

GRENFELL TOWER

EMPLOYER'S REQUIREMENTS FOR MEP SERVICES

1 Introduction

This specification generally describes the work proposed for the renovation of the mechanical, electrical and plumbing services.

The specification describes the services in accordance with the current stage of design, generally in accordance with RIBA Stage 'E'. This means that the specification represents design development at this stage and does not contain all the information required to produce a full working installation. Further design development by the Contractor will be required.

The project will be procured on a Design and Build basis with a main Contractor employing a specialist MEP Contractor to carry out the services design and installation. The main Contractor will be responsible for all of the specialist MEP Contractor's work.

The specialist MEP Contractor shall agree all contract terms and conditions with the main Contractor.

2 Definitions

Refer also to the main contract preliminaries.

The Employer:

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Contact: Claire Williams

Quantity Surveyor:

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The Employer's Agent (EA):

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Contact: Phillip Booth

The Main Contractor:

The general Contractor employed by the Employer to carry out the Works.

The Contractor:

The specialist MEP Contractor employed by the main Contractor to carry out the MEP Works.

3 Description of the Project

The building is an existing tower block with 20 storeys of residential accommodation on top of a podium containing new residential accommodation, offices, a nursery and a boxing club.

The general scope of the project is:

- Recladding of the façade
- Reconfiguration of the podium levels to provide additional residential accommodation
- Relocation and refurbishment of the nursery
- Relocation and refurbishment of the boxing club
- Provision of new office space and meeting rooms
- Modifications to the MEP systems as described in the relevant sections below

It should be noted that a key factor for this for this project is that the tenants will remain in occupation throughout the installation and it is therefore essential for all basic services to remain functional at all times apart from pre-agreed interruptions.

4 Design Responsibility

Preliminary design work has been carried out by the Building Services Consultant Max Fordham LLP in order to inform other members of the design team and to assist in preparing these Employer's Requirements.

Although some design information is shown in the preliminary design documents, this is for guidance only and the Contractor shall not rely on this information. The Contractor is ultimately responsible for **ALL** of the design and shall therefore verify, adopt, develop & complete the design based on the requirements of this specification.

The tender documentation defines the scope of the works, and defines for each system within the installation the engineering concept, design criteria, performance requirements, standards of materials and workmanship.

The Contractor will be deemed to have prepared all designs and specifications and the Employer will be entitled to rely upon such designs and specifications.

The Contractor will offer himself as an expert in the field of building services and/or relevant specialist field and will design and install an installation that is in accordance with the tender documentation, is constructed in accordance with the agreed programme and is within the tender price.

The Contractor shall employ experienced design engineers who have available to them all published knowledge relevant to buildings, building services and relevant specialist fields.

The Contractor shall allow sufficient time within the programme for carrying out and completing the design, detailed information and installation drawings, review by the EA, incorporation of any comments or necessary amendment(s), subsequent resubmission(s) and review(s).

The Contractor is responsible for the suitability, compatibility and correct installation of all components whether specified within the tender documentation or chosen by the Contractor to meet the specified performance of the installation(s).

The Contractor shall provide all detailed information and drawings as described in Appendix A, together with all other information which is reasonably necessary to co-ordinate the design and construction of these Works with the design and construction of all other works in time to meet the overall building programme. The Contractor shall request such further information as may be required to design and construct these Works in sufficient time to meet the programme. Development of the design shall be in conjunction with the EA, all other trades and Contractors.

Refer also to further design responsibilities/requirements set out in Section 5 below.

5 Specification - General Conditions

The Mechanical and Electrical Works packages are described in this specification. This specification is in addition to, and shall be read in conjunction with, the Main Contract Preliminaries.

Mechanical

The mechanical Works comprise all of the mechanical services required for the following systems:

R10 Rainwater drainage

R11 Foul drainage above ground

S12 Hot and cold water

S32 Natural gas

S61 Dry riser

T31 Low temperature hot water heating

U10 General ventilation (including U11 Bathroom and U12 Kitchen extract ventilation)

W60 Controls

Electrical

The electrical Works comprise all of the electrical services required for the following systems:

V20 LV distribution

V21 General lighting

V22 General LV power

W20 TV

W10/W30 Telecomms & Data

W40 Access control

W50 Fire detection & alarm

W51 Earthing & bonding

W52 Lightning protection

A 12 months maintenance service for the MEP systems shall be provided during the defects liability period.

The Works shall comprise the full design and drawing production, manufacture, works testing, supply, installation, inspections, testing (on and off site), setting to work, commissioning, provision of as installed drawings, record drawings, operating and maintenance manuals, investigating and advising on operating problems, making good defects of design or installation and all labour to form a 'complete installation'.

Full design specifically requires the development of all layouts, details and co-ordination, but also includes any design information necessary for other design team members to complete their own

information. This design development shall progress by a process of repeated refinement in co-operation with the rest of the design team and other Contractors, to the final approval of the Employer's Agent (EA). The Contractor shall produce such drawings when and as necessary and as required by the EA to effectively communicate the intent and details of the design to others.

The Contractor's attention is drawn in particular to the requirements for high quality workmanship and the Contractor's responsibility for full design and co-ordination of their works with respect to other services, the structure and fabric of the building.

The existing mains/engineering services are described in the specification, but this description shall not be assumed to be comprehensive. The Contractor shall be responsible for locating all existing services before work commences. Examine all available drawings of the engineering services and report any discrepancies to the EA. A site visit shall be made by the Contractor during the tender period.

Incorporate all equipment, accessories, controls, supports and ancillaries implicitly or explicitly required either by the specification and drawings, or in accordance with accepted current practice and procedures, which after assembly, testing and commissioning will enable that section of the Works to function correctly and safely, and to achieve the specified performance. Include all of the materials and labour to form a complete and fully functioning installation, whether or not all the necessary components are indicated in the Employer's Requirements.

Carry out and complete the Work of the installation in accordance with the true intent and meaning of the specification and drawings to the entire satisfaction of the EA.

The Contractor shall liaise with other Contractors and design team members to ensure the successful installation of the services. Allow for the provision of all drawings required to ensure the above. Agree setting out dimensions of all components with the EA. Any items installed unsatisfactorily and without prior agreement shall be modified to the satisfaction of the EA at no extra cost to the contract.

It is expected that the Contractor, having had experience of installations of similar complexity, will make due allowance for the integration of the services installations into the building with all constraints which that implies.

Provide labour attendance on other contractors when the services Works interface with other Contractors especially during setting to work and commissioning.

Provide labour attendance on Public Utilities (where applicable), including out of hours working, for demonstration of systems and any other testing requirements the Utilities may have to satisfy themselves that the systems comply with their requirements.

Provide drawings of builderswork requirements and mark out on site. The Contractor shall be responsible for the supply and installation of all fixings and supports for their installation.

Ensure that the works comply with all relevant British Standards, Local Authority Requirements, Public Utility requirements, and the like.

All services run in occupied spaces, stairs, etc., shall be run concealed within service ducts, ceiling voids, etc., unless specifically stated and agreed otherwise.

Allow for co-ordinating of the Works with the works of other trades and installations which may be on site during the period of the Works.

Ensure all equipment and systems are installed to provide electromagnetic compatibility within the system and with any other systems installed in the same area. Ensure all systems and buildings are assessed for protection to and that such protection meets the requirements of BS 6651. Ensure all equipment meets the requirements of the appropriate electromagnetic computability standard.

Contractor's Responsibilities

The services installations design shall be provided by the Contractor who shall employ experienced engineers who have available to them all published knowledge relevant to building and services. This includes:

All Building Regulations

British Standards

CIBSE Publications

IEE Regulations

Statutory Requirements

Other regulatory and standards documents as indicated in this specification or as may be required.

The Contractor will offer himself as an expert in the field of building services and will develop the design and install an installation which is fit for its purpose, is in accordance with the Employer's Requirements, is constructed in accordance with the agreed programme and within the tender price.

Development of the design shall be in conjunction with the EA, the Building Services Engineer, other members of the design team and all other trades and contractors. An initial set of services layouts has been produced by the Building Services Engineer which indicate the general principles of distribution and the general complexity of the works. These are preliminary drawings for strategic planning purposes only and full execution of the design work shall remain the Contractor's responsibility.

The Contractor is responsible for the suitability, compatibility and correct installation of the components specified here and chosen by the Contractor to meet the specified performance of the installation. The Contractor, at his discretion, may submit alternative manufacturers or suppliers for consideration, however full technical details and cost implications shall be included with the tender.

The Contractor shall carry out the design under stages of the RIBA Plan of Work to a sequential programme, in particular:-

At Tender

- (i) Understand the Employer's Requirements and submit comments on it, if any. Provide details of any proposals that differ from the Employer's Requirements.
- (ii) Submit a method statement describing the arrangements for developing the design and installing the services installations.
- (iii) Submit details of proposals and components included in the tender bid to meet the specified performance of the installation. Details of alternative manufacturers and suppliers may be submitted for consideration at this time.
- (iv) Provide cost information in a format defined by or acceptable to the Quantity Surveyor.

Contract Period

- (i) Prepare outline proposals for the services installations for the agreement of the EA. Investigate the options available and describe the performance that can be achieved.
- (ii) Design and detail the services installations as part of the overall co-ordinated building design allowing for every stage of the design to be brought to a successful conclusion by the process of repeated refinement until it is clear that the installation and co-ordinated drawings can be completed.

Select all components in consultation with the EA in order to standardise as far as possible, replacement and service parts.

Provide copies of calculations if requested by the EA.

(iii) It is the Contractor's responsibility to prepare and develop, to a form agreed with the EA, the Design and Construction drawings. Include in this as a minimum, mechanical and electrical layouts at 1:50, plus any of the following drawing types as required:

Sketch Drawings

Design Drawings

Installation Drawings (including Shop Drawings)

Builder's Work Drawings

Co-ordination Drawings

Detailed Drawings

Controls Drawings/Wiring Diagrams

Equipment Drawings

As-installed drawings

Record Drawings

The EA may require other drawings as necessary to satisfy themselves that the Employer's Requirements have been met. No services installation works shall begin on site until a set of installation drawings have been finally commented on by the EA. Any modification required by the EA to services installed before comments have been made shall be at no cost to the Employer.

Comments by the EA or other member of the design team on the Contractor's drawings, specifications or any other material does not constitute a transfer of responsibility from the Contractor to the Employer for that element of the works. Comments on drawings or any other material is deemed as acceptance that the portion of works appears to be generally in line with the design intent and performance objectives. The responsibility for the correctness of the final design remains the responsibility of the Contractor.

(iv) Negotiate and agree all details with regulatory bodies as necessary.

(v) Negotiate and agree all details with the Statutory Authorities and Public Utilities as necessary.

(vi) Meet with Building Control and provide the EA with written confirmation of the various stages including detailed Building Control Approval for the Works prior to construction.

(vi) Inspect the Works during the construction period and at completion to ensure the work is being carried out in accordance with the drawings, Employer's Requirements and good engineering practice. Record and rectify any defects.

(vii) Witness the testing and commissioning of the Works and examine the records thereof and confirm acceptance.

(viii) Prepare As-installed drawings as the work proceeds.

(ix) Prepare Record Drawings and Operating & Maintenance Manuals.

(x) Advise the EA on all aspects of the design, operation and performance of the installed systems, and the building internal environment following completion.

