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PROJECT

Specification for the Electrical Engineering Services at 24 Heath Drive, Hampstead, London.

Project No.: E16/117
Date: January 2018
Revision: Tender 00

CONTENTS

SECTION 1

1 INTRODUCTION

1.1 GENERAL DESCRIPTION

This specification has been written as a technical specification for the Electrical Services Installation at 24 Heath Drive, Hampstead, London.The specification sets out general standards that shall be applied to the installation and workmanship. Where drawings have also been issued this specification shall be read in conjunction with those drawings.

The Works referred to in this specification are for the Supply, Installation and Commissioning of the Electrical Engineering Services.

Only the highest quality of workmanship will be accepted.

The property is grade 2 listedand hence considered to be of historic value. All work should be carried out with the greatest of care, particularly where the work has an impact on the fabric of the building or its structure or structural integrity.

The buildingswas built in the mid 19th century and is generally of brick and masonry construction with timber suspended floors and timber structural supports. Landings to staircases are generally stone.

As in historic buildings any external installation will require building and planning consent for satellite dishes, terrestrial aerials, cameras, etc. It should be checked these consents are in place prior to executing any works.

After practical completion, the Contractor shall be responsible for a twelve months' period of defects liability and to provide twelve months' maintenance services.

Ceiling void zones will to be created in which the main horizontal cable runs shall be concealed.

The electrical installation is required to be of the highest quality and shall be fully flush throughout with the exception of plant spaces.

At present the building consists of, Ground, First,andSecond Floor Levels. A new Basement Level will be constructed as part of this project.

1.2 SCOPE

The Contractor shall be required to supply, install and commission all the systems described in this specification and associated drawings. The works shall include, but not be limited to, the following:-

1) Coordinating with other members of the Construction Team and Professional Team to ensure the electrical services do not clash with any other services or the building structure including architectural or decorative features.

2) Coordinating with other members of the Construction and Professional Team to ensure the electrical services meet the approval of all concerned.

3) Providing fabrication drawings, installation drawings for all services and detailed wiring diagrams for all equipment and panels.

4) Inspecting all plant, equipment and materials as delivered or where specified at the manufacturer's works.

5) The supply and installation of the following systems, but not limited to:-

   (a) Main incoming electrical supplies, main switchgear, sub-mains and distribution boards.

   (b) Lighting, external lighting and installation of lighting control equipment supplied by the AV specialist installer.

   (c) Small power.

   (d) Emergency lighting.

   (e) Fire alarm and detection equipment.

   (f) Installation of cabling forthe AV specialist contractor.

   (g) Intruder alarm, CCTV and Video door entry system.

6) The provision of Record Documents including 'As Installed Drawings', Operating & Maintenance Manuals and Building Logbook.

7) Instruction to the employer's staff upon the correct operation of the systems.

8) Handing over all tools, keys, spares necessary to operate/maintain the systems.

1.3 DRAWING LIST

The following drawings are issued in association with this specification:-

NUMBER	DRAWING TITLE/DISC FILE NAME	SCALE	SIZE
16/117-E01	Electrical Symbols Legend	NTS	A1
16/117-E02	Mains Distribution Schematic	NTS	A1
16/117-E03		1:50	A1
16/117-E04		1:50	A1
16/117-E05		1:50	A1
16/117-E06		1:50	A1
16/117-E07		1:50	A1
16/117-E08		1:50	A1
16/117-E09		1:50	A1
16/117-E10		1:50	A1

SECTION 2

2 CONDITIONS OF TENDER AND PRELIMINARIES

2.1 PRELIMINARIES – GENERALLY

The Conditions of Tender shall be as stated in the Contract Conditions and Bill of Quantities. Detailed requirements for drawings are shown in Section 3, and the section entitled Inspection, Testing and Handover, of this document.

The Contractor appointed shall be deemed to have been aware, at the time of his tender, of the General Conditions and Preliminaries of the Main Contract and to have made allowance for these in his tender.

