.
- . Reduce risks at source if avoidance is not possible.
- . Consider measures which will protect all workers if neither avoidance nor reduction to a safe level is possible.
- . Ensure that the design includes adequate information on health and safety.
- . Pass this information on to the planning supervisor so that it can be included in the health and safety plan; and ensure that it is given on drawings or in specifications, etc.

- . Co-operate with the planning supervisor and where necessary, other designers involved in the project.

The key construction duties can be outlined as follows:-

- . Provide information for the health and safety plan about risks to health and safety arising from the works and the steps they will take to control and manage the risks.
- . Manage their work so that they comply with rules in the health and safety plan and directions from the principal contractor.
- . Provide information for the health and safety file including method statements and about injuries, dangerous occurrences and ill health.
- . Provide information and training to the employees on site.
- . Provide operation and maintenance manuals including risk assessments and method statements for operations required to maintain the systems installed under this contract.

#### **2.1.16 VARIATIONS/ADDITIONS**

No variations or additions to the contract are to be undertaken without the written approval/instruction of the contract administrator.

#### **2.1.17 INFORMATION**

The contractor must satisfy themselves using the drawings and specification and by visiting the site, the exact requirements of the contract.

Lack of information in this respect will not be considered to form a claim later.

#### **2.1.18 ACCESS TO PLANT**

Plant shall be installed in such a manner that components may be installed, accessed, maintained, removed and replaced without difficulty and without compromising the safety of personnel. The installation shall, as a minimum, satisfy the following requirements:-

- . BS:7671 Requirements for Electrical Equipment of Buildings
- . Manufacturers recommendations
- . BS:8313 (Accommodation of Building Services in Ducts)
- . BSRIA Application Guides - Design for Maintainability
- . BSRIA Technical Notes - Space Requirements for Building Services Distribution Systems
- . CDM Regulations

All maintainable items of plant shall be accessible from floor level.

All items of plant which are likely to be replaced within the life of the building shall be arranged such that they can be removed without dismantling any elements of permanent structure and without comprising normal access routes. For the purposes of this requirement permanent structure shall be defined as any building components which cannot be readily removed or reassembled within a practical time period.

The above requirements are intended to indicate the expected standards. Should it prove necessary to compromise any access provision the contractor shall record the proposals and justification and shall submit to the engineer and the planning supervisor. If accepted as the most appropriate arrangement details of the non-compliance shall be recorded in the Operating and Maintenance manuals and the Health and Safety file.

#### **2.1.19 SCHEDULE OF RATES**

The contractor shall provide within 2 weeks after being appointed to carry out the works, 2 copies of the schedule of rates adding up to the total tender sum.

No work will be valued unless a schedule of rates has been issued.

All variations during the contract shall be based on the prices indicated within the schedule of rates submitted.

The schedule does not remove the contractors responsibility for the accuracy of the tender and the contractor will be deemed to have included for all materials and labour, etc, for the complete installation as detailed in the tender specification, drawings, and site conditions.

#### **2.1.20 PHASING AND PROGRAMME OF WORKS**

The contractor shall produce a detailed programme of works in conjunction with the overall development programme which clearly demonstrates the proposed sequence of the works. The contractor shall report progress on a monthly basis against the programme.

During the course of the contract detailed programmes of work shall be submitted for specific areas (e.g. Testing, Commissioning, Demonstration and User Training) as requested by the engineer.

#### **2.1.21 CONFIDENTIALITY**

The tenderer (whether his/her tender is accepted or not) and any other recipients of the specification and documents (whether they submit a tender or not) shall treat the details of the specification and drawings as private and confidential and shall not reproduce same without the Engineers permission.

### 2.1.22 PROHIBITED MATERIALS

The following substances will not be specified for use or used in the construction of the works. The Contractor will further advise the Engineer of it becoming aware that any material it has specified has become generally known to be deleterious between specification and use, and if any of the below is discovered within the property.

- High alumina cement
- Woodwool slabs in permanent shuttering form
- Calcium chloride in blockwork or brickwork
- Asbestos products
- Sea washed aggregates or sea dredged aggregates
- Concrete, concrete blocks and concrete products made with aggregates made from rock types such as slate, shales and sand stones with a high proportion of clay and in particular pyretic slates
- Aggregates which do not comply with BS 882 and BS 8110 and aggregates susceptible to alkali silica reaction
- Calcium silicate bricks and tiles
- Lead or any products containing lead for use in drinking water systems
- Urea formaldehyde foam or any insulation product containing formaldehyde or any materials which release formaldehyde in quantities which may be hazardous with reference to the limits set by the Health & Safety Executive
- Materials which are generally composed of mineral fibre either man made or naturally occurring which have a diameter of 3 microns or less and/or a length of 200 microns or less which contain fibres not sealed or otherwise stabilised to ensure that fibre migration is prevented
- Glass fibre reinforced concrete
- Bricks or blocks with more than 0,5% soluble sulphate content
- Colliery waste as fill material
- Slip bricks
- Concrete that may be susceptible to alkali-silica reaction
- Proprietary open web lattice joists or beams nailable type
- Timber trusses manufactured with truss plate connectors
- Resin coated blocks
- Lightweight or air entrained concrete blocks
- All tropical rainforest hardwood
- Any product which contains Montreal listed CRC gasses or uses them in manufacture
- PTFE fabrics the use of PTFE as jointing tape in plumbing installations is permitted
- Bitumen coated polyurethane for use as a damp proof course
- Any substances which by nature or application contravene any relevant British Standards or Codes of Practice or good building practice applicable at the time of use and any other materials generally known at the time of specification or use to be deleterious to health or safety or to the durability or integrity of buildings.