(xi) Modify the design and/or installation, should the installation not meet the Employer's Requirements, the agreed proposals, Statutory requirements, etc.

Post Contract

During the 12 months defects liability period, which shall commence on the day named in the Project Completion Certificate, make good with all possible speed any defects arising from any defects of design, installation or manufacture.

If the Contractor replaces or renews any portion of the Works, provisions of this clause shall apply to the portion of the Works so replaced or renewed until expiration of 12 months after the date of such replacement or renewal.

Provide a routine maintenance service to carry out all maintenance recommended by equipment manufacturers and in accordance with accepted good working standards. The cost of this shall be included in the tender sum.

Compliance with Regulations

The Contractor shall comply with all regulations and conditions etc. laid down by the relevant gas, water, fire and electricity utilities. Also any regulations and conditions etc. laid down by the local authority, Fire Officer, the Health and Safety at Work Executive, etc.

British Standards

Materials are to be of the best quality consistent with the character of the Works. Materials are deemed to be specified in the following order of priority unless otherwise indicated:-

- Complying with the latest British Standard;
- Complying in general with British Standards.

Workmanship

Generally all workmanship and materials used should be according to the best principles of the trade to which the particular work belongs. In particular workmanship and materials should be to the appropriate latest editions of the British Standards, and the Local Authority and Utilities Requirements.

All exposed services and equipment, such as pipework and the like shall be installed true, plumb, and made good with a high degree of care and workmanship. Any items which do not meet this requirement in the opinion of the EA will be replaced at no additional cost to the contract.

Submit samples of all services items which are visible, e.g. - electrical outlets, radiators, etc., to the EA for approval. The finishes of all visible items shall be to the CA's approval.

Install anti-vibration mounting on all plant items with moving parts (e.g. fans, pumps, etc.) to minimise noise and vibration transmission.

Other Regulations and Codes

All materials and equipment shall be installed in accordance with the manufacturer's instructions and good practice.

All electrical equipment and installations shall comply with the 17th Edition of the I.E.E. Regulations.

Protection & Fixings

The Contractor shall ensure that all his on-going installations are adequately protected at all times.

Bright metal and electrical equipment shall not be exposed, or installed until the building is sufficiently advanced to give protection from the weather.

Works susceptible to corrosion shall not be installed where it will be subject to inclement weather or excess moisture.

Damage to such items in the manner described will require replacement at the Contractor's cost.

All fixings are to be approved by the structural engineer and are to comply with any manufacturer's instructions.

The Contractor shall be responsible for the supply and installation of all fixing and supports for their installation.

Concealed Works

The EA shall be given the opportunity to inspect all works to be buried or concealed prior to any permanent covering being applied. In no instance shall concealed or buried work be covered without being tested and witnessed by the Contractor and the EA in the manner described elsewhere within these Employer's Requirements.

Testing and Commissioning

The Contractor shall carry out the testing and commissioning work using trained and experienced engineers. For the purposes of testing and commissioning the Contractor shall provide all necessary skilled and unskilled labour and all instruments and testing equipment.

The adopted testing and commissioning procedures shall be at least those required by the CIBSE Commissioning Codes.

Test the installation, including preliminary checks to ensure that all systems and components are in a satisfactory and safe condition before start-up, to demonstrate that the installation operates successfully on automatic control and provides the conditions/performance defined by the Employer's Requirements.

Record and submit testing/commissioning reports prior to completion and include approved copies in operating and maintenance manuals.

The Contractor shall give to the EA in writing, 7 days notice of the date after which he intends to carry out the tests as specified and shall permit the EA to witness the tests, if so required.

The Contractor shall notify the EA in writing when, in his opinion, the installations or parts thereof have been tested/commissioned and are satisfactory.

The Contractor shall then operate the installation or selected parts thereof in the presence of the EA (or his appointed representative) and shall make all specified tests and take all specified measurements to the satisfaction of the EA.

Should the tests or measurements fail to demonstrate that the plant and equipment installed by the Contractor is operating satisfactorily the Contractor shall repeat the commissioning and testing procedure to the satisfaction of the EA.

Maintain all records of tests, etc. on site for inspection by the EA if required.

Record Drawings and Operating & Maintenance Manuals

Manuals and drawings are to be compiled to enable the occupants to operate, maintain and extend/modify the installation.

Issue a draft of the manuals and drawings to the EA at least 1 month prior to completion for comment.

The Contractor will be responsible for the safe running, operation and maintenance of the installations until the requirements of this section have been satisfactorily completed. Practical Completion will not be given until the Record Drawings and Manuals have been issued in their final form.

Three copies of the manual and drawings are to be provided at Practical Completion. The contents of each manual shall include:-

1. A schedule of all equipment and plant giving a description, manufacturer's model number, serial number, manufacturer's name, address, and telephone number.
2. Manufacturer's descriptive and technical leaflets and operating and maintenance recommendations placed in order and indexed.
3. A brief description of the overall running of each system written in a manner suitable for a non-technical person unfamiliar with the installation to understand.
4. Day-to-day operating instruction in respect of each service, all safety equipment and procedure in the event of alarm and breakdown.
5. Complete set of A1 prints of the record drawings protectively sleeved and bound in.
6. Maintenance routines on a daily, weekly, monthly etc. basis for each item of equipment and installation, this section to include manufacturer's advice and recommendations.
7. Test certificates and commissioning reports.
8. Maintenance Log Book - this shall be completed each time any work/inspection is carried out.

Record drawings included in the Employer's manual are to include:-

- a) Schematics scheduling all plant and equipment.
- b) Plans and elevations scheduling the plant and equipment and the routes of all cables, conduits and pipework, including all access points that have been provided.
- c) Co-ordinated drawings of the mechanical and electrical installations, including incoming services.
- d) Wiring diagrams of all equipment installed indicating the distinction between the Contractor's wiring and the manufacturer's wiring with terminals fully numbered. Drawings shall be co-ordinated and cross referenced to indexing of the manuals.

This complete set of information shall be bound in a hard back A4 ring binder with title page indicating job title, document title, Contractor's name and address and job reference number and Employer's name and address. The job title and project name shall be printed on the front and the spine of the binder.

Handover

On completion of testing and commissioning and following successful demonstration to the EA and the Employer that the installations are complete and will run successfully, instruct the Employer in the operation of all systems to his satisfaction. This shall be done at a meeting on site, at which the Employer and his representatives will be present and the relevant operating and maintenance manuals shall be available. Before the meeting is arranged the Contractor shall have produced record drawings and had them approved. The Contractor shall attend three further meetings during the defects period at times to be agreed with the EA. These meetings shall provide the Employer with the opportunity to discuss the installations and clarify any issues which have arisen since handover.

The Contractor shall provide the following equipment at handover:

1. Any specialist tools necessary for the correct and ready maintenance and adjustment of any item of plant or equipment;
2. Operating and maintenance manuals and record drawings;

If Practical Completion is allowed before the Contractor has discharged his handover responsibilities, they shall be entirely responsible for the safe running, operation and maintenance of the installation until such time as these duties have properly been completed.

Description of Drawing Types

SKETCH DRAWINGS means line diagrams and layouts indicating basic proposals, location of main items of plant, routes of main pipes, air ducts and cable runs in such detail as to illustrate the incorporation of the service within the installations and to illustrate that the Employer's Requirements have been met.

DESIGN DRAWINGS means schematic and layout drawings indicating all items of equipment/plant and their relationship to each other, and all pipe/duct routes clearly marked and sizes indicated. These drawings are to be produced in sufficient detail to enable the EA to check that the Contractor has correctly interpreted the Employer's Requirements for the installations.

CO-ORDINATION & DETAILED DRAWINGS means drawing showing the inter-relationship of two or more systems, their allotted positions and their relationship to the remainder of the building works and building fabric. The drawings shall be in such detail as to demonstrate that each service will be properly separated from each other and the building fabric, and that they can be satisfactorily installed and maintained.

BUILDER'S WORK DRAWINGS means drawings and/or schedules showing architectural and/or structural work required and necessary to facilitate the execution of the installations and their integration into the remainder of the works by the Contractor. These drawings shall also show the locations of access panels in ceilings, ducts, etc. required for initial commissioning and regular maintenance.

INSTALLATION DRAWINGS means drawings based on the design drawings and/or co-ordination drawings showing details of the Contractor's Proposals for the execution of the works. Ensure such drawings and details relate, where appropriate, to builder's work drawings.

SHOP/FABRICATION DRAWINGS means drawings produced for the purpose of explaining how the components of the designed installation are to be fabricated and assembled.

EQUIPMENT DRAWINGS means drawings produced by a manufacturer or equipment supplier detailing principle dimensions, fixings, connections and all other relevant details.

CONTROLS DRAWINGS/WIRING DIAGRAMS means drawings and/or schematic details of components showing the control layout with each item uniquely identified including a brief description of the controls operation and associated interlocking.

AS-INSTALLED DRAWINGS means installation drawings, equipment drawings, etc., marked up as the work proceeds to indicate the as-installed works. These marked up drawings are then used to produce the Record Drawings as necessary.

RECORD DRAWINGS means drawings, diagrams and schedules, etc., prepared from the marked up installation and co-ordination drawings (as-installed drawings) showing the installation as finally executed.

Builders Work

Ensure that all relevant builderswork information is provided to the structural engineer in good time to enable them to provide any structural design input relating to this.

Provide fire protection of service penetrations where necessary. Fire zones are specified by the architect.

Maintenance

Allow for the maintenance of the installations described in this document for 12 months following the date of Practical Completion. Provide a programme detailing the schedule of maintenance visits by the Contractor.

Include for planned preventative maintenance, including routine checks and adjustments, to keep the installation in efficient working order.

Allow for all items of plant and equipment including spare parts, lubrication and all consumables.

Allow for, in addition, time as required to visit site to discuss and investigate reported operational problems, and completing a site log book detailing all work carried out in response to complaints.

Include for 24 hour callout for emergency repairs with 4 hours maximum response time. An alternative Contractor will be used to carry out these repairs, at the Contractor's cost, if the Contractor fails to provide this emergency service.

Plant warranties shall run from 12 months from the date of Practical Completion.

6 Existing Services

General:

Currently, there are a number of existing main services which rise from the lower levels of the building to serve existing occupied areas at podium level and also the residential areas in the upper levels of the building.

As previously stated, the intention is to complete the Works with the tenants remaining in occupation of the building. This will require maintaining the main services at all times or where this is not possible, ensuring that any interruption is agreed with the EA prior to any work being carried out.

It may be necessary to reroute some services to enable the general construction works to be carried out. A visual survey of the main services in the lower levels has been carried out and information provided based on this survey. It is however, the Contractors responsibility to carry out their own survey and make their own assessment of how they will achieve no, or minimal, interruption of the main services to the existing residential areas.

Surveys:

A number of surveys have been carried out and these are scheduled in Schedule J4614/A(64)502. The Contractor shall use these for guidance only and shall carry out any further surveys or checks required to enable them to progress the design and the Works.

7 Description of Services by Type

This section describes the requirements for each of the mechanical, electrical and public health services within the building. The section is arranged in accordance with the RIBA common arrangement of work sections.