2.2 DEFINITIONS

"The Employer"	This shall mean The Estate Office.
"The Architect"	This shall mean Kyson Architects
"The Engineer"	This shall mean Edward Pearce LLP, Old School House, 35 Ewell Road, Surbiton, Surrey. KT6 6AF.
"The Contract Administrator"	This shall mean Kyson Architects
"The Contractor"	This shall mean the Contractor employed to carry out the Works described in this specification.
"The Main Contractor"	This shall mean the Contractor employed to carry out the building works.
"Tender Documentation"	Drawings and other documentation as appropriate to the agreed procurement method prepared to enable those tendering to interpret the design for the Works and to submit a tender for executing all or any part of the Works.
"Installation Drawings"	Drawings based on Tender Documentation issued as "Construction Issue" and/or Coordination Drawings showing details of proposals by Contractors or Sub-Contractors for the execution of the Works. The Installation Drawings will be in such detail as to enable the Works to be installed.
"Builders Work Details"	Drawings prepared by Contractors based on Installation Drawings showing requirements for building works necessary to facilitate the installation of the Works (other than where it is appropriate to mark out on site).
"Builders Work Information"	Drawings and/or schedules that may be prepared by the Engineer pre tender to show the provisions required to accommodate the Works which significantly affect the design of the building structure fabric and external works. Such drawings and schedules will have been issued to assist the Quantity Surveyor in

	budgeting and the Structural Engineer in compilation of his schemes. These drawings will be superseded by the Contractor's Builders Work Details.
"Coordination Drawings"	Drawings showing the inter-relationship of two or more engineering services and their relation to the structure and architectural details. Such drawings shall be provided to a scale of not less than 1 to 50 unless otherwise agreed and be prepared in such detail as to demonstrate that the engineering services will be properly separated from one another and can be satisfactorily installed and maintained. The Coordination Drawings shall embrace other engineering services not part of these Works.
"Record Drawings"	Drawings prepared by the Contractor in order to provide the Client with a record of the Works as installed.
"Construction Drawings"	Drawings issued by the Engineer to enable the Contractor to prepare and issue his Installation/ Shop Drawings.

2.3 PRE-TENDER QUOTATIONS

The Contract Administrator may have, as is normal, obtained several quotations from various companies during the design stage of this project. It should not be assumed that quotations given to Edward Pearce LLP are correct, as the design may have changed since the quotation was given. The tenderers shall be responsible for obtaining and checking quotations against the tender documents.

2.4 DEVIATIONS/VARIATIONS

The Contractor shall when requested prepare within 14 days a Quantified Schedule of Rates which shall total to the value of the Contract and be sub-divided in accordance with the sub-division of Tender. Within each sub-division the Contractor shall list all components and exact quantities of same, complete with a unit cost and total cost. All these items shall then be added together to equal the sub-division total.

Other than where provisional sums or contingencies have been allowed no lump sums will be permitted within the schedule.

The said Quantified Schedule of Rates shall be submitted and agreed with the Contract Administrator **BEFORE** the award of the Contract and shall form the basis of pricing any additions, omissions or variations.

If during the course of the Contract a new item arises which is not included in the Schedule of Rates, then a rate shall be agreed with the Contract Administrator. This rate shall include the establishment charges, profit, etc., pro rata with those on which the tender and previously agreed rates are computed.

The Contractor shall present all prices and details of all deviations to the Contract Administrator for checking immediately they arise and co-operation in this is essential to ensure smooth and speedy execution of the works and to keep financial commitments up to date.

No claims for extras will be allowed unless the Contractor has, prior to putting same in hand, obtained written instructions from the Contract Administrator in respect of

such extras, or unless the Contactor has received from the Main Contractor an official deviation order. No drawings or other documents except such deviation order will be recognised or construed as an order for extras.

Work in connection with variations shall not be carried out on a daywork basis unless agreement is given thereto in writing by the Contract Administrator before the work is commenced.

List of materials or time sheets signed by the Clerk of Works as being correct in fact, will not necessarily imply that the work carried out will be valued on a daywork basis.

All claims for works carried out on a daywork basis shall have supporting time sheets attached to the claim and be submitted with the final account. The time sheets are to be signed by the Clerk of Works, having been previously submitted to him weekly by the Contractor as the work proceeds. The Clerk of Works will require a copy of the time sheets as he signs them and these will be retained until the Contractor's final account is received.