### **2.1.23 ENERGY EFFICIENCY ASSESSMENT**

The mechanical and electrical services installations shall be designed wherever possible to achieve the highest energy efficiency as required by the Planning Conditions if applicable.

## **2.2 Procurement, Plant and Materials**

### **2.2.1 SUB CONTRACTORS**

Any proposed subcontractors must be approved by the engineer prior to letting of subcontracts.

As soon as practicable after entering into the contract and after of the engineers approval, the contractor shall enter into such sub-contracts required as he considers necessary for the satisfactory and timely completion of the contract works.

The contractor shall provide a copies of all sub-contract orders placed in connection with this contract on request.

### **2.2.2 SUPPLIERS**

The contractor shall be held responsible for ensuring that the performance of all fittings or equipment meet the requirements of the design, whether or not the manufacturers and suppliers details are mentioned in the specification.

### **2.2.3 SAMPLES**

The contractor shall provide a sample, properly labelled, of any materials and products proposed for use in the works, on request of the engineer.

Such samples shall be submitted to the engineer for his comment at his offices or elsewhere as directed, with all parts left loose, so that they may be taken apart for internal inspection by hand without the necessity of using spanners, screwdrivers or wrenches.

The engineer may require such samples to be subjected to tests designed to ensure compliance with British Standard and other relevant Specifications and requirements of this contract.

The contractor shall provide the facilities and apparatus for such tests and carry them out in the presence of the engineer. The contractor shall also replace the samples where necessary.

Samples shall be liable to be retained for the purpose of comparison with future deliveries, but any or all of the samples shall be returned to the contractor should he so request, after their purpose has been served.

#### **2.2.4 NAME PLATES AND LABELS**

All plant and equipment supplied for the works shall give the manufacturer's name, date of manufacture, type and working conditions, etc., together with all other particulars which will aid identification for the ordering of spare parts.

#### **2.2.5 SITE DELIVERY**

The contractor shall be responsible for the off-loading, storing and manoeuvring of his plant and equipment in connection with this contract.

#### **2.2.6 HANDLING AND STORING MATERIALS AND PRODUCTS**

The Contractor shall be responsible for the following:

- Deliver, off-load, store and transport about the Works all materials and products in the manner recommended by their manufacturers.
- Provide adequate safe, covered storage and protection for all materials and products.
- Protect all open ends (on equipment, pipework, ductwork, cables, etc) from ingress of dirt, dust and moisture by means of purpose made caps or covers.
- Where materials and products cannot be stored in dry buildings, they shall be raised clear of the ground and supported. They shall be protected from damage by frost, water and building work with covers or other appropriate means. Materials and products must not be stored by placing directly on earth or any other damp or corrosive surface.
- Materials and products shall be adequately coated to prevent damage by oxidation, etc., and this coating shall be maintained until ready for final finishing.

#### **2.2.7 ASBESTOS BASED MATERIALS**

No asbestos based materials shall be used on the contract. Where the contractor encounters any asbestos based materials or materials which he suspects might contain asbestos he shall leave the material undisturbed and immediately advise the contract administrator.

Although the contractor is required to comply with the general requirements of the Health and Safety at Work Act particular attention is drawn to the hazards associated with asbestos based materials. The contractor shall, in addition, satisfy himself by references to the appropriate Statutory Authority that no risk exists.

#### **2.2.8 ERECTION OF PLANT**

The erection of all plant and equipment included in the works, shall be the sole responsibility of the contractor, who shall carry out any special instructions given, or recommended, by the manufacturer. In the absence of any instructions, the contractor shall submit his proposals to the engineer and supervisor. Should any faulty erection of equipment affect the working efficiency of the plant, the contractor shall be bound to make good at his own expense.

## **2.3 Installation**

### **2.3.1 CO-ORDINATION AND INTEGRATION**

The contractor shall ensure that the programme of installation of the services in relation to each other is co-ordinated and carefully planned before any installation work commences including liaison with other sub-contractors and designers.

The contractor shall submit to the engineer dimensioned plan and section co-ordinated services drawings for known congested areas. These drawings shall adequately demonstrate that proper co-ordination of the works will be achieved within the allocated service zones and with the building structure and finishes.

It is the contractors responsibility to ensure that potential clashes are identified before work commences in all areas. The contractor shall ensure that such co-ordination planning is programmed to provide reasonable time for modifications to be detailed where necessary before installation is due to commence.

The working drawings shall be provided by the contractor together with site sizes and the necessity of arranging access to all services for maintenance, and to establish the inter-relationship of services in confined spaces. Builderswork drawings shall be provided by the contractor with full knowledge of the inter-relationship of all services present.

The exact position in the works of the above items relative to grid lines, floors, beams, ceiling, walls and other structural items and any other services in this contract is the responsibility of the contractor.

### **2.3.2 PROGRESS DRAWINGS**

The contractor shall keep on site one full set of prints of the working drawings marked with the progress of all work in connection with this contract.

These drawings, which shall be maintained in clean condition, shall be kept up to date on a weekly basis, and all pipe lines, cable routes, positions of equipment and apparatus, including all modifications and/or variations, shall be clearly recorded by the contractor on the drawings as they are installed.