R10 Surface and Rainwater Drainage

DESIGN PARAMETERS

- The Building Regulations Approved Document Part H
- BS EN 12056, BS 8000 Part 13, BS 8301 and all other relevant British Standards.
- CIBSE Guides.
- Local Authority and other statutory requirements.

Plant/Equipment Life: A minimum of 20 years without major replacement.
System Life: In excess of 25 yrs.

SYSTEM DESCRIPTION

The extent of the work to the rainwater system is limited to amending the existing system at podium level in order to suit the new construction works.

Rainwater pipes shall be hidden within risers or similar vertical distribution routes or above suspended ceilings where appropriate.

All new rainwater pipes to be accessible for rodding.

MATERIALS & WORKMANSHIP

Use cast-iron pipework and fittings to BS 460 similar to the existing pipework.

TESTING & COMMISSIONING

Advise the EA, of the time that pressure tests may be witnessed. Submit system to two separate tests - air test and hydraulic performance test in accordance with BS 12056 Part 3. Keep a systematic record of tests. Distribute to the EA and provide copies in the O&M Manuals.

R11 Foul Drainage Above Ground

DESIGN PARAMETERS

- The Building Regulations Approved Document Part H
- BS EN 12056, BS 8000 Part 13, BS 8301 and all other relevant British Standards.
- CIBSE Guides.
- Local Authority and other statutory requirements.

Plant/Equipment Life: A minimum of 20 years without major replacement.

System Life: In excess of 25 years.

SYSTEM DESCRIPTION

The above ground drainage installation comprises soil vent pipes (SVP's), stub stacks and branch pipes to connect all sanitary ware to the below ground foul drainage. The work is primarily within the podium area in connecting to sanitary ware in the new residential areas and the other new construction areas. There will also be some rerouting of existing pipework where necessary to accommodate the new construction.

Include for drainage connections to any washing machines and dishwashers shown on the architect's drawings.

Include for drainage connections to discharges from the heating systems where required.

The internal foul drainage layout shall be arranged to provide a minimum number of soil and vent stacks while also ensuring that the pipe routes are the shortest practicable, with as few bends as possible and no bends in wet portion of soil stacks. Soil vent pipes shall not offset horizontally above ceilings within flats unless no other viable route is available. Any proposed offsets shall be agreed with the EA prior to installation.

As far as practicable, all new soil vent pipes shall connect to the building's existing vent pipe system rather than use air admittance valves. Any proposed air admittance valves shall be agreed with the EA prior to installation.

MATERIALS & WORKMANSHIP

Soil and waste SVPs, stub stacks and branches are generally to be concealed in builderswork ducts, risers and ceiling voids.

All new above ground vertical stacks are to be HDPE. All branch pipes to be solvent welded uPVC for ease of installation.

All drainage components are to be installed in accordance with the manufacturer's recommendations.

All HDPE pipework shall be electro fusion jointed. All pipes shall be black in colour. All pipes shall have been tempered to reduce the risk of shortening (reversion) from high temperature discharges. All WC's shall be connected to the drainage system using push fit pan connectors.

Intumescent sleeves shall be fitted to all plastic pipes greater than 40mm that pass through floors and fire partitions in accordance with the Building Regulations Part B and BS 476.

The system shall generally be single stack with vented stacks. Any air admittance valves used shall be BBA certified.

A trap shall be provided for each appliance. Allow for 32mm for showers and washbasins and 40mm for sinks. All WC's shall have internal overflows.

Copper pipework and trapped tundishes are to be provided for safety overflow valves, pressure relief valves and for collection of boiler condensate. Pipework shall discharge over floor gullies.

All main soil and vent pipes shall be insulated with a vapour barrier to protect against condensation and provide acoustic separation. Insulation materials shall be selected to have a GWP of 0.

Access shall be provided at all changes of direction to enable easy rodding of all pipework. All stacks shall have rodding access at floor level. All stub stacks shall have cap access points. All waste branches shall have rodding eyes. All access/maintenance points shall be located in accessible locations in service ducts, etc. The Contractor shall advise the EA of any access panels or other significant builderswork with visual impact.

Install pipes, fittings and accessories in accordance with BS 8000 Part 13, BS EN 12056 Parts 1, 2 & 5 and manufacturer's recommendations. Obtain all components for each type of pipework from the same manufacturer, unless otherwise indicated.

Handle, store and securely fix all products and accessories in accordance with the manufacturer's instructions. Inspect components before fixing and reject any which are defective. Ensure cut ends are clean and square with burrs removed.

Allow for thermal and building movement when jointing and fixing, using proprietary expansion fittings if necessary. Fix pipes at centres not greater than those specified in BS 8000 Part 13. Provide additional supports as necessary at junctions and changes in direction.

Form junctions using fittings intended for the purpose, ensuring that jointing material does not project into bore of pipes, fittings and appliances.

Provide access points and rodding eyes as necessary in convenient locations, to permit adequate testing and cleaning of pipework, any inconvenient locations to be agreed with the EA. Provide rodding and access points at all changes of direction to enable whole system to be maintained. Fit all access covers and cleaning eyes as work proceeds.

Ensure pipe routes are shortest practicable, with as few bends as possible. Arrange all pipe runs to present neat appearance, parallel with other pipe or service runs and building structure, subject to gradients for draining and venting. Ensure all vertical pipes are plumb or follow building lines.

Seal all open ends as installation proceeds by plugs or caps to prevent the ingress of foreign matter. In the event of such precautions not being taken, strip out pipework adjacent to open ends to demonstrate that fouling of the bores has not occurred.

Arrange supports in pipe runs so that no undue strain is imposed upon pipes. Ensure that materials used for supports are compatible with the pipeline material. Space supports in pipelines as instructed by the pipework manufacturer. Select pipe rings and clips according to the application and material computability.

TESTING & COMMISSIONING

Advise the EA, of the time that pressure tests may be witnessed. Test section by section as the work proceeds and subsequently on completion with all sanitary fittings fixed and working. Submit system to two separate tests - air test and hydraulic performance test in accordance with BS 12056. Ensure there is retention of 25mm water seal in every trap and that no air is blown through the trap seal when performance is tested. Keep a systematic record of tests. Distribute to the EA and provide copies in O&M Manuals.

S12 Hot and Cold Water

DESIGN PARAMETERS

The design, specification, installation and setting to work of the whole of the works shall comply with all relevant British Standards, Water Supply (Water fittings) Regulations 1999 and Water Supply (Water Fittings) (Amendment) Regulations 1999, and equipment manufacturers' recommendations.

In particular:

- British Standard BS 6700
- BS EN 806
- BS 5422
- BS 7074
- BEEN 12828
- Building Regulations Parts J and L
- Local authority requirements
- BSRIA Application Guide 4/94 Guide to Legionellosis.
- HSC L8 - Legionnaires' disease - control of legionella bacteria in water systems ACOP
- CIBSE TM13 'Minimising the risk of Legionnaires Disease'.
- CIBSE Guides
- Institute of Plumbing: Plumbing Engineering Services Design Guides

Provide a consistent pressure for each of the existing and refurbished areas between a minimum of 2 bar and a maximum of 2.5 bar at the point of use.

Domestic hot water to be a minimum temperature of ??°C.

Plant/Equipment Life: A minimum of 20 years without major replacement.

System Life: In excess of 25 years.

SYSTEM DESCRIPTION

Existing

There is one main incoming water service to Grenfell Tower. Water is run to potable and non-potable water storage break tanks in the basement before being pumped to potable and non-potable storage tanks in the roof plant room.

Cold water supplies drop in vertical ducts from the roof tanks to serve each flat. Hot water is generated within each flat using 'Elson' units as break-tanks and indirect hot water cylinders.

Strip Out

All water services shall be surveyed and labelled prior to strip out works.

The existing cold water service to each flat shall remain live until the new cold water supply has been installed and connected. The existing riser pipework shall remain in-situ after it is decommissioned.

Within each flat, the hot and cold water services shall be left intact apart from the final lengths of pipe which will need to be removed to facilitate the installation of the new heat interface unit (HIU - see heating section later).

Remove all water services serving the podium levels while ensuring that the water services to the existing flats are not interrupted.

Any water storage to be removed shall be isolated for at least 24 hours before permanent work is done to remove the service.

New System

The new system will generally continue with the current strategy of pumping mains water to storage tanks on the roof, but the storage strategy will be amended such that all stored water will be potable. The existing incoming water main can be reused since the water consumption is likely to remain as it currently is or may decrease as a result of the refurbishment works.

The existing potable and non-potable tanks have been visually inspected by a tank maintenance company and although their condition could be improved, they have been assessed by the maintenance company as possibly having between 5 and 10 years useful life remaining. It has therefore been agreed that the existing tanks should be retained. The Contractor shall inspect the tanks and allow for carrying out any minor repairs necessary to bring them up to serviceable standards. Notwithstanding any other work required to the tanks, a specific requirement is that all of the tank insulation shall be replaced.

The non-potable tanks shall also have any necessary work carried out which may be required to bring them up to potable standard.

The current amount of water storage may be in excess of that required for normal day to day operation. This may be resulting in inadequate turnover of the stored water causing it to be stored at a higher than desirable temperature. The new installation shall be such that individual tanks can be isolated, drained and taken out of use thereby reducing the stored water content. The tanks would still be available for bringing back into use should there be any problems arising from the reduced level of storage.

The Contractor shall inspect all valves forming part of the cold water system and ensure that on completion, all valves have been refurbished so that they isolate properly and the spindles are free moving and easy to operate. Should any valves be beyond economic repair, the Contractor shall replace these with new valves.

New potable cold water pipework shall run from the roof storage tanks to serve sanitary appliances in all areas of the building. The pipework on the upper residential floors shall run in a vertical duct located in the lift lobbies outside the flats. At podium level, the pipework will generally run concealed in ceiling voids or in services riser ducts.

An additional pump set will be required for a number of flats on the upper floors as the static pressure alone from the storage tanks will not be sufficient to ensure a reasonable pressure or flow of water through the heat interface unit. This additional pump set will be located in the roof plant room. The pump set shall be a proprietary pump set with a minimum of two pumps. A control panel shall provide electrical power and control for the pumps. The controls shall alternate the pumps in a lead/lag configuration. A common fault indicator shall register on the panel and at a remote point in the reception area.

Hot water shall be generated locally within the new and existing flats, the nursery and the office spaces by the HIU's. The HIU's have two heat exchangers, one for space heating and one for domestic hot water heating. The domestic hot water heat exchanger has a primary heating circuit fed from the building's heating system. It also has a secondary circuit which will be fed by the cold water supply from the roof tanks. The heat exchanger transfers heat from the primary heating circuit to the cold water thereby providing domestic hot water. Complete hydraulic separation is maintained between the primary and secondary circuits.

Apart from the final connections to the new cold water service and the HIU, the water services pipework within the existing flats will not be replaced.

New hot and cold water pipework shall be installed to serve the new apartments, the nursery, boxing club and offices. Provide secondary hot water circulation pumps or trace heating where necessary.

The hot water system for the boxing club shall be provided by an indirect cylinder as there are three showers which may be operating simultaneously or relatively continuously during peak periods. Alternatively, a larger HIU or dedicated heat exchanger would be acceptable, subject to satisfactory flow rates being achieved.

A 'Point of Use' water heater shall be provided for the Community Room where there is only an individual sink being provided.

Water consumption meters will not be provided.