If variations involving dayworks are agreed by the Contract Administrator, the labour rates used shall be those currently authorised by the National Joint Council for the Industry. Any additional inducement, bonus, or other plus rates, will only be allowed if prior written authority for their inclusion has been obtained from the Contract Administrator.

2.5 SITE MEETINGS

Regular meetings at agreed intervals shall be held on site if required. The Contractor shall arrange to have an accredited representative present at each of these meetings until completion of the Works.

2.6 COMPLIANCE WITH BYE-LAWS, ETC.

The Contractor shall comply with and give all notices required by any Act of Parliament or by any regulation or bye-laws of any local authority or any public service company or authority who has any jurisdiction with regard to the works or with whose systems are the same, or will be connected, and he shall pay any fees or charges legally demandable under such Act of Parliament, regulation or bye-law in respect of the Works.

2.7 PATENT RIGHTS

The Contractor shall pay any claims, costs or expenses in connection with any patented, copyright or protected article supplied by the Contractor or his suppliers and used on or in connection with the work and any payments or royalties payable in one sum or by instalments shall be included and paid by the Contractor to whomsoever they may be due.

2.8 VISITS TO SITE

The Contractor shall visit the site before submitting his tender in order that he may make himself thoroughly acquainted with the nature and extent of the works, and to obtain all details necessary for estimating purposes as no allowance can be made from neglect of this clause.

2.9 DELIVERY OF ACCOUNTS

The Contractor shall from time to time as may be directed by the Contract Administrator, deliver to him a detailed account in such form as he shall direct, setting out the quantities of work done and material delivered, the sums claimed by the

Contractor to be payable to him under the Contract and in respect of increased or varied work.

2.10 PAYMENTS TO CONTRACTOR AND CERTIFICATES

Payments shall be made to the Contractor in accordance with the Conditions of Contract.

2.11 TESTS AT CONTRACTOR'S WORKS

Except where otherwise provided in the Contract, the Contractor shall provide all labour, materials, power, fuel, stores, apparatus and properly calibrated and certified instruments for carrying out necessary tests at his own or his suppliers works.

The Contractor shall give the Contract Administrator written notice when any portion of the plant is ready for test.

2.12 TESTS AT SITE

The Contractor shall carry out such pressure, insulation and other tests and performance and taking over tests on site as may be required by the Contract Administrator and unless otherwise indicated in the Specification, provide all necessary duly certified instruments, labour and materials required for the purpose of the tests, and all fuel, oil and accessories required for any trial runs and for the tests, until the prescribed tests have been passed to the satisfaction of the Contract Administrator.

In the event of the plant not passing the tests, all reasonable expenses incurred by the Contract Administrator or Main Contractor, due to the repetition of such tests shall be deducted from the monies due to the Contractor. This shall particularly apply to abortive visits to witness commissioning.

2.13 USE OF DEFECTIVE WORK

If the defective portion of the Works be required by the Employer for commercial use, he shall be entitled to make use of the same in a proper manner, for a time sufficient to enable him to obtain other plant to replace it, the Contractor being allowed a proper sum for the use of same.

In the case where the Contractor although willing to do so, is unable to repair defects in certain parts of the work, in consequence of the Employer not being able to allow such parts to be placed in his hands for the requisite time owing to their being in use, the Contractor shall be paid in full for such portion of the Works on giving an undertaking with security if required, to remedy the defects as the same can be placed in his hands for the purpose.

2.14 INSTRUCTION OF OPERATORS

The Contractor shall on the 'taking over' of the Works instruct the staff appointed by the Employer in the correct adjustment and operation of the plant and equipment installed and thereafter during the defects liability period make additional attendances, without charge at the Works as may be reasonably necessary for the Contractor to satisfy himself that such instructions are being carried out by the appointed staff.

The Contractor shall also hand to the Employer or to his duly appointed representative the manufacturer's instructions for operating, greasing, oiling and adjusting the said plant.

2.15 COMMENTS ON DRAWINGS

Where comment on drawings etc. is offered, it shall not relieve the Contractor of his obligations under common law. The comments will only cover the checking of details to assist the Contractor in reducing the potential for error and shall be subject to the detailed requirements of the specification and drawings. Full responsibility for the accuracy and eventual correct functioning of equipment or systems shall remain with the Contractor.