The contractor shall retain and make the above drawings available at any time for inspection by the engineer.

### **2.3.3 ATTENDANCE**

The contractor shall be responsible for the execution of the following works:-

- 1) Supplying all relevant information pertaining to chases in floors, walls and ceilings where necessary.
- 2) Setting out all holes, ducts, etc., required through walls and any other structures.

- 3) Providing the information regarding the disposition, number and dimensions of all Services in partition walls.

This information may be conveyed by marking out and or drawn information as required and agreed under the particular contract. The contractor shall include any necessary attendance on site to allow co-ordination of these activities with the main contractor or sub contractor carrying out the work.

#### **2.3.4 LABOUR AND SUPERVISION**

Only skilled tradesmen shall carry out the works.

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

The supervisor shall prepare progress schedules and a programme to ensure full exchange of information with other trades and shall be available to attend meetings on site as required. The supervisor shall also keep a diary recording the day-to-day progress of the work and the details of all instructions received.

The contractor shall be responsible for the supervision and correct installation of all work carried out under this contract whether or not he has, with the permission of the contract administrator, let any portion of the works as a specialist Sub-contract.

Where such a portion of the works has been let to a specialist sub-contractor, all contact with him shall be through the contractor.

#### **2.3.5 PAINTING AND ANTI-CORROSION TREATMENT**

All components requiring anti-corrosive treatment shall be painted or shall be treated by other "metal coating" methods.

All paints shall be lead free type, with primers having good adhesion, good rust covering power, rust inhibiting and grain flowing properties. Gloss paint shall be machine finished paint having high adhesion and high resistance to solvents, mineral oils, cutting oils, detergents, chipping and impact damage.

All paints shall be manufactured by one of the scheduled firms and supplied by one manufacturer, even if the painting is done off site. The paint shall be delivered to site in sealed containers labelled with the following information.

- 1) Type of Paint
- 2) Brand Name
- 3) Manufacturer's batch reference

Work described as painted shall be given one coat of primer and two coats of glass machine finished paint. Work described as primed shall be given one coat of primer.

Damage to metal coated/painted work shall be repaired to the satisfaction of the Engineer or the component replaced.



### 2.3.6 FIXING TO BUILDING FABRIC

The contractor shall be responsible for the structural integrity of all supports and fixings for plant, equipment and components.

Components and equipment shall be fixed firmly to the building fabric using screws or bolts, as specified, of the maximum size permitted by the fixing holes.

Screw-fixings to solid brickwork or concrete shall be made using substantial proprietary metal or plastic plugs, ensuring that both plug and screw are well embedded into the masonry behind and applied finish. Screw-fixing to sheet metal shall be made using sheet metal screws.

Through-the-wall bolt-fixings shall consist of a bolt sufficiently long to pass through the wall, spreader plate under the head and a nut and washer.

Bolt-fixings to solid brickwork, blockwork or concrete shall be made using self-drilling anchors. Bolt-fixings to hollow backgrounds shall be made using toggle-bolts or expanding plastic rawlnuts.

Bolt-fixings to structural steelwork shall be by means of clamps and adapters of the Lindaptor, installed in the manner recommended by their manufacturer.

The proposed methods of fixing to the structure should be approved by the structural engineer and engineer.

The following operations must not be carried out without the permission of the structural engineer. Failure to observe this requirement may result in the contractor having to make good the damage to structural steel, reinforced concrete, facing brick and other materials at his own expense.

- 1) Drilling or cutting of holes in structural steelwork
- 2) Welding on structural steelwork
- 3) Drilling of holes in reinforced concrete
- 4) The use of cartridge operated tools
- 5) Drilling or fixing to roof purlins

### **2.3.7 POSITION OF POINTS**

The positions, points and equipment shown on the drawings shall be assumed approximate for Tender purposes.

The contractor shall ensure by referring to the architect's or other detailed drawings that all accessories are located to suit fitments etc., and the equipment served by the outlet or accessory.

### **2.3.8 INTERRUPTION OF EXISTING SERVICES**

The contractor shall not, unless he has received the written permission of the engineer and contract administrator, interfere with, or interrupt in any way, the operation of any existing services such as gas mains, water mains, sewers, drainage, electricity cables, etc., and in the case of the work of statutory authorities or private owners, without also having received permission of such authorities or owners.

The contractor shall be responsible for any damage to such services caused by the contractor's personnel and equipment and shall make good any such damage at his own expense, to the satisfaction of the contract administrator, authorities or owners.

### **2.3.9 CONNECTING TO EXISTING SERVICES**

The contractor shall notify the engineer and the contract administrator in writing, giving a minimum of seven days notice, of his intention to connect into or isolate any existing services and await his approval for so doing. The notice shall be accompanied by a method statement for the works which includes detailed timings with regard to preparation duration and service interruption.

**2.3.10 NOTICE PRIOR TO COVER**

The contractor shall notify the engineer or contract administrator in writing, giving a minimum of seven days notice, whenever any works or materials are ready to be covered within building fabric, ceilings, earth or otherwise hidden and shall leave these works uncovered until they have been inspected and approved by the engineer or contract administrator.

Any work which is covered or hidden before inspection by the engineer or contract administrator, shall, where required be uncovered and subsequently made good at the expense of the contractor.

**2.3.11 PROTECTION OF THE INSTALLATION**

The contractor shall allow for taking all necessary precautions to protect the complete installation from any damage which may occur before handover and written acceptance by the engineer or contract administrator.