The new cold water and domestic hot water system shall be provided with minimal interruption to the existing supplies. The work shall be phased to minimise any disruptions. All work shall be planned and coordinated with the EA throughout the duration of the works to allow tenants to be adequately warned of any supply disruptions.

Low water use fittings shall be installed in all new areas of the building.

MATERIALS & WORKMANSHIP

Install, test and commission systems to comply with BS 6700, Water Supply Byelaws and equipment manufacturers' recommendations.

Arrange all exposed pipe runs to present neat appearance, parallel with other pipe or service runs and building structure, subject to gradients for draining or venting. Ensure all vertical pipes are plumb or follow building line.

Space pipe runs in relation to one another, other services and building structure. Allow for thermal insulation and ensure adequate space for access to pipe joints, etc.

Install pipework with gradients to allow drainage and air release. Install air vents and drain cocks to allow all sections of pipework to be completely drained and vented.

Arrange supports and fixings to accommodate pipe and building movement caused by thermal changes. Isolate pipes from structure to prevent noise or abrasion due to thermal movement and changes in direction.

Enclose pipes passing through building elements, (walls, floors, partitions, etc.) concentrically within purpose made sleeves. Cut sleeves from material same as pipe one or two sizes larger than pipe. Do not use sleeves as pipe supports. Install sleeves flush with building finish.

Seal all open ends as installation proceeds by metal, plastic plugs or caps, to prevent ingress of foreign matter. In the event of such precautions not being taken, strip out pipework adjacent to open ends to demonstrate that fouling of the bores has not occurred.

Select type of pipe rings and clips according to the application and material compatibility.

Arrange supports and accessories for equipment, appliances or ancillary fitments in pipe runs, so that no undue strain is imposed upon pipes. Ensure that materials used for supports are compatible with pipeline materials. Arrange pipework, valves, drains, air vents etc., for convenient routine maintenance and renewals.

Hot and cold pipework shall be Pegler Yorkshire Xpress Copper or equal and approved. The Xpress system has been proposed to reduce the amount of "hot work" required to be carried out. Reducing the risk of fire by using mechanical jointing is the preferred option.

Thermal insulation shall generally comply with BS 5970.

All hot and cold pipework shall be insulated with Kingspan Tarec Kooltherm foil faced phenolic foam having zero ozone depletion potential (ZODP) or equal and approved.

Various thicknesses of insulation will need to be used to coordinate with the limited head height in the lift lobby areas. Cold water pipework shall be insulated to prevent condensation. The following general rules shall apply as a minimum but thicker insulation shall be used where possible:

- Main runs - 25mm thick
- Branches - 20 mm thick
- Final Branches to individual units - 15 mm thick

In order to avoid heat pick-up, cold water pipes shall not run parallel with heating or domestic hot water pipes.

Colour code all pipework and label at intervals not exceeding fifteen metres. Apply 50mm wide colour bands and superimpose a legend identifying circuit and direction of flow.

Valves

Provide isolating valves on all hot and cold services such that no more than 3 appliances are isolated by any one isolating valve.

Stop valves to BS 1010 Part 2, with compression fittings to BS 864 Part 2. Non-dezincifiable copper alloy body. Kitemark certified for use on rising main service. Gate valves to BS 5154, Series B horizontal pattern with compression fittings to BS 864 Part 2. Copper alloy or bronze body, non-dezincifiable. Kitemark certified for general use.

Spherical plug service valves (Ball-O-Fix valves) to BS 6675, with compression or BSP female swivel fittings as required. Lever or screw-driver operated for use as service valves to individual sanitary appliances so that those appliances can be serviced or maintained. To be fitted on hot and cold service to all appliances. Drain cocks to BS 2879, screw-down type, non-dezincifiable, serrated outlet to accept hose pipe for use on hot, cold and heating systems to enable the complete draining of all sections of pipework. Double check valves to WRC approval for use on unvented appliances.

Supply and fit plastic labels to all valves (except Ball-O-Fix valves) engraved with description of function.

All pipework run exposed in unprotected areas (plantrooms, service corridors etc. but not within risers, above false ceilings etc.) shall be protected with aluminium sheeting pipework protection.

TESTING & COMMISSIONING

Pressure Testing

Advise appropriate personnel, including EA, of the time that pressure tests may be witnessed. Test concealed or buried pipework before any permanent covering is applied. Complete pressure testing before applying thermal insulation. Thoroughly flush out the whole system, fill system, vent all air from system and check for leaks, repair any leaks and re-check. Pressure test the system to twice the working pressure (or at least 5 bar – whichever is the highest) for a period of one hour then check for and repair any leaks. Repeat pressure test if leaks have been found.

Sterilisation

After flushing process, carry out sterilisation in accordance with BS 6700. Prior to sterilisation ensure each system is flushed, cleaned and drained. Fill with clean water and introduce sterilisation chemical, take samples to ensure correct chlorine concentration. Repeatedly flush system with clean water until all traces of chlorine have been removed - leave system filled. Submit samples to registered laboratory for independent micro-biological analysis and report results to the EA.

Performance Testing

Demonstrate that all draw off points give adequate rates of flow as required by the design parameters. Keep a systematic record of tests. Distribute to EA and provide copies in O&M Manuals.

S61 Dry Riser

DESIGN PARAMETERS

The design, specification, installation and setting to work of the whole of the works shall comply with all relevant British Standards, in particular:

- CIBSE Guide E
- BS 9990:2006
- BS 143
- BS 5041

Plant/Equipment Life: A minimum of 20 years without major replacement.
System Life: In excess of 25 years.

SYSTEM DESCRIPTION

The existing dry-riser system shall essentially remain unaltered with modifications carried out to suit the new areas at podium level. The inlet valve shall be relocated to a point on an external wall. New landing valves shall be provided where indicated on the drawings.

MATERIALS & WORKMANSHIP

All dry riser pipework to be galvanised carbon steel to BS 1387 with long radius malleable cast iron fittings to BS 143 screwed and socketed.

Landing valves to BS 5041: Part 4 inlet breeching to BS 5041: Part 3.

Landing valve boxes to BS 5041: pt4.

S32 Natural Gas

DESIGN PARAMETERS

The minimum gas pressure at the new boiler plant connection shall be as required by the relevant gas regulations and by the boiler manufacturer. Calculations for the new connection pipework shall be carried out taking into account the gas flow rate required by the existing boilers.

The installation is to be installed in accordance with 'Safety in the Installation and Use of Gas Systems and Appliances', Guidance on the Gas Safety (Installation and Use) regulations 1998 and Approved Code of Practice, HSE Books, 1998.

Other Regulations that the system shall comply with are as follows:

- Institute of Gas Engineers Publication IGE/UP/2
- British Gas Publication IGE/TD/3 - Main laying
- British Gas Publication IGE/TD/4 - Gas Services
- BS 6644:2005
- Building Regulations Document B
- Health & Safety Commission - Approved Code of Practice and Guidance
- Health & Safety - The Gas safety (Installation and Use) regulations 1994
- Requirements of the Gas Supplier
- All Institute of Gas Engineers requirements

Plant/Equipment Life: A minimum of 20 years without major replacement.
System Life: In excess of 25 years.

SYSTEM DESCRIPTION

The scope of works is limited to providing a new connection from the existing gas system to serve the new boiler plant.

A sub-meter shall be installed to meter the gas consumption of the new boilers serving the Tower. Prices for two options shall be provided, these being:

- A standard meter
- A digital meter connected to a central BMS/metering system

An amended gas system line diagram shall be mounted in the meter room and at the building entrance.

MATERIALS & WORKMANSHIP

The gas pipework installation shall be heavy grade steel painted canary yellow. Gas supply pipelines for maximum operating pressure up to and including 16 bar to BS EN 12007; for steel pipework BS EN 12007-3

TESTING & COMMISSIONING

Commission gas fired plant in accordance with IGE/UP/4.

Commission gas supply systems in accordance with BS EN 12327.

T32 Low Temperature Hot Water Heating

DESIGN PARAMETERS

Design the system to maintain minimum temperatures of 21oC in all internal spaces with an external temperature of - 4oC.

- Building regulations Part J and Part L
- CIBSE guide B2
- BS EN 12828
- BS 7074
- CIBSE Commissioning Code W

Allow for initial warm up in the sizing of heating plant and emitters. Include margins as indicated in the CIBSE Guide.

Plant/Equipment Life: A minimum of 20 years without major replacement.
System Life: In excess of 25 years.

SYSTEM DESCRIPTION

General

The building shall be provided with heat for space heating and instantaneous domestic hot water by means of a central gas-fired condensing boiler installation, delivering LTHW (low temperature hot water) heating to the various areas. The new heating system shall only serve the Tower building and shall be totally separate from the existing main boiler plant which will continue to serve the 'Finger Block' flats.

Each flat, the nursery and the office area shall have a HIU (heat interface unit) as indicated on the drawings, providing space heating and instantaneous hot water. The boxing club will have a heating only HIU with the domestic hot water being provided by an indirect storage cylinder. The HIU's shall hydraulically separate the central plant installation from the local installation in each area.

The LTHW system shall comprise at least, but not be limited to, the following components:

- 3 No. gas-fired condensing boilers (for space heating, hot water supply and back-up).
- Heating system buffer vessel.
- Heating system circulating pumps.
- Local heat interface units
- Heat meters for each HIU – options for type of meters to be provided
- Local heat emitters.
- Thermostatic radiator valves
- Room thermostats for each flat, the nursery, boxing club and offices
- Pressurisation unit.
- Expansion vessels and safety valves.
- Common low-loss headers.
- Automatic and manual water dosing pots
- Air and dirt separators.
- Differential pressure valves.
- System monitoring: visual pipeline gauges,
- System monitoring: Options for BMS interface with temperature and pressure sensors, etc.
- Safety devices.
- Commissioning valves and equipment/system isolation valves.
- Anti-vibration mounts for all plant.
- Builderswork

There is a Community Meeting room which is unlikely to be used on a regular basis, so the heating for this room shall be by electric convector heaters.

Central Boiler Plant

New central boiler plant to serve the Tower shall be located in the existing basement plant room.

The boiler plant shall be sized to cope with the peak simultaneous heating and hot water generation loads. Preliminary calculations indicate that the heat output required from the boilers in order to meet the peak load is approximately 700 kW. The Contractor shall make its own assessment of the peak load and install boiler plant adequate to meet this load. Notwithstanding the rating of the boilers, the boiler plant shall be modular with a minimum of three equal-sized modules being provided.

The boilers shall be natural gas fired condensing boiler to BS EN 656:2000, thermal performance to BS EN 15502-2-1:2012 and installation in accordance with BS 6644 – 2011. They shall be complete with all necessary controls, pumps, etc. for the correct operation of the heating plant. Each boiler shall have a modulating burner capable of modulating down to 10% of full output rating.

The flues from the new boilers shall connect to a twin-wall, insulated stainless steel common header in the plant room. The header shall then connect into the existing spare builderswork flue which terminates at roof level.

The builderswork flue will require to be lined in order to deal with the condensation from the combustion products. One possible option for lining the flue has been investigated with a proprietary flue lining company:

Chimflue Ltd.
Unit 5
Viscount Court
South Way
Andover SP10 5NW
Tel: 01264 332 878
E-mail – sales@chimflue.co.uk

They have provided a quotation for carrying out this work Quotation Ref: Q1309070CW dated 1 Nov 2013.