SECTION 3

3 GENERAL REQUIREMENTS

3.1 GENERAL

This section of the Specification deals with the standards of materials, workmanship and approved methods of installation required in connection with the Electrical Engineering Services.

This section must be read and applied in conjunction with later detailed sections of the Specifications and the drawings and schedules issued herewith.

Except for materials or items of equipment which are specified as being supplied and/or fixed for the Works by others, these Works shall include the supply, delivery to site, installation, testing, adjusting, regulating, commissioning and leaving in satisfactory working order the complete systems as specified and scheduled herein and/or indicated on the drawings issued herewith.

The Contractor appointed shall be deemed to have been aware, at the time of his tender, of the General Conditions and Preliminaries of the Main Contract and to have made allowance for these in his tender.

3.2 MATERIALS, WORKMANSHIP AND PERFORMANCE

All the Works shall be executed with the materials of the respective kinds specified with guaranteed performance to recognised national testing methods and procedures to the reasonable satisfaction of the Contract Administrator.

The installation and all equipment used therein shall comply with all relevant Acts of Parliament, Regulations, Statutory Instruments, British Standards Specification and Codes of Practice and the requirements of:

(1) BS 7671:2008 incorporating Amendment No. 1:2011 - The "Requirements for Electrical Installations" issued by The Institution of Engineering and Technology and the BSI.

(2) The Fire Officer

(3) The Local Electricity Gas and Water Undertakings

(4) The Local Authority

(5) The Electricity (Factories) Acts Special Regulations 1908, 1944 (The Electricity Regulations).

(6) Electricity at Work Regulations 1989.

(7) Health and Safety at Work Regulations 1989.

(8) All relevant British Standards.

(9) The Construction (Design and Management) Regulations 2015.

In the event of a discrepancy between this Specification and any British Standard Specification and/or Code of Practice the most stringent requirement shall be followed.

All persons engaged upon the Works shall be properly qualified to the appropriate grade.

All materials considered by the Contract Administrator to be unsound or not in accordance with the Specification and all work carried out imperfectly or with faulty materials shall be removed immediately and properly replaced to the satisfaction of the Contract Administrator at no cost to the Works. In the event of neglect or refusal to carry out replacement or remedial works, the Contract Administrator reserves the right to make alternative arrangements for the Works to be carried out in accordance with the prevailing contractual conditions.

3.3 MAKES OF MATERIALS AND COMPONENTS

These shall be as specified elsewhere in this document, any deviation from this shall be declared by the Contractor at the time of tender.

3.4 CONSISTENCY OF COMPONENTS

The agreed components shall wherever practicable be used throughout the particular service or system affected and throughout all services or systems run together on the same installation, for matching and to reduce the need for different attention and spares.

3.5 ORDERS TO SUPPLIERS

Upon receipt of the order to commence the Works, all orders shall be placed with suppliers and a timed delivery programme arranged to ensure that materials are on site at the time necessary to conform with the agreed Main Contractor's programme.

3.6 DEFECTS LIABILITY

The defects liability shall be as stated in the Contract Documents which will not be less than 12 months from the day named in the Certificate of Practical Completion of the Works.

3.7 AMBIGUITY OR DIVERGENCE

If any ambiguity or divergence between the drawings and/or the Specification is disclosed, this shall be referred immediately to the Contract Administrator in writing, together with application for any necessary instructions from the Contract Administrator in relation thereto.

In the event of any ambiguity or divergence in or between the tender drawings and/or this Specification, the most stringent requirements shall be deemed to have been included for in the tender.

3.8 DRAWINGS, PROGRAMME AND METHOD STATEMENT

The Contractor shall provide for the Contract Administrator’s comment, THREE WEEKS prior to commencement on site, detailed Installation Programme and Method Statements.

The Contractor shall be responsible for the accuracy of all wiring diagrams provided by him and for the correct internal wiring of all pre-wired equipment.

The Contractor shall be held responsible for any extra costs incurred by him or his Sub-Contractors engaged upon the Works for additional or abortive works which in the opinion of the Contract Administrator is due to the Contractor's failure to comply with these provisions.