The cost involved in repairing any damage before handover.

**2.3.12 REMOVAL OF RUBBISH AND CLEANING**

The contractor shall at all times keep the site free from obstruction and rubbish insofar as they are a direct result of carrying out the contract works and he shall remove from the site at his own expense, all surplus materials and temporary works which were brought on to the site by as soon as these are no longer required. On completion of the works, the contractor shall leave the site in a clean and tidy condition, to the satisfaction of the engineer and contract administrator.

**2.3.13 NOTICES AND LABELS**

All plant, equipment, components, isolators and switches shall be fitted with labels detailing their function. The labels shall be black characters engraved on white traffolyte securely fixed to the equipment.

**2.3.14 FINAL CONNECTIONS**

The contractor shall allow for making all final connections to equipment and for co-ordination with the equipment supplier or manufacturers.

**2.3.15 MATERIALS**

All materials and items of equipment are to be of the same manufacture for their various types, in order to standardise and simplify maintenance and replacement.

All materials are to be adequately protected and stored, and the tender price to include for all necessary storage containers required for this purpose.

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**2.3.16 FIRE PRECAUTIONS**

All materials and surfaces incorporated in the construction of the development should have the requisite fire resistance, surface spread of flame and other relevant characteristics appropriate to their location and purpose as required by the appropriate regulations and in accordance with current legislation.

The contractor shall also allow for complying with site safety practices with regard to fire precautions. This may involve the preclusion of hot works during certain periods.

**2.3.17 WARRANTIES**

All warranties and guarantees for materials, equipment and components shall be provided for 12 months from practical completion. Extended warranties shall be provided where any plant is utilised for any reason other than commissioning prior to handover.

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## **Section 3 UTILITIES**

### **Contents**

- 3.1. General**
- 3.3. Water Services**
- 3.3. Drainage Services**
- 3.4. Electrical Services**
- 3.5. Telephone & Broadband**

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## Section 3 UTILITIES

### 3.1. General

The following is a general indication of the utility service requirements for the project. It shall be the responsibility of the contractors to liaise with the various statutory bodies and suppliers / shippers regarding the detailed requirements for the project.

### 3.2. Water Services

The Client has procured a quotation for the supply and installation of a new water service to the site boundary. From this location, the contractor will supply a new MDPE water main to the plantroom in the ground floor corridor to serve the Cat 5 booster set and a cold-water storage tank complete with a multi-stage booster set. The incoming pipework and arrangements will be as drawing no.s 1359-105 & 500.

It shall be the contractor's responsibility to liaise with Affinity Water and take responsibility for programming the installation of the new supply.

### 3.3. Drainage Services

It shall be the contractor's responsibility to liaise with the Building Inspector and arrange witnessing and final certification.

### 3.4. Electrical Services

The Client has procured a quotation for the supply and installation of a new electricity service to the meter cupboard in the ground floor corridor. The route for the incoming services and the general arrangements will be as drawing no. 1359 – 204 & 500.

It shall be the contractor's responsibility to liaise with UKPN and the meter operating companies throughout the period of the contract and take responsibility for programming the installation of the new supply.

### 3.5. BT & Broadband

The contractor shall apply to BT Openreach for all BT Infinity and Broadband lines and install all ducts and access chambers in accordance with their requirements.

The Contractor shall include for the liaising with BT and BT Openreach to activate any new accounts.

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## Section 4 TESTING, HANDOVER AND WARRANTY

### Contents

#### 4.1 General Requirements

- 4.1.1 Management and Administration
- 4.1.2 Inspection of Equipment
- 4.1.2 Test Certificates

#### 4.2 System Specific Testing and Commissioning

- 4.2.1 General
- 4.2.2 Low Pressure Hot Water Heating Installation
- 4.2.3 Hot Water Supply Installation
- 4.2.4 Cold Water Supply Installation
- 4.2.5 Gas Installation
- 4.2.6 Ventilation Installation
- 4.2.7 Thermal Installation
- 4.2.8 Above & Below Ground Drainage
- 4.2.9 Electrical Installation
- 4.2.10 Plant and Equipment
- 4.2.11 Confirmation of Set Points

#### 4.3 Handover

- 4.3.1 Operation and Maintenance Instructions
- 4.3.2 Record Drawings
- 4.3.3 Employer's Representative Training

#### 4.4 Warranty and Maintenance

- 4.4.1 Warranty
- 4.4.2 Maintenance

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## Section 4 TESTING, HANDOVER AND WARRANTY

### 4.1 General Requirements

#### 4.1.1 MANAGEMENT AND ADMINISTRATION

All testing and commissioning shall be properly and safely executed in accordance with sound practice, Health and Safety considerations and the Electricity at Work Regulations.

The contractor shall include for the complete testing and commissioning of the installations which must be to the complete satisfaction of the client's representative, fully demonstrating the performance of the installed systems.

All testing and commissioning shall be carried out in accordance with British Standards and with the relevant section of this document in the presence of the client's representative, on site, and if requested at the place of manufacture. Throughout testing and commissioning the contractor shall use certified calibrated instruments and apparatus supplied by the contractor.

Where test parameters are not given results obtained equal to or better than the minimum standards set out in the British Standard shall be deemed satisfactory.

The client's representative shall have access at all reasonable times to such parts of the contractor's or his sub-contractor's works as may be necessary for the purpose of inspection, examining and testing of materials, workmanship and performance of plant.