The Contractor shall either progress with using Chimflue, refining the design as necessary or shall propose an alternative method or an alternative installer.

The boiler flues in the plant room shall be twin-walled, insulated stainless steel flue complying with BS5440 or BS5854 (as appropriate).

Pumps

Individual boiler pumps shall be provided to ensure water circulation through the boilers whenever they are operating. The boiler pumps shall circulate the boiler water through a low-loss header/buffer vessel. The main circulating pumps will then pump water to the building as required.

There shall be two main circulating pumps to provide run and stand-by. The pumps shall be separate individual pumps and not twin-head pumps.

The pumps shall be variable speed pumps with inverter control drives. The pump control system shall monitor the pressure in the heating system and control the pump speed to maintain optimum pressure within the system. The pump control system shall alternate the duty pump on a daily basis.

Distribution Pipework and Valves

New mains heating flow and return risers shall run up the building from the boiler room to the top flat. The mains shall be heavy grade steel. Jointing shall be made using proprietary mechanical joints such as flanges, victaulic coupling, etc. – hot jointing will not be used without the written agreement of the EA.

At each floor level, branch pipes connect the risers to the flats and other heated areas. This pipework shall be stainless steel using a “cold joining” connection method to avoid hot works as described earlier in section S12 Hot and Cold Water. All cold joints shall be capable of withstanding the high pressures which will be present in the system.

Static system pressure will reach 9 Bar at the bottom of the main pipe risers. All equipment and valves shall be capable of operating safely at this pressure.

The Contractor shall design the system to take these high pressures into account. One way of achieving this would be to provide differential pressure control valves, such as Oventrop Hydromat DTR (or equal and approved), to regulate and maintain the differential pressure across the flow and return at each level from approximately 35 to 70 kPa per floor. This will ensure the quiet operation of thermostatic radiator valves. A flow regulating valve such as Oventrop Hydromat QRT (or equal and approved) to work in parallel with the differential pressure control valve would help to protect against excessive flow conditions which can sometimes be experienced in variable speed pumping systems.

Pressurisation Set

The primary sealed heating system shall be filled and pressurised by a pressurisation unit. The unit shall have a digital control panel with a pressure transducer monitoring the system pressure. The controller shall have three volt-free relay outputs for – boiler run with high and low pressure cut-out, general fault and combined warning and fault. The unit shall have a built-in electronic water meter with a volt free warning relay, which shall activate should the monthly consumption exceed 50 litres per month.

The pressurising unit can be located in the roof plant room if required.

Water Treatment

An automatic water treatment system shall be provided. The Contractor shall engage a water treatment specialist company to analyse the heating system water and recommend suitable water treatment. An automatic dosing plant shall be installed to provide the type of treatment recommended by the specialist company. The dosing system shall use an appropriate inhibitor that is approved by the boiler and other plant manufacturers and suitable for the type of heating system/pipework installed. Ensure that any chemical treatment of heating system water is suitable for use with components and equipment comprising the heating system.

The heating system in each flat, the Nursery, Boxing Club and Offices shall be dosed with an appropriate inhibitor that is approved by the HIU manufacturer and suitable for the type of heating system/pipework installed.

Heat Interface Units (HIU's)

Each flat shall have a ‘Heat Interface Unit’ (HIU) which shall be connected to the new heating mains to provide space heating and to heat the domestic hot water supply. The HIU's shall be located in the cupboard where the existing Elson hot water tank is located.

The HIU's shall have two heat exchangers, one for space heating and one for domestic hot water heating. The heating heat exchanger shall have a primary heating circuit fed from the building's heating system. This transfers heat to a secondary circuit which circulates heat to the radiators in the flat. The heat exchanger maintains complete hydraulic separation between the two circuits.

The HIU domestic hot water heat exchanger has a primary heating circuit fed from the building's heating system. It also has a secondary circuit which is fed from the cold water supply. The heat exchanger transfers heat from the primary heating circuit to the cold water thereby providing domestic hot water for the flat. Again, complete hydraulic separation is maintained between the two circuits.

The HIU container box shall be fully insulated with insulation on all heating parts and on all faces of the box to reduce radiated and convected heat into the flat.

The HIU shall be type SAV Flatstation as manufactured by Danfoss or equal and approved.

Locate HIU's with adequate surrounding space for service and maintenance. Fit isolating valves required to isolate all connections to the HIU.

Heating within Flats, Nursery, Boxing Club and Offices

Heating within these areas shall comprise panel radiators served by distribution pipework. In order to reduce the risk of fire, it would be preferred to use cold jointing of pipework. The Contractor shall assume this is a requirement but may comment and offer alternatives as they see fit.

In general, the radiators shall be standard panel radiators as manufactured by Stelrad Ltd. or equal and approved.

In the Nursery areas where children will be playing and in the accessible WCs and shower rooms, low surface temperature radiators shall be provided.

Insulation

Controlling heat emission from the main risers and the branch pipework is critical as the pipes generally run within enclosed lobbies and excess heat will result in a significant rise in temperature. It will therefore be crucial that all pipes are insulated to a very high standard of insulation. This will entail using thicker than standard insulation where possible and ensuring that all insulation is well fitted and covered with retaining material. It will be necessary to provide insulation for flanges, valves and all other components over and above straight pipework. Valve boxes shall be provided and fitted after commissioning has been carried out.

All concealed insulated systems shall be offered to the EA for inspection prior to them being covered up.

Controls

General:

All main controls shall be digital based controls. The Contractor shall provide costs for two options for the main controls installations, these being:

- Local, stand-alone controls
- 'Outstation' type controls which can communicate with major Building Management Systems (BMS) installations, such as TREND, etc.

The BMS controls shall be capable of being connected to future central points both within and remote from the building using standard data communication systems. The Contractor shall provide details of proposed options with the tender.

A mechanical control panel (MCP) shall be provided. This shall contain all necessary, controls, circuit protection, starters, etc. On the face of the panel, On/Off/Auto switches shall be provided for all pumps along with Run/Trip, Panel Live, etc. indicator lamps.

Central Boiler Plant:

Heating is required continuously throughout the day and night. The heating water flow temperature needs to be maintained at a high enough temperature to provide domestic hot water when required. A sequence controller shall be provided which operates the boilers in sequence to provide a constant heating flow temperature.

The controller shall operate the plant in the most energy efficient way available, including lead/lag control, modulating burner control, etc.

The controller shall be a digital data type controller. It shall be face mounted on the boiler control panel such that adjustments can be made without having to open the panel door. The heating flow temperature and any other relevant data shall be displayed on a screen on the face of the boiler control panel.

Provide an interface with the boiler room ventilation system such that the new boiler plant will not run unless air flow has been established.

Similarly, amend the existing boiler plant control such that it will not run unless air flow has been established.

The design assumptions for sizing the gas supply system for the original boiler plant are not known. In order to avoid any problems with gas flow, the Contractor shall either produce calculations which show the existing gas supply line is adequate to support the three existing boilers firing at the same time as the new boiler plant or amend the control of the existing boiler plant such that no more than two of the existing boilers fire at any one time.

Local Controls:

The heating systems in the flats, Nursery, Boxing Club and Offices shall be the same. A time-switch shall control operating times of the system. A central thermostat shall provide central temperature control with thermostatic radiator valves providing individual local control. In order to avoid hard wiring, the central thermostat shall be a wireless type. The thermostat and the time control shall be a Drayton 'Digistat' 3RF Wireless Thermostat/Programmer or equal and approved.

Provide controls and motorised valves to enable automatic control of all local heating systems.

In the Community room where electric heating is being provided, the convectors shall be controlled by a room thermostat/programmer similar to that being provided for the flats.

Metering

The Contractor shall provide costs for the following heat-metering options for all of the areas being provided with the new HIU installations:

- Remote wireless operated metering.
- Remote hard-wired metering suitable for MBus or similar systems for data collection.
- Both of the above, but with 'pay as you go' card payment system.

MATERIALS & WORKMANSHIP

General

The setting out of all visible equipment shall be agreed with the EA prior to installation. Samples of all visible equipment shall be offered to the EA for approval.

Pipework

Install pipework to the standards described in Section S12 above.

Insulation

Insulate pipework to the standards described in Section S12 above.

TESTING & COMMISSIONING

Pressure Testing

Test concealed pipework before any permanent covering is applied. Complete pressure testing before applying thermal insulation. Isolate or remove pump, open all valves and thoroughly flush out the whole system. Replace pump, fill system, vent all air from system and check for leaks, repair any leaks and re-check. Pressure test the system to twice the working pressure for a period of 60 minutes, and check for and repair any leaks. Repeat pressure test if leaks are found.

Commissioning

Carry out testing and commissioning in accordance with Appendix A.

Test and commission installations to the requirements of CIBSE Commissioning Codes.

Provide test certification/commissioning reports for EA and for inclusion in the O&M Manuals.

Advise appropriate personnel, including the EA, of the time that pressure tests may be witnessed.

U10 General Ventilation**DESIGN PARAMETERS**

- Building Regulations, Part F
- Local Authority requirements
- HVCA - DW144
- HVCA - TR/17
- CIBSE Guides

Plant/Equipment Life: A minimum of 20 years without major replacement.
 System Life: In excess of 25 years.

SYSTEM DESCRIPTION**Refuse Lobbies**

The access to the refuse chute from the main circulation area is via an enclosed lobby. Mechanical ventilation is currently provided to this lobby via supply and extract grilles located at high and low level next to the chute entrance. The supply and extract fans are located in the roof plant room. It is not proposed to carry out any work on the existing fans or ductwork. The Contractor shall service the fans and report any deficiencies following the service with any recommendations for remedial work.

Access to the refuse chute is currently provided from Walkway +2 upwards. Additional access to the refuse chute will be provided on Walkway +1. The ventilation system will be extended down to Walkway +1 level to provide general supply and extract ventilation to the newly formed refuse chute access rooms.

Bathroom Ventilation – Existing Flats

The bathrooms are currently ventilated by a central extract system with fans in the roof plant room. The system comprises a series of small riser ducts which rise to roof plant room level to combine into larger ducts which in turn, connect to the central fans to discharge to outside.

The existing system shall essentially remain as it currently is apart from the final connections to the bathrooms.

The Works covered by this specification comprise:

- Servicing the toilet extract fans and reporting any deficiencies following the service with any recommendations for remedial work
- Cleaning of the main ductwork system.
- Replacement of the final length of ductwork to each bathroom.
- Provision of new grilles to each bathroom.

Kitchen Ventilation – Existing Flats

The kitchens shall be ventilated by a panel mounted extract fan. The fan shall be switched locally.

Bathroom and Kitchen Ventilation – New Flats

On the lower floors where the new flats are being constructed, the bathrooms and kitchens in each flat shall be ventilated by a combined extract system as indicated on the drawings. The extract system will run continuously.

The ventilation unit shall be located within a kitchen cupboard.

Boiler Room Ventilation

The current ventilation system to the basement boiler room does not comply with the required standards and is to be upgraded by the installation of additional ventilation.

Provide a new supply fan located as indicated on the drawings.

The fan shall run continuously and shall have a differential pressure switch which prevents any of the boilers from firing until air flow has been established.