The Contractor shall also provide, prior to manufacture or installation, detailed installation and coordination drawings for the entire installation, purpose-made

equipment including pipe, ductwork, conduit, trunkings and other supports, brackets, frameworks, panels, sheet metal works, ladders, gangways, plating, etc.

Installation drawings shall be fully co-ordinated with other services and where more than one service shares the location within the building, the other services must be shown whether or not they form part of this Contract.

The Contractor shall allow in his tender for revising his installation drawings in accordance with revisions to all other drawings which may be issued by the design team.

The Contractor shall be responsible for all builder's work drawings and detailed drawings being available in conformity with the Main Contractor's programme, and shall supply to the Main Contractor for general distribution 4 sets of such drawings, or such other number as may be specified elsewhere.

The Contractor shall be responsible for any discrepancies, errors or omissions in the drawings supplied by him or his Sub-Contractors, and for leaving the installation complete and in proper working order whether or not the whole of the work is properly and correctly shown on the drawings.

All drawings submitted by the Contractor shall be clearly dimensioned with due regard to mounting heights, false ceiling accommodation, recessed lighting fittings, beams, columns, etc., as shown on the tender drawings and/or Contract Administrator's drawings/structural drawings.

The Contractor shall provide for the Contract Administrator's comment dimensioned drawings giving details of all builder's work, including service ducts, chases and holes to be left in construction, bases for apparatus and equipment, foundations etc. Builder's Work Drawings shall be issued to suit the Main Contractor's programme allowing 14 days for the Contract Administrator's comments prior to use.

3.9 DRAWINGS TO BE SUBMITTED BY THE CONTRACTOR

Tender design drawings as defined in Clause 2.2 will be provided by the Design Team.

The Contractor shall provide as part of these works the following drawings as defined in Clause 2.2:-

- Coordination Drawings.
- Installation Drawings.
- Installation Wiring Diagrams.
- Control Logic Diagrams, Switchgear, Start and Control Panel Drawings.
- Shop Drawings.
- Record Drawings.
- Builders' Work Drawings.
- As Installed Drawings shall be maintained on site.

The requirements for each of the above are set out below and shall be allowed for in the Tenderers quotation.

3.9.1 Coordination Drawing

A drawing showing the inter-relationship of two or more engineering services and their relation to the structure and building fabric. The main features of a co-ordination drawing are as follows:-

- Plan layouts to a scale of at least 1:50, accompanied by cross-sections to a scale of at least 1:20 for all congested areas.
- A spatially co-ordinated drawing, i.e. no physical clashes between the system

components when installed at the scaled-off positions shown on the drawing. Provide dimensions in areas where tolerances are minimal.
- Make allowance for the service at its widest point for spaces between pipe and duct runs. Allow for insulation, standard fitting dimensions and joint widths on the drawing.
- Make allowance for those plant items specified by the designer and identified in the design specification.
- Make allowance for installation working space and space to facilitate commissioning and maintenance.
- Indicate positions of main fixing points and supports where they have significance to the structural design.
- Arrange the services so that it is possible to demonstrate a feasible sequence of installation.
- Support the drawing with individual services drawings for clarity.
- Plantroom layouts to a scale of at least 1:20, accompanied by cross-sections and elevations to a scale of at least 1:20.

3.9.2 Installation Drawing

These Installation Drawings shall be prepared from the Engineer's "Construction Issue" given at the commencement of the project.

A drawing based on the detailed drawing or co-ordination drawing with the primary purpose of defining that information needed by the tradesmen on site to install the works. The main features of installation drawings should be as follows:

- Plan layouts to a scale of at least 1:50, accompanied by cross-sections to a scale of at least 1:20 for all congested areas.
- A spatially co-ordinated drawing, i.e. no physical clashes between the system components when installed at the scaled-off positions shown on the drawing.
- Make allowance for inclusion of all supports and fixings necessary to install the works.
- Make allowance for the service at its widest point for spaces between pipe and duct runs. Allow for insulation, standard fitting dimensions and joint widths on the drawing.
- Make allowance for installation details provided from shop drawings.
- Make allowance for installation working space; space to facilitate commissioning and space to allow on-going operation and maintenance in accordance with the relevant health and safety requirements.
- Make allowance for plant and equipment including those which are chosen as alternatives to the designers specified option.
- Provide dimensions where the positioning of services is considered to be important enough not to leave to the tradesmen on site.
- Plantroom layouts to a scale of at least 1:20, accompanied by cross-sections and elevations to a scale of at least 1:20.