Except where stated in the specification or in the contract documents the Contractor shall provide all labour, materials, power, fuel test and access equipment for carrying out the tests specified.

Within four weeks of the contract works being let to the contractor he shall provide, for the agreement and approval of the client's representative, a comprehensive commissioning dossier giving full details of all tests to be carried out. The proposed method of recording of test information in respect of the plant and installations to be installed in the contract.

Prior to the anticipated commencement of commissioning works, the contractor shall resubmit the commissioning dossier, augmented and revised to suit any alterations or additions/deletions to the Scope of Works, which have been implemented during the contract period, for final approval of the client's representative.

The contractor shall give the client's representative a minimum of seven days notice of his intention to carry out tests.

Additional tests may be carried out as requested by the client's representative during the Defects Liability Period. Tests shall only be requested in this period if equipment is not performing as specified. Should it be found, after re-testing, that the acceptance test criteria has not been maintained, then any additional costs incurred shall be borne by the contractor.



#### **4.1.2 INSPECTION OF EQUIPMENT**

The contractor shall inspect all plant and equipment immediately on delivery and shall not accept any which is damaged.

Any plant, equipment and accessories found to be unduly marked by tools or damaged, corroded or distorted by any cause, will be rejected by the client's representative and must be replaced by the contractor at his own expense.

Any damage considered repairable must be notified to the engineer for inspection before any remedial work commences. Remedial work shall only be carried out on the authority of the client's representative.

The contractor shall be responsible for protection of his work during the execution of the contract.

#### **4.1.4 TEST CERTIFICATES**

Manufacturers and other Test Certificates are to be provided in duplicate for all systems, plant and equipment. These shall be submitted to the engineer during the testing and commissioning process. Additional copies shall be incorporated in the maintenance manuals as detailed elsewhere.

### **4.2 System Specific Testing and Commissioning**

#### **4.2.1 GENERAL**

All testing and commissioning shall be properly and safely executed in accordance with sound practice, Health and Safety considerations and the Electricity at Work Regulations.

The contractor shall include for the complete testing and commissioning of the installations which must be to the complete satisfaction of the client's representative.

All testing and commissioning shall be carried out in accordance with British Standards CIBSE Guides, IEE Regulations and with the relevant section of this document in the presence of the client's representative, on site, and where requested at the place of manufacture. Throughout testing and commissioning the contractor shall use properly calibrated and certified instruments and apparatus supplied by the contractor.

Where test parameters are not given results obtained equal to or better than the minimum standards set out in the British Standard shall be deemed satisfactory.

The client's representative shall have access at all reasonable times to such parts of the contractor's or his sub-contractor's works as may be necessary for the purpose of inspection, examining and testing of materials, workmanship and performance of plant.

Except where stated in the specification or in the contract documents the contractor shall provide all labour, materials, power, fuel and test equipment for carrying out the tests specified tests shall be on the site and/or off site as applicable to the test specified.

The contractor shall ensure that all test equipment utilised by himself or his representatives for carrying out the tests is adequately maintained and calibrated, and carefully handled and transported.

The contractor shall give the client's representative a minimum of seven days notice of his intention to carry out tests.

The contractor shall allow for carrying out these testing and commissioning of the installation in sub-sections as may be necessary for technical purpose or to suit the construction programme.

Additional tests may be carried out as requested by the client's representative during the Defects Liability Period. Tests shall only be requested in this period if equipment is not performing as specified. Should it be found, after re-testing, that the acceptance test criteria has not been maintained, then any additional costs incurred shall be borne by the contractor.

Where commissioning tests are required to be carried out on specialist equipment and installations, the attendance of the Specialist Manufacturer/Installer, together with any specialist test equipment, shall be provided as part of this section of the works.

All commissioning personnel shall be properly trained and competent in the use of the instruments they are using.

#### 4.2.2 LOW PRESSURE HOT WATER HEATING

##### INSTALLATION

##### Pressure Test (before insulation and painting)

The whole of the system shall be filled with water and tested to twice the normal working pressure.

The test pressure shall be maintained for 30 minutes after dealing with all weak joints, defective fittings and pipes disclosed by the initial application of the test. The test shall be repeated after any defect has been repaired.

When this test has been completed the system shall be drained down and allowed to flush itself by removing sections from the lowest points of the installation.

Where the pressure tests involved may cause undue strain or damage to the expansion bellows installed, dummy pieces shall be provided in the pipelines during the tests, which shall be equal in length to the expansion bellows plus an allowance of one third the expansion rate for cold draw.

Where a test pressure of twice the normal working pressure exceeds that allowed on any component in the system, these items shall be removed or isolated before the pipework is tested. The whole system shall then be re-tested to a maximum pressure acceptable to all components.

**Thermal Test** (after insulation and painting)

A series of approved tests shall be performed on the heating installation before handover and during the first full heating season, or after handover at a time agreed with the Services Engineer.

Records in triplicate shall be made of these tests which shall include temperature of normal operation.

**4.2.3 HOT WATER SUPPLY INSTALLATION**

**Pressure Test** (before insulation and painting)

The whole of the system shall be filled with water and tested as detailed for the Hot Water Heating Installations.

Where a test pressure of twice the normal working pressure exceeds that allowed on any component in the system, these items shall be removed or isolated before the pipework is tested. The whole system shall then be re-tested to a maximum pressure acceptable to all components.