Smoke Control Ventilation

The lift lobbies on the residential floors are all ventilated to provide smoke control in the event of fire.

Existing System:

The system comprises a fresh air shaft and a smoke extract shaft serving all the lift lobbies on the residential levels of the building. The system is designed to work as a natural ventilation system, but supply and extract fans are also installed to enable the Fire Brigade to provide additional mechanical ventilation if they consider that to be advantageous in dispersing smoke.

Each lift lobby has a fresh air inlet at low level on one side of the lobby and a smoke exhaust vent on the opposite wall of the lobby at high level. The vents connect directly into the fresh air shaft and the smoke extract shaft respectively.

Each vent has a remote operated damper which is normally closed.

There is a smoke detector in each lobby. In the event of a fire in any of the lobbies, the smoke vent dampers and the fresh air dampers serving that particular lobby open. The dampers on all other levels remain closed.

A fireman's switch at ground level gives the Fire Brigade the choice of using mechanical ventilation.

Proposed System:

The current system was designed and installed around 40 years ago and there are no compatible current standards. Building Control have been approached to agree how best to progress with the design of the system given the physical constraints of the building. Their response, along with that of the Fire Brigade, is expected during the tender period.

It is proposed to install a new ventilation system which will primarily be for fire safety and smoke control, but which will also provide some ventilation to reduce the possibility of the lobbies becoming uncomfortably warm due to heat emission from the heating pipes running through the lobbies.

The current system is old and over the years has had some of the original parts replaced with different components. The proposed system will provide new supply and extract fans as well as consistent new components on all floors and should prove significantly more reliable in operation and be easier to maintain than the current system. It will also make routine testing simpler and easier to carry out.

Smoke Control:

It is not viable to adapt the existing system to comply with current standards. Given the physical constraints of the existing building, the design approach has therefore been to upgrade the existing system to as high a standard as possible.

The new system will be a mechanical supply and extract system which does not rely on natural ventilation as the performance of a naturally ventilated system would be difficult to model and verify. As

there are no directly applicable standards which can be referred to, it is considered that it would be reasonable to design the system to provide an air-change rate of approximately 15 air-changes/hour.

The existing fresh air shafts and smoke extract shafts will be reused.

The system will be extended to serve the Walkway +1 floor.

New motorised dampers will be fitted to all fresh air and smoke extract vents.

New louvres shall be installed at all lift lobby levels.

New fresh air supply and smoke extract fans will be provided.

New smoke detectors will be fitted in the lobbies.

A new fire panel will be installed on the ground floor.

On detection of smoke within any lift lobby served by the smoke control system, the fresh air and smoke dampers serving that particular lobby would open fully and the supply and extract fans would operate. The fresh air and smoke dampers on all other levels would all be closed.

The fire panel would have a ventilation selector switch which would enable the Fire Brigade to control the supply and extract fans.

Dual power supplies would provide normal/stand-by power from different sources to the fans and to the fire panel.

Indication shall be provided on the fire alarm panel to indicate activation of any smoke detector and the status of the fans.

Temperature Control:

As part of the refurbishment of the building, new heating mains serving the residential areas are being installed. These will rise through the building within the lift lobbies with branches to the flats at each level. These heating mains will be relatively large and even with a high standard of insulation, they will emit a significant amount of heat into the lobbies.

This has caused considerable problems on other projects and it is considered essential for this project that provision is made to provide adequate venting.

Normally, comfort ventilation would be kept separate from smoke ventilation. However, for this project where the lobbies are land-locked, there are few, if any, options available apart from using the smoke vent system.

It is therefore proposed that under normal conditions the fresh air and smoke dampers are kept open. Temperature sensors located within a few 'typical' lobbies would operate the fans if the temperature in any of these lobbies rose to an uncomfortable level. Conversely, the temperature sensors would also close the dampers if on very cold days the lobby temperature dropped below a pre-set level.

In the event of smoke being detected within any lift lobby served by the smoke control system, the fresh air and smoke dampers serving that particular lobby would remain open and the supply and extract fans would operate. The fresh air and smoke dampers on all other levels would all be closed. The system would be set up such that it was 'fail-safe' with priority always being given to the fire safety operation.

Notwithstanding that the above proposals are currently being considered by the relevant authorities, for the purposes of pricing, the Contractor shall assume that the proposals will be accepted and shall price the installation accordingly.

Prior to commencement of the contract, formal approval will have been obtained. It will then be the Contractor's responsibility to verify, adopt and implement the design to the satisfaction of the relevant authorities.

MATERIALS & WORKMANSHIP

Generally, new ductwork (apart from low-profile plastic ductwork) shall at least comply with the requirements of DW 144 & 151 low pressure/velocity classification and be of an equivalent or better standard than existing ductwork.

Supply all grilles and louvres required to form a complete installation. Allow for powder coating to a BS colour to be specified by the EA. Submit samples of typical size and finish for approval by the EA.

Install fans in accordance with the manufacturer's instructions and recommendations in HEVAC Fan Application Guide.

Install any proprietary ductwork systems strictly in accordance with manufacturer's recommendations.

TESTING & COMMISSIONING

Carry out commissioning in accordance with the procedures, checks and tolerances given in the CIBSE Commissioning Codes, BSRIA Application Guides and Appendix A of this specification. Commission fans in accordance with the manufacturer's instructions. Measure and balance system flow rates and keep a systematic record of commissioning results. Issue to EA and include in the O&M Manuals.

On completion of the installation, demonstrate correct operation to the EA, Building Control and the Fire Brigade as appropriate.

Electrical Installations

SCOPE

The general scope of the electrical works is as follows:

- Electrical systems to all new/refurbished areas of the building.
- Minor power supplies within existing flats to HIU's and kitchen extract.
- New intercom system for existing and new flats
- TV system extension to new flats
- New lighting to existing lift lobbies
- New external lighting
- Power and control to new items of mechanical plant
- Power and control to new smoke control system
- Lightning protection system refurbishment

DESIGN PARAMETERS

Comply with the following:

- IEE Wiring Regulations, 17th Edition
- The Building Regulations 1991.
- CIBSE Guides.
- All relevant British Standards.
- Local Electricity Utility
- British Telecommunications plc.
- Equipment manufacturer's instructions and recommendations on selection, installation, commissioning and maintenance.
- All setting out dimensions to be to the approval of the EA.
- All wiring connections to be accessible.
- Safe access to all switchgear.
- CIBSE Code for Interior Lighting
- CIBSE Code for External Lighting
- Provide all light fittings complete with suitable lamp(s).
- Building Control / Fire Officer's requirements
- Requirements of the Public Switched Telephone Network Operator

V20 Power

SYSTEM DESCRIPTION

Incoming Power Supplies:

There are currently individually metered supplies from the Utility Company UKPN, serving the existing flats. There is also a single UKPN supply serving a Landlord's board which then serves the Nursery, the Boxing Club, the Office areas, landlord areas, mechanical plant, lifts, etc. The UKPN supplies shall be retained.

There may be diversions and/or temporary works required to these services to allow enabling and permanent work to progress. The Contractor shall carry out all work associated with these diversions/ temporary works.

As part of the new works, the Contractor shall arrange with UKPN for new metered supplies to be provided for the Nursery, the Boxing Club, the Office areas and the new flats. This shall include provision of all cables, containment and attendance required by UKPN.

The existing landlord supplies currently serving areas or equipment which are to remain, shall be retained. The Contractor shall carry out all work associated with retaining these, including any diversions or temporary works.

Within each of the new areas, provide a suitable size miniature circuit breaker distribution board, adequately rated to provide power and lighting to the systems shown on the drawings. All power circuits generally to be protected with combined MCB/RCD's. The board shall have at least two spare ways.

Mechanical Plant Power Supply:

There is an existing power supply and mechanical plant panel serving the existing mechanical plant in the basement. This shall remain as at present.

For the new boiler plant installation, provide a new power supply from the existing landlord's main board to serve the new mechanical control panel described in Section T32.

There is an existing power supply serving the roof plant room. Subject to this being in satisfactory condition and suitably rated, this supply may be used to provide power to the water pressure booster pump set.

Smoke Control Power Supply:

The smoke control system requires a secure power supply incorporating normal and back-up supplies. At present, the smoke control fans are supplied from a power source outside of the building (Testerton Walk) and from the landlord's supply in the building. A changeover panel monitors the supplies and on failure of one supply will switch over to the other.

The new system shall have a new panel provided with similar arrangements for changeover power. Subject to checking they are in good condition, correctly rated and suitable material, the existing power sources can connect to the new changeover panel.

Power to the smoke control dampers can also be taken from the new changeover panel, subject to agreement with the Fire Officer.

Power within Existing Flats:

The power and lighting installation within the existing flats shall remain unaltered apart from the provision of spur points taken from existing circuits to serve the new kitchen extract fan and the new heat interface unit.

Power within New Flats:

The type of cables and containment for the power, lighting and other electrical systems installations within the new flats shall be at the discretion of the Contractor. Wherever possible, the cables and containment shall be concealed. Any proposed exposed elements shall be agreed with the EA prior to installation. It should be noted that the height of the rooms at Mezzanine level is very restricted so careful planning of the installations will be required.

Final locations and setting out of all socket outlets and fused spurs to be approved by the EA.

V21 GENERAL LIGHTING

The general scope of the lighting installations is as follows:

- Lighting within new areas at ground to level Walkway +1.
- Lighting in lift lobby areas.
- External lighting.
- Emergency escape lighting.

The proposed lighting installations are shown on the tender drawings and schedules.

Design Lighting Levels:

Flat living/dining spaces: 200

Flat kitchens: 300

Flat bathrooms: 150 not including task lighting (e.g. mirror lights)

Communal corridors: 150

Provide luminaries, lamps, controls and accessories as required.

External fittings shall have vandal resistant housings providing even light with no shadows or voids and minimal light pollution. A minimum uniformity rating of 25% and above with a colour rendition index rating of 60 and white light where any CCTV is used is provided.

The external lighting design shall be more fully developed by the Contractor in conjunction with the architect and EA during the next stage of design.

Emergency Lighting:

Emergency lighting shall be provided where indicated on the drawings and any other areas required by Building Control/Fire Officer. The installation shall be in accordance with BS 5266 using maintained fittings with battery packs.

Lighting Controls:

Lighting generally shall be locally switched apart from completely internal areas where the lighting shall be on continuously.

Control of external lighting shall be by photocell control.

Provide samples of each light fitting upon request by the EA.

All luminaries to be of IP rating and robustness suitable for the environment in which they are installed.

V22 GENERAL LV POWER

Provide 13A power socket outlets to all new areas as indicated on the drawings. Sockets to be as specified in the electrical schedules.

Provide cleaner's sockets to new common areas. Provide shaver sockets in bathrooms of new flats.

Final locations of electrical accessories to be agreed with the EA.

W10 TELECOMMUNICATIONS / W30 DATA TRANSMISSION

The occupants of all the new areas will make their own arrangements for connecting to telecomm and data providers.

The Contractor shall provide suitable containment from the outlet points shown on the drawings for the various areas to central locations/risers to enable cables to be pulled through in the future.

W20 TV SYSTEM

There is an existing communal television system serving the existing flats. This system shall be extended to serve the new flats.

The Contractor shall engage SCC Alphatrack who currently maintain the TV system to extend the existing system to serve the new areas.