3.9.3 Installation Wiring Diagram

Drawing showing the interconnection of electric components, panels etc in accordance with the design intent indicated in the schematic drawings and incorporating the details provided on manufacturer's certified drawings.

Indicate the following: maximum electrical loading for each supply cable; cable termination facilities; and cable identification and all terminal numbers.

3.9.4 Controls Logic Diagrams

Diagrams, drawings and/or schematic details of all control components and instruments showing the layout with each item uniquely identified together with a description of the controls operation and details of the associated interlocking.

3.9.5 Switchgear, Start and Control Instrumentation Panel Drawings
Drawings showing the construction and internal wiring diagrams of the starters, panels and/or other devices.

3.9.6 Shop Drawings
Drawing prepared by a fabricator or supplier unique to the project. Including supplier's drawings for ductwork, pre-fabricated pipework, medical gas systems, pneumatic tube transfer system, roof support system, sprinkler systems, control and switchgear panels and associated internal wiring.

3.9.7 Manufacturers' Drawings
Drawing provided by a manufacturer or supplier to indicate a typical representation of the product, components or plant items to be supplied for a particular project.

3.9.8 Manufacturer's Certified Drawing
Drawing provided by a manufacturer or supplier to indicate details of the produce, component or plant items and which the manufacturer or supplier guarantees the supplied equipment will comply with.

3.9.9 Record Drawing
Drawing showing the building and services installations as installed at the date of practical completion. The main features of the record drawings should be as follows:-

- Provide a record of the locations of all the systems and components installed including pumps, fans, valves, strainers, terminals, electrical switchgear, distribution and components.
- Use a scale not less than that of the installation drawings.
- Have marked on the drawings the positions of access points for operating and maintenance purposes.
- The drawings should not be dimensioned unless the inclusion of a dimension is considered necessary for location.

3.9.10 Builder's Work Drawing

Design Stage
A drawing provided by the Engineer to the Quantity Surveyor and Structural Engineer to show the provisions required to accommodate the services which significantly affect the design of the building structure, fabric and external works, issued solely for costing and Planning.

These drawings will be superseded by the Contractor's Builders Work Drawings.

Installation Stage
To be prepared and issued by the Contractor.
Drawing to show requirements for building works necessary to facilitate the installation of the engineering services (other than where it is appropriate to mark out on site).

The Contractor shall provide for the Contract Administrator's comment dimensioned drawings giving details of all builder's work, including service ducts, chases and holes to be left in construction, bases for apparatus and equipment, foundations etc. Builder's Work Drawings shall be issued to suit the Main Contractor's programme allowing 21 days for the Contract Administrator's comments prior to use.

The Contractor shall supply a comprehensive wiring diagram for the following systems

- Electrical Distribution Schematics
- Security & CCTV Systems
- Fire Alarm System
- Door Entry System

and submit these for the approval of the Contract Administrator before the installation of the Works.

3.9.11 As-Installed Drawings

Drawings/records retained on site to record the progress of and any site modifications to the Works including any changes to software.

These drawings shall be used to prepare Record Drawings at completion.

3.10 SETTING OUT WORKS

The Contractor shall set out the whole of the Works in strict compliance with the tender and detail drawings, and shall be responsible for the correctness of the position, levels and dimensions of the Works.

It shall be the responsibility of the Contractor to ascertain from room layout drawings the positions of equipment, piping, conduit and the like, and to install the services having regard thereto.

If at any time during the progress of the work any error shall appear or arise in the position, levels or dimensions of the Works, the Contractor, on being required to do so by the Contract Administrator, shall at his own expense remove and amend the work to the satisfaction of the Contract Administrator.

In setting out the Works, and in the course of installation, the Contractor shall require to take due consideration of the need for reasonable access to equipment, etc., for maintenance purposes.