**Thermal Test** (after insulation and painting)

A series of tests shall be performed on the hot water supply installation to Code of Practice C.P.342. Records shall include normal temperature, flow and pressure head available at fittings and equipment served.

**4.2.4 COLD WATER INSTALLATION**

The installation shall be pressure tested as detailed for the Hot Water Heating Installations.

**4.2.5 GAS INSTALLATION – Not Required**

#### 4.2.6 VENTILATION INSTALLATION

##### General Ventilation Equipment

All equipment (fans, filters, heaters, etc.) shall be tested to the relevant Standard Testing Procedure.

Prior to testing of the ductwork all dust and other materials shall be removed from the ductwork and grilles and specialist equipment removed from the ducting. If necessary, cleanliness shall be demonstrated by dismantling sections of ductwork.

Prior to testing, all equipment, e.g. filters, grilles etc., shall be thoroughly cleaned.

A series of approved tests shall be performed on the Cooling and Ventilation Systems during the Winter and Summer seasons. Records shall be made of these tests which shall include the following:-

- a) All fan speeds and duties.
- b) All dampers and valves shall be adjusted to obtain the design air flow rates.
- c) Temperature readings shall be taken in individual rooms chosen by the Engineer.
- d) Sound levels in selected areas.

##### Low & Medium Pressure Air Distribution Ductwork

All air distribution equipment shall be tested as determined by the Engineer in accordance with B.S.5720.

The pressure tests shall be carried out strictly in accordance with, DW.144 of the H.V.C.A., using a high pressure blower, manometer, calibrated orifice, 'U' tube gauge and necessary flexible tubes and connection pieces.

Smoke tests shall also be carried out.

#### 4.2.7 THERMAL INSULATION

Pre-formed thermal insulating material shall be subjected to a thickness test as described in B.S.1334.

The thickness of the insulating material for plastic composition, flexible and dry filled thermal insulation material shall be determined after installation, and in the case of plastic composition materials when finally dry.

If the tests for thickness carried out in accordance with the procedure outlined in B.S.1334 show that the insulating materials has been applied to a thickness less than required, then the additional thickness required shall be installed without extra cost.

#### 4.2.8 ABOVE & BELOW GROUND DRAINAGE

All tests on above ground sanitary pipework systems shall be carried out in accordance with BS5572: 1978, together with latest amendments.

##### Notices of Tests

The contractor is responsible for notifying all interested parties such as the Building Inspector, Project Manager, Main Contractor and Engineer. Notices must be given in writing seven days prior to the test date.

##### Interim Visual Inspections

Inspections and tests shall be made during the installation of the sanitary pipework system as the work proceeds, to ensure that the pipework is properly secured and clear of obstructing debris and Superfluous matter and that all work which is to be concealed is free from defects before it is finally enclosed.

##### Testing (Air Test)

Normally this test is carried out to detect that all pipes and fittings are air-tight and shall be completed in one operation.

The water seals of all sanitary appliances shall be fully charged and test plugs or bags inserted into the open ends of the pipework to be tested. To ensure that there is a satisfactory air seal at the base of the stack, or at the lowest plug, or bag in the stack. If only a section of the pipework is to be tested, a small quantity of water sufficient to cover the plug or bag can be allowed to enter the system.

One of the remaining testing plugs shall be fitted with a tee piece, with a cock on each branch, one branch being connected by means of a flexible tube to a manometer. Alternatively a flexible tube from a tee piece fitted with cocks on its other two branches, can be passed through the water seal of a sanitary appliance. Any water trapped in this tube shall be removed and then a manometer can be connected to one of the branches as described above.

Air pumped into the system through the other branch of the tee piece until a pressure equal to 38mm water gauge is obtained. The air inlet cock is then closed and pressure in the system should remain constant for a period of not less than three minutes. The results shall be recorded and reported and a copy included in the Operating and Maintenance manuals.

##### Leakage Detection

With the pipework subjected to an internal pressure using the air test, a soap solution shall be supplied to the pipework and joints. Leakage can be detected by the formation of bubbles.

### **Water Test**

In addition to the air test a water test shall be carried out. The part of the system mainly at risk is that below the lowest sanitary appliance and this may be tested by inserting a test plug, in the lower end of the pipe and filling the pipe with water. Up to the floor level of the lowest sanitary appliance, provided that the static head does not exceed 6m. The results shall be recorded and reported, and a copy included in the Operating and Maintenance manuals.

### **Performance Testing**

All appliances should drain speedily, quietly and completely into the sanitary pipework stacks.

### **Trap Water Seal Tests**

To ensure that adequate water seals are retained during peak working conditions the test described below shall be carried out. After each test a minimum of 25mm of water seal shall be retained in every trap.

Each test shall be repeated at least three times, the trap or traps being recharged before each test. The maximum loss of seal in any one test, measured and recorded by a dipstick or small diameter transparent tube, shall be taken as the significant result.

#### 4.2.9 ELECTRICAL INSTALLATION

All electrical equipment and internal wiring or wiring forming an integral part of mechanical equipment or of the Contract shall be tested in accordance with I.E.E. Regulations.