The contact at SCC Alphatrack is:

Michael Campbell
Head of IRS Division



@sccalphatrack.co.uk

The new system shall be to at least the same standard and quality as the existing system.

W40 ACCESS CONTROL

A new access control system shall be provided for all of the existing flats, the new flats, the offices and the reception desk .

The new system shall comprise voice communication between each area and the communal front door. The system shall allow occupants to release the front door lock.

The existing system wiring serving the existing flats shall as far as possible be reused. New wiring shall be installed to serve the new flats.

The Nursery does not require an intercom, but a proprietary door bell (mains operated) shall be provided.

The Boxing Club does not require a connection to the front door, but do require a local intercom at the entry door to the Club.

W50 FIRE DETECTION & ALARMGeneral:

New fire detection and alarm systems shall be installed in The Nursery, the Boxing Club, the Office areas and the Meeting Rooms. These areas shall all be provided with at least a Type "M" system as defined in BS5839-1. Each system in these areas will be "stand alone" but interlinked so that an outbreak of fire in one of them will be enunciated on all fire alarm control panels.

The new flats will be provided with LD3 systems of detection and sounders as defined in BS 5839-6.

Engage a fire alarm specialist to design, develop, supply, install, test and commission the fire alarm system.

The new flats will be provided with LD3 systems of detection and sounders as defined in BS 5839-6.

Central Panel:

As described in Section U10 above, a central control panel shall be provided for the lift lobbies smoke control system. In addition to the indication provided for the smoke system, provide indication of fire being detected in any of the new areas described above.

Include for a dial-up connection to the local Fire Brigade.

W51 EARTHING & BONDING

Ensure earthing and bonding arrangements comply with the requirements of the IEE Wiring Regulations and the local supply utility.

Provide all circuit-protective and safety earthing and bonding as necessary and in accordance with the nature of the incoming supply and in accordance with BS7671:1991 IEE 17th Edition Wiring Regulations

W52 LIGHTNING PROTECTION

There is an existing lightning protection system. This has been surveyed by a lightning protection specialist installer and several defects have been identified. The lightning protection specialist installer's contact details are:

Lightning Protection Testing UK
20 Lingfield Green
Darlington
Co Durham
DL1 1DD

Sam Spence

info@lightningprotectiontestinguk.co.uk or nationwidelps@gmail.com

The contractor shall engage Lightning Protection Testing UK or a similar lightning protection specialist installer to rectify all of the identified defects. On completion, the Contractor shall provide a certificate confirming that the system complies with the relevant parts of BS EN 62305.

MATERIALS & WORKMANSHIP

General:

Inspect all equipment and components on delivery, before fixing and after installation and reject and replace any which are defective.

Engrave accessory plates with name of any fixed equipment served. Use 6mm high letters with engraving coloured black. Type-face to be agreed with the EA.

Provide a purpose made schematic diagram permanently fixed adjacent to the main distribution board only showing the connections of the equipment and plant.

Consumer Unit & Distribution Board Identification:

Identify every outgoing way with a renewable circuit chart in a transparent plastic envelope permanently fitted inside distribution board cover. Clearly indicate in typed script, circuit identification number, cable size, fuse or circuit breaker rating and a description of item supplied and area supplied by circuit.

Conduit & Trunking:

Remove burrs from cut trunking ends.

Provide drainage outlets at lowest points in conduit installed externally and in locations where condensation may occur. Arrange conduit and trunking, plumb where vertical, neatly parallel with other service runs and the structure. No exposed conduit or cables, except where agreed by the EA in writing.

Make provision at expansion and settlement joints for movement. Use manufactured expansion couplings.

Install conduit, trunking and equipment clear of other services. Ensure trunking and conduit is independently supported from building fabric. Obtain approval for supports.

Use trunking only where continuous access along its length is available. Use multi-compartment trunking for segregation of services wiring with earth steel partitions. Separate compartments for wiring of LV circuits, ELV circuits, data, voice, etc.

Conduit & Trunking - UPVC Trunking Installation:

Use proprietary units to form junctions and changes of direction wherever possible. Fit grommets, bushes or liners to holes through which cables pass.

Conduit & Trunking - Steel Trunking Installation

Steel trunking and fittings to be standard cable trunking to BS 4678 Part 1. Size: in accordance with BS 7671 (IEE regulations). Finish: zinc coated to BS EN 10142 or BS 2989 and BS EN 10147.

Use proprietary units to form junctions and changes of direction wherever possible. Fit a copper link at each joint to ensure electrical continuity. Fit grommets, bushes or liners to holes through which cables pass.

Multi Compartment Trunking Installation:

Install carefully to avoid surface damage. Install in accordance with manufacturer's recommendations. Where trunking or ducting pass through fire resisting floors, ceilings, cavity barriers, etc., seal internally with packed rock fibre or proprietary intumescent material.

Cable Installation – General:

Do not commence internal cabling until the building is enclosed and weatherproof. Install cables neatly and securely, adequately protected against accidental damage, adverse environmental conditions, mechanical stress and deleterious substances. Install cables without joints other than at equipment and terminal fittings. Do not use junction boxes without approval.

Do not run cables in spaces where they will be surrounded or covered by insulation. Use cable conductors throughout; do not use conduit or trunking as protective conductors.

Locate concealed horizontal runs in walls within 150 mm of ceiling or between 150 and 300 mm of floor. Locate concealed vertical cable runs to wall switches and outlets in line with accessory.

Use armoured cable for external buried cable; XLPE/SWA/PVC cable to BS 5467, rated voltage 600/1000V. 90 °C max. operating temperature. BASEC certified. Copper or aluminium conductors. Galvanised steel armour.

Flexible cords to be to BS 6141, heat resisting PVC insulated and sheathed cable.

Flexible cord to be used for pendent light fittings, connections to recessed fittings.

MICC cables to BS 6207 part 1 table 2, light duty, rated voltage 600V. BASEC certified. PVC sheathed, colour red. Use MICC cables (or approved 'Soft Skin' fire rated cables) for fire alarm installation.

Cable Installation - Armoured Cable:

Handle and install carefully to prevent damage to sheath and armouring. Do not install if cable and ambient temperature are, have been for the last 24 hours, below 0°C.

Fit galvanised steel guards where cables are liable to mechanical damage. Bond armour to equipment and main earthing system. Make moisture proof connections to apparatus using sealed glands and PVC shrouds.

Cable Installation - PVC Sheathed Cables:

Do not install cables when temperature is near or below freezing. Do not install in cavities of external walls. Fit insulating cable glands at entries to equipment. Terminate cable sheaths within boxes.

Cable Installation - MICC Cables:

Straighten and dress flat cables prior to fixing.

Cable jointing sundries:

Use terminations conforming to the BS 4579. Use tapes to BS 3924. UPVC and steel conduit installation:

Use maximum practical lengths to minimise number of joints. Form bends by machine and remove burrs from cut ends. Use bends and/or junction boxes at changes of direction. Do not use elbows or tees of any sort without approval. Fix securely with boxes fixed independently of conduit.

Cable Installation – Cable Identification:

Provide all cables, other than final sub-circuit wiring with labels fixed at each end of cable, either side of wall and floor penetrations and at approximately 10m intervals. Ensure labels show reference number of cable. Protect all equipment and ancillaries against corrosion. Protect ferrous metals with coatings at works. Provide all items for decorative finishing primed to suit base material and finish.

Identification:

Apply identification notices in accordance with the BS 7671 (IEE wiring regulations) Clause 514 to all electrical cables, plant and equipment. Fix using materials compatible with the notices and fixing surface. Apply identification markers in accordance with the BS 7671 (IEE Wiring Regulations), Clause 514 to all conductor termination points. Label all electrical plant and equipment using safety sign A.2.8 of BS 5378, Part 1, where voltages above ELV exist.

Power & Lighting – General:

Install luminaries in horizontal plane unless otherwise agreed. Ensure luminaries are clean. Ensure classification of luminaries is appropriate to purpose of space served. Install recessed and semi-recessed luminaries as manufacturer's details. Where a luminaire is supported from conduit, provide a conduit box forming an integral part of conduit system at each point of suspension. Where conduit enters luminaire, use backnuts and washers to secure luminaire to conduit. Where luminaire is supported from trunking, use appropriate clamps or brackets.

Power & Lighting - Connections to Luminaries:

Connect circuit wiring to luminaries. Use grommet where cables enter luminaire body. Connect the earthing terminal of Class 1 luminaries to the circuit protective conductor of the supply circuit. Clip loose wiring within luminaire, at 300mm intervals. Recessed: terminate at plug and socket to BS 546, located not more than 500mm from the access through the ceiling. Use flexible cord from plug to supply terminals of luminaire.

Electrical Accessory Installation:

Provide CPC between earth lug on metal box and accessory except for plastic accessories. Ensure there is no damage to accessories during installation. Protect surface mounted accessories from painting. Install front plates of flush mounted accessories after painting. Align accessories to building finishes. Mount grouped accessories in line, parallel and equidistant. Distribution boards to be Merlin Gerin or approved equivalent, with a switch disconnector as the main control. Number of ways as required plus 25% spare capacity. Permanently label each way to identify circuit and rating. Circuit protection: miniature circuit breakers to BS 3871 Part 1 or moulded case circuit breakers to BS 4752 Part 1. Accessories in rooms are to be set out with consideration to furniture layouts and to the approval of the EA.

Earthing & Bonding

Bond together all exposed conducting parts with joints of negligible impedance. Carry out work in accordance with BS 7671 (IEE Regulations), BS 7430, Electricity Supply Regulations, and Local Electricity Supply Authority Requirements. Provide protective and equipotential bonding conductors. Size in accordance with the BS 7671 (IEE Wiring Regulations). Carry out installation of earthing system in accordance with BS 7671 (IEE Regulations 16th Edition) and BS 7430. Secure bare copper tape to structure with fixing devices which avoid piercing tape and ensure 3mm (minimum) clearance of tape from structure, at 450mm maximum, centres. Connect to earth bar at incoming electrical service position. Connect main earth conductors and main equipotential bonding conductors to earth bar.

Terminate protective conductors on switchboard earthing bar. Provide main and supplementary equipotential bonding conductors in accordance with BS 7671 (the IEE Wiring Regulations). Use earthing clamps complying with BS 951.

Telecommunications & Data:

Liaise with and attend upon the telephone system supplier for provision of the telecommunications service and ensure the installation meets their requirements. Ensure all equipment and systems are designed and installed to provide electromagnetic compatibility within the system and with other systems installed in the same locations, and comply with BS 905 where applicable.

Fire Alarm System

Liaise with and attend upon the fire alarm system supplier for provision of the fire alarm service and ensure the installation meets their requirements. Ensure all equipment and systems are designed and installed to provide electromagnetic compatibility within the system and with other systems installed in the same locations, and comply with BS 905 where applicable.

TESTING & COMMISSIONING

Comply with BS 7671 (IEE Regulations). Provide completion certificates in accordance with BS 7671 (IEE Regulations). Provide information to fulfil BS 7671 (IEE Regulation) 711-01-02.

Provide all testing and commissioning as and if required by the Supply Authorities.

Carry out site testing and inspection and provide test certificates for specialist installations.

Record all results and readings.

Provide copies of any test and inspection result, issue to EA and provide copies in O&M manuals.

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.