Two copies of inspection certificates or as prescribed by the I.E.E. Regulations shall be submitted for approval. The tests required are as follows:-

Insulation	(Regulation 612.3)
Polarity	(Regulation 612.06)
Continuity	(Regulation 6.1.2.2)
Protection	(Regulation 612.4)
Earth Fault Loop Impedance	(Regulation 612.9)
Operation of Protective Devices	(Regulation 612.8)

The details in parentheses refer to the relevant sections in B.S.7671

#### 4.2.10 PLANT & EQUIPMENT

The installations shall be maintained and run for as long as required to ensure that all plant, equipment, control etc., are working correctly. This period shall commence after the completion of all the adjustments. The correct operation of all plant, services, controls and instruments and each item of equipment shall be proved by demonstration to the Services Engineer, prior to the works being handed over to the Client.

Should the completion of the witnessed demonstrations be prevented during the agreed period for witnesses attendance and have to be postponed to a later date, by reason of the Contractor/Sub-Contractor failing to ensure that all of the installation has been prepared for functioning in a correct, safe and proper manner, and in accordance with the specified requirements, then the Contract/Sub-Contract sum may be reduced by an amount equal to the expenses incurred by the witnesses having to return to site at a later date for resumption of the testing.

Further attendance shall be provided for supervising and instructing the Client's Engineer on the correct operation and maintenance procedure of all plant, equipment, controls etc.

#### 4.2.11 CONFORMATION OF SET POINTS

Before commissioning is commenced, the contractor shall confirm all setpoints, time and one settings associated with all control systems.

## 4.3 HANDOVER

### 4.3.1 OPERATION AND MAINTENANCE INSTRUCTIONS

Before the Date of Practical Completion the Contractor shall provide two paper and one USB Memory stick set of Operating and Maintenance Instructions for all the installations included in the Contract.

The paper sets shall be adequately bound in Lever Arch files. The manuals shall contain an index and be divided into appropriately titled logical sections to the Client Representatives approval.

Each set shall incorporate a detailed description of the operating procedures for each system and item of equipment, together with details of the regular maintenance routines recommended by the Manufacturer. Each item of equipment, together with typical fault finding routes and a description of emergency action which should be taken in the event of breakdown of equipment. In addition, for each item of equipment, a list of spare parts shall be given which the manufacturers recommended should be kept in store.

The manuals and instructions shall contain, though not be limited by the following information:-

- Index.
- Set of reduced A3 size prints from the "As Fitted" record drawings.
- General description of the systems, equipment used and method of control systems.
- Schematic diagrams and control diagrams.
- Schedule of routine maintenance.
- Schedule of period maintenance for specialised equipment.
- Schedules of method of adjustments, typical fault finding routine.
- Wiring diagrams of plant etc.
- Schedule of equipment giving name, address and telephone number of manufacturer.
- Description of emergency action which should be undertaken in the event of breakdown of equipment. Telephone numbers of essential contacts to include.
- Test and Performance Data.
- Test Certificates.
- Recommended spares part list giving item description, part number and replacement time scale.
- Health and Safety notes, advice and declaration.



#### 4.3.2 RECORD DRAWINGS

The Contractor shall provide, before the Date of Practical Completion preliminary record drawings as PDF Files for comment/approval by the Team. Once commented upon, the drawings shall be issued as Autocad .DWG Files.

The "As Installed" drawings shall show the following:

- 1:100 or 1:50 scale drawings and a system diagram of the complete installation showing all pipework and duct work distribution with the appropriate code letters and identification marks.
- The system diagrams shall record the values within the installation where appropriate.
- The location of the Supply Authorities connections provided within the Sub-Contract whether carried out by the Contractor or by the appropriate Authority, together with the points of origin and termination, size and type of cables.
- Complete equipment and circuit schedules.
- Manufacturer drawings showing the arrangement and assembly of component parts of all machines and any piece of equipment which may need servicing.
- Diagrams illustrating the principles of operation of automatic controls and of instrumentation, present in combination with any foregoing item.
- Manufacturer's internal wiring diagrams for each piece of electrical equipment supplied under the Sub-Contract, together with physical arrangement drawings where necessary to locate and identify the component parts.
- Interface details with existing equipment or equipment installed separately from these works.

Two prints of each "As Installed" drawing shall be issued to the client's representative for approval prior to final issue.

The contractor shall also supply and fix adjacent to the distribution boards and consumer units:

- Test & Inspection Notices regarding the electrical installation.
- Schematic Wiring Diagram of the controls installation.

#### 4.3.3 END USER'S TRAINING

The contractor shall include for training the client's designated personnel in the function, use and maintenance requirements of the systems. The training for each system must be carried out by persons having an in depth knowledge of their function, operation and maintenance.

The training shall be provided in two parts as follows:

Outline demonstration of the key functions and operation of each system prior to handover.

Detailed training and instruction on each system within two weeks of handover. The contractor should allow for a minimum of one half day's training for **each** system as defined in the headings of Section 4 of this specification.

The training should demonstrate all aspects of the installations to the satisfaction of the client's designated personnel.

The contractor shall be responsible for scheduling and programming the pre and post handover training to suit the client's designated end users.

#### 4.4 WARRANTY AND MAINTENANCE

##### 4.4.1 WARRANTY

It shall be deemed that warranty on the plant equipment and installation shall commence at the date of Practical Completion of the Contract Works (Building Works and Services Installations) unless specifically otherwise agreed by the client's representative in writing.

The contractor shall warrant all materials, plant, equipment and systems installed against fault, failure and incorrect or inadequate performance for a period of twelve calendar months from the date of practical completion.

The warranty shall include all replacement parts, equipment and labour. The contractor shall allow for carrying out warranty work outside normal working hours as necessary to suit the clients operation of the building. The contractor shall provide a single point of contact for reporting faults and problems which occur on all systems.

##### 4.4.2 PLANNED MAINTENANCE

The contractor shall include for full maintenance of the systems during the first twelve months after the completion or phased completion of the project. The contractor will provide the managing agents with a no-cost Planned Maintenance contract prior to Practical Completion.

# APPENDIX A

## EQUIPMENT SCHEDULES

**A1 ELECTRICAL SERVICES EQUIPMENT SCHEDULE**

DESCRIPTION	MANUFACTURER	ALTERNATIVES
Distribution Board	MEM, Hager, Merlin Gerin	Equal or approved
Internal Accessories	MK Edge, MK Logic Plus	Equal or approved
External Accessories	MK Weatherseal	Equal or approved
Luminaires/Lighting	As Luminaire Schedule	None Accepted
Door Entry System	Came	Equal or approved
Smoke/Heat Detection System	Aico	Equal or approved
Dimmers	MK Electric	Equal or approved

**A2 MECHANICAL SERVICES EQUIPMENT SCHEDULE****All equal and approved**

Electric Panel Radiators	Dimplex Monterey (See Dimplex Quotation)
Towel Rails	Dimplex TDTR350W (See Dimplex Quotation)
Cylinders	Dimplex ECSD175-580 (See Dimplex Quotation)
Service & Non Return Valves	Peglar Yorkshire Group.
Water Conditioner	Dutypoint
DHW Secondary Return Pump	Grundfos UP 15-14 PM GB
Insulation	Koolphen & Armaflex
Sanitaryware	As specified by the Architect
MVHR & Purge Ventilation Systems	NuAire (See NuAire Quotation)
Drainage systems	Saint Gobain, Polypipe

**NOTES:**

## 1. PUMPS:-

The mechanical contractor shall calculate system resistance for the actual system pipework routes and equipment installed and install a pump of the appropriate duty. The mechanical contractor shall allow within his tender costs for the installation of pumps providing the required flow rate.

# APPENDIX B

# TENDER SUMMARY

## TENDER SUMMARY

### APPENDIX B MECHANICAL & ELECTRICAL SERVICES TENDER SUMMARY

#### **B1 Preliminaries**

1.	Project & Site Management	£
2.	Provision of Quantified Schedule of Rates	£
3.	Working and Construction Co-ordinated Drawings	£
4.	Provision of Site Storage, Offices etc.	£
5.	Provision of offloading, distributing, hoisting and placing in position materials, access equipment including all necessary access equipment, etc. task lighting, placing own rubbish into skips, etc.	£
	<b>Sub Total</b>	<b>£</b>

#### **B2 Mechanical Services Measured Works**

6.	Connections to utility services incl. Water & Drainage	£
7.	Incoming mains cold water, package booster set & distribution pipework	£
8.	Apartment MVHR, Purge & Kitchen Extract Ventilation Supply & Installation	£
9.	Apartment Cold Water & Domestic Hot & Cold-Water Systems Supply & Installation including connections to kitchen appliances	£
10.	Break tank, pumpset and distribution pipework to Bib-taps	£
11.	Above Ground Drainage Supply & Installation	£
12.	Installation of Sanitaryware	£
13.	Thermal & acoustic insulation to pipework	£
14.	Testing & Commissioning	£
15.	"As Fitted" drawings, O&M Manuals and end user demonstration	£
16.	12 Months planned maintenance of the installed systems	£
	<b>Sub Total</b>	<b>£</b>

**B3 Electrical Services Measured Works**

17.	Connections to incoming utility services incl.electrical & BT	£
18.	Main distribution board, Ryefield boards and sub-mains to floors	£
19.	Landlord's electrical services supply & installation incl. connections to Utility meter, external lighting, mechanical & associated services etc	£
20.	Apartment Isolators and sub-mains incl. Containment	£
21.	Apartment Meter tails, main switch and consumer unit	£
22.	Apartment small Power Supply & Installation including final connections to kitchen appliances	£
23.	Apartment lighting services	£
24.	Apartment heating & hot water services	£
25.	Earthing & Equipotential bonding	£
26.	Telephone & TV Cabling supply & Installation	£
27.	CCTV system Supply & Installation	£
28.	Intruder Alarm Supply & Installation	£
29.	Door Entry System Supply & Installation	£
30.	Testing & Commissioning	£
31.	"As Fitted" drawings O&M Manuals and end user demonstration	£
32.	12 Months planned maintenance of the installed systems	£

<b>Sub Total</b>	<b>£</b>
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<b>Total (excl. VAT)</b>	<b>£</b>
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# APPENDIX C

## LUMINAIRE SCHEDULE



Luminaire Detail	Drawing Ref	Description
	D7	Recessed LED Downlight c/w remote driver and 60 minute fire rating Aurora Enlite EN-FD101  Em = Emergency Version
	D51	Recessed LED Downlight c/w remote driver and 60 minute fire rating Aurora Enlite EN-FD103
	Internal Wall Light	LED Wall Light with Halo Ring TamLite SLHL220NWW  Em = M3 Emergency Version
	BL	1.0 metre Plate mounted LED Bollard c/w LED E27 Lamp  National Lighting.co.uk Product Ref: 33143
	B	15W Round LED Bulkhead with White Opal Diffuser  Em = Emergency Version

**Note: For remaining External Lighting Refer to Gemma Lighting Specification.**