Test and certify the fire alarm installation in accordance with BS 7671 (the IEE Wiring Regulations) and BS 5839 Part 1.

Test the telephone installation to the requirements of the system supplier.

Test the security system to the requirements of the system supplier.

Provide copies of all tests and certificates, issue to the Employer's Agent and incorporated in to the appropriate O&M Manuals.

APPENDIX A:

Design, Commissioning & Handover Information Responsibilities

Note: This appendix only contains Tables C, D & E.

1. Allocation of Design Responsibilities

TABLE C: The Contractor carries out the Design

The Contractor shall carry out the whole of the design and drawing production for the Works or specialist elements described within the tender documentation.

TABLE C		DESIGN & DRAWING PRODUCTION ACTIVITIES			
Design Activity		Responsibility			Comments
		EA	Contractor	Other	
C.1	Prepare proposals for the installations for the agreement of the EA. Investigate the options available and describe the performance that can be achieved.		✓		
C.2	Prepare and develop, to a form agreed with the EA, the Sketch & Detailed Design Drawings.		✓		
C.3	Design and detail the installations as part of the overall co-coordinated building design allowing for every stage of the design to be brought to a successful conclusion by the process of repeated refinement until it is clear that the Installation and Coordination Drawings can be completed.		✓		
C.4	Provide copies of calculations if requested by the EA.		✓		
C.5	Provide copies of any risk assessments undertaken in compliance with the requirements of Regulation 13 of the Construction (Design and Management) Regulations 1994.		✓		
C.6	Negotiate and agree all details with regulatory bodies as necessary.		✓		
C.7	Negotiate and agree all details with the Statutory Authorities as necessary		✓		

TABLE C		DESIGN & DRAWING PRODUCTION ACTIVITIES			
Design Activity		Responsibility			Comments
		EA	Contractor	Other	
C.8	Meet with Building Control and provide the EA with written confirmation of the various stages including detailed Building Control Approval for the installations proposed, prior to construction		✓		
C.9	Modify the design and/or an installation, should the installation not meet the specification and/or agreed proposals, Statutory requirements, etc.		✓		
C.10	Production of Drawings				
	Sketch Drawings		✓		
	Schematic Drawings		✓		
	Detailed Design Drawings		✓		
	Coordination Drawings		✓		
	Installation Drawings		✓		
	Installation Wiring Diagrams		✓		
	Manufacturer's Drawings		✓		
	Manufacturer's Certified Drawings		✓		
	As-installed Drawings		✓		To be marked up on site as the work proceeds.
	As-installed Drawings		✓		
	Record Drawings		✓		
	Builder's Work Drawings		✓		
	Specialist Drawings		✓		
C.11	Spatial Co-ordination		✓		
C.12	Confirmation of plant or system sizing		✓		
C.13	On-site Co-ordination		✓		
C.14	Confirm compatibility of plant equipment specified for use in the same system or where an interface is required between systems.		✓		

2. Allocation of Commissioning Responsibilities

TABLE D		SPECIFYING SYSTEM COMMISSIONING ACTIVITIES			
Design Activity		Responsibility			Comments
		EA	Contractor	Other	
Design					
D.1	Ensure that the selected systems will meet the Employer's brief and that their commissioning requirements are compatible with any project restraint concerning sectional handover/phasing.		✓		
D.2	Identify and incorporate into system designs the essential components and features necessary to enable the proper preparation and commissioning of building services.		✓		
D.3	Review all designs to ensure that systems can be properly prepared, and are commissionable.		✓		
D.4	Prepare the commissioning specification.		✓		
Management					
D.5	a) Produce a commissioning method statement and logic diagram for integration into the building Contractor's construction and finishes programmes. b) Produce a "commissioning plan" as required by Part L2 of the Building Regulations.		✓ ✓		It is for the Contractor is to demonstrate to the local Building Control officer that the person(s) providing this report are suitably qualified.
D.6	Produce a flushing, chemical cleaning and water treatment method statement, logic diagram and programme for integration into the building Contractor's construction, commissioning and finishes programmes.		✓		
D.7	Attend commissioning meetings as necessary OR arrange and chair commissioning meetings as necessary.		✓		

TABLE D SPECIFYING SYSTEM COMMISSIONING ACTIVITIES					
Design Activity		Responsibility			Comments
		EA	Contractor	Other	
D.8	Comment on the adequacy of systems for commissioning as detailed on specialists' drawings and manufacturers' shop drawings prior to actual manufacture at works. Ensure comments are incorporated into finished products.		✓		
D.9	Carry out site inspections, to ensure that the commissioning facilities are being installed. Check compliance with specified guides and standards.		✓		
D.10	Monitor the on-going progress of the procurement, manufacture, installation and commissioning of all plant items.		✓		
D.11	Assess the effects of any anticipated delays to the services installation and the completion of interfaces with the building works critical to the commissioning programme. Formulate strategies to overcome potential delays.		✓		
D.12	Establish an agreed set of pro forma documentation relating to the commissioning and testing of plant and systems.		✓		Issue to EA for comments.
D.13	Approve the proposed set of instruments of the commissioning and testing works.		✓		
D.14	Ensure that the instrumentation is periodically calibrated as necessary and records retained.		✓		
D.15	Witness the flushing, cleaning and treatment of systems in accordance with the specification.	✓	✓		Contractor shall be fully satisfied with the pre-commissioning cleaning before inviting EA to witness.
D.16	Witness pre-commissioning activities in accordance with the specification.		✓		
D.17	a) Commission all systems to methods, logic and programme (see 4.5) and record results and b) Witness specified demonstration of system commissioning results.	✓	✓ ✓		Contractor shall be fully satisfied with the commissioning results before inviting EA to witness.

TABLE D SPECIFYING SYSTEM COMMISSIONING ACTIVITIES					
Design Activity		Responsibility			Comments
		EA	Contractor	Other	
D.18	Witness and record the specified demonstration and testing of plant items and systems in accordance with the specification.	✓	✓		Contractor shall be fully satisfied with the commissioning results before inviting EA to witness.
D.19	Establish procedures to allow the demonstration of normal emergency, shutdown and standby mode operation of plant and systems.		✓	✓	"Other" = manufacturer's or suppliers of plant items.
D.20	Witness demonstration of same to specified requirements.	✓	✓		Contractor shall be fully satisfied with the demonstration results before inviting EA to witness.
D.21	Demonstrate the partial load testing of plant to the employer and designer in accordance with the specification.		✓		
D.22	Witness the operation of the BMS on site to the specified requirements.	✓	✓	✓	"Other" = BMS Specialist Designer. Contractor shall be fully satisfied that the performance of the BMS meets the requirements of the contract documents before inviting EA to witness.
D.23	Witness the functional testing of all safety interlocks in accordance with the commissioning specification.	✓	✓		Contractor shall be fully satisfied with the commissioning results before inviting EA to witness.
D.24	Witness the demonstration of acoustic tests, if any, in accordance with the specification.	✓	✓		Contractor shall be fully satisfied with the commissioning results before inviting EA to witness.
D.25	Witness the operation of plant and systems for specified periods of time to prove plant reliability.	✓	✓		
D.26	a) Produce commissioning report detailing the results of the commissioning and commenting on the performance of systems. b) Produce a "commissioning report" as required by Part L2 of the Building Regulations for submission to the local Building Control office.		✓ ✓		It is for the Contractor to demonstrate to the local Building Control officer that the person(s) providing this report are suitably qualified.
D.27	Ensure that all plant settings are recorded, including appropriate reference to plant items. The records should be incorporated within the operating and maintenance manuals.		✓		

Table taken from BSRIA Technical Note TN 21/97 "Allocation of Design Responsibilities for Building Engineering Services"

3. Production of Handover Information

TABLE E PRODUCTION OF HANDOVER INFORMATION					
Design Activity		Responsibility			Comments
		EA	Contractor	Other	
E.1	Define the scope and content of operating and maintenance manuals appropriate to the size of project, the employer's operating and maintenance strategy and the technical capability of the maintenance staff.		✓		
E.2	Define the requirement for record drawings appropriate to the employer's operating and maintenance strategy.		✓		
E.3	Advise on the need for a specialist author for production of operating and maintenance manuals.		✓		
E.4	Advise on the need for a separate survey of installed systems to facilitate production of record drawings.	✓			This survey will only be required if the Contractor has failed in their duty to fully record the installed services as the work proceeds and before it is covered up. The cost of this survey, if required, will be recovered through the Contract.
E.5	Prepare a specification for operating and maintenance manuals. Specify the section headings and required technical content of the manuals.		✓		
E.6	Prepare a specification for record drawings. Specify content, form of delivery and the method of production of the drawings to be produced.		✓		
E.7	Define what level of documentation, commissioning results and other information shall be available prior to practical completion and handover. Take into account possible implications of phased handover and partial possession.		✓		In order to comply with the CDM Regulations the Contractor shall ensure that complete O&M information and Record Drawings are available to the employer prior to Practical Completion.
E.8	Produce operation and maintenance manuals in accordance with the specified requirements.		✓		
E.9	Ensure that information needed for inclusion in the operating and maintenance manuals is obtained as the works progress. Identify individual sources of information.		✓		

TABLE E		PRODUCTION OF HANDOVER INFORMATION			
Design Activity		Responsibility			Comments
		EA	Contractor	Other	
E.10	Establish target dates for when information shall be available to the author of the operating and maintenance manuals. Advise on timescales for production of maintenance information relative to key dates i.e. installation start date, setting to work, start dates for testing and commissioning and handover dates.		✓		
E.11	Monitor the programme for production of operating and maintenance manuals and adjust dates to allow for progress of the project.		✓		
E.12	Receive, inspect and comment on the contents of the operating and maintenance manuals in order to confirm general compliance with the specified requirements.	✓	✓		The Contractor shall inspect and comment on the manuals where produced by others on their behalf prior to submission to EA. The Contractor shall ensure that drafts of the O&M manual(s) are available for comment at least 8 weeks prior to Practical Completion.
E.13	Modify and update operating details to reflect commissioning results.		✓		
E.14	Accept the completed operating and maintenance manuals on behalf of the employer.	✓			
E.15	Identify key dates and intervals at which draft record drawings will be inspected.		✓		Contractor shall provide schedule of dates for the release of this information.
E.16	Modify the record drawings as the works progress so that all alterations from the installation drawings are recorded as work proceeds.		✓		Contractor shall ensure that the As-installed Drawings are maintained on site and updated as the work proceeds. The As-installed Drawings are to be made available for inspection when requested by the EA.
E.17	Receive, inspect and comment on the Record Drawings in order to confirm general compliance with the specified requirements.	✓	✓		The Contractor shall inspect and comment on the record drawings where produced by others on their behalf prior to submission to EA.
E.18	Accept the completed record drawings on behalf of the employer.	✓			
E.19	Prior to handover, make recommendations for the		✓		When stated in the Preliminaries the Contractor shall provide a priced proposal for the

TABLE E		PRODUCTION OF HANDOVER INFORMATION			
Design Activity		Responsibility			Comments
		EA	Contractor	Other	
	commencement and carrying out of operation and maintenance during and after the Defects Liability Period.				maintenance of the installed services during the period concurrent with the Defects Liability Period within their contract price.
E.20	Provide the employer with a log-book as required by statute under Part L2 of the Building Regulations.		✓		