3.11 REMOVAL OF MATERIALS AND REINSTATEMENT

The Contractor shall remove all waste, temporary supports, surplus materials and equipment, make good any damage caused and carry out any reinstatement necessary as and when required and to the satisfaction of the Contract Administrator. The Contractor shall allow for all redundant materials to be removed from site and disposed of safely.

3.12 PROGRESS OF WORKS

The Contract Administrator will inspect the Works during the progress of the installation and will advise the Main Contractor and Contractor of his opinion of the engineering works and specific deficiencies or defects. It is not in any way part of the Contract Administrator's duty to progress the Works on behalf of the Main Contractor.

The Contractor as part of his obligations is required to produce both builder's work, detailed working and coordination drawings and these are to be presented to the Contract Administrator for consideration. It is essential that such drawings are prepared well in advance of their being required for use to allow a reasonable period for study and comment. Normally the period should be two weeks from receipt to the issue of comments by the Contract Administrator. The party or parties issuing the drawings for consideration shall be deemed responsible for any claim for delays in site works if sufficient time as stated is not given to the Contract Administrator.

It is expected of the Main Contractor in collaboration with his Sub-Contractors to show clearly on programme charts or networks the proper allocation of dates, times and periods for the preparation and issue of builder's work and detailed working and coordination drawings plus the consideration time for the Contract Administrator's scrutiny and the date for the completion of the snagging.

The programme must also allow a minimum period of 4 weeks between completion of the Works and handover so that the Contractor can properly commission and record

the operation of the completed Works and give time for the Contract Administrator to evaluate the Works and if necessary organise with the Contractor for the rectification work which may be necessary due to a design or installation fault.

The Contract Administrator cannot and will not agree to accepting the Works until the end of the commissioning and evaluation period and not then if the plant is not properly operational to his satisfaction.

Should this situation arise the Client will be informed that the Contract Administrator recommends deferring acceptance of the whole project until the engineering works are operating as designed.

3.13 NAMEPLATES, ETC.

All plant and apparatus shall be provided with engraved metal nameplates or embossed lettering, showing the maker's name, reference number, and any other relevant particulars.

3.14 SAFEGUARDS AGAINST DETERIORATION OF PLANT

Notwithstanding any protection to be provided by the Main Contractor, all necessary action shall be taken by the Contractor to prevent deterioration of all materials, components and machinery, etc., before, during and after installation for the duration of the Contract and any amount to cover this shall be included in the Tender.

Ferrous metalwork not galvanised shall have a protective coat of paint or other material before despatch from works.

Any deterioration or damage to manufacturer's protective coating during storage and following installation shall be made good to the satisfaction of the Contract Administrator.

Plugs, caps, covers, etc., shall be fitted to materials delivered to site on all openings and on ends of tubes to prevent entry of foreign matter, water and the like.

As far as possible, machinery, electric motors, valves, other bright metalwork, fine equipment, such as instruments, etc., shall not be installed or exposed until the building is sufficiently advanced and closed to give complete protection from the weather. Whether installed before this time or afterwards, the Contractor shall be responsible for the care of the equipment and for seeing that it is properly protected in such a way that dust, building material and water cannot affect it, or enter working parts, and so that it cannot be damaged by others. Equipment which is in any way unsatisfactory due to inadequate storage will not be accepted.

All ironwork, brackets, supports and the like shall be painted one coat of primer before despatch to site or immediately after manufacture if made on site. All welds and the exposed threads of joints shall be similarly painted by the Contractor immediately they have been made.

3.15 SAFETY PRECAUTIONS

The Contractor shall take all safety precautions to prevent the possibility of accidents which may be caused mechanically or electrically or otherwise. He shall also provide detachable guards to cover all moving machine parts wherever they may be located and whether they are intended to be permanent or temporary. Details of all guards and their method of fixing shall be submitted to the Contract Administrator for comment before manufacture is commenced.

3.16 METAL CUTTING

The use of welding torches for cutting openings, in steel brackets and the like for trimming, studding, etc. is strictly prohibited.

3.17 MATERIALS

None of the following materials shall be used on the Project:-

a) Lead (all solders shall be lead free).

b) High alumina cement

c) Woodwool slabs used in permanent shuttering.

d) Calcium chloride in admixtures for use in reinforced or pre-stressed concrete.

e) Asbestos or asbestos based products.

f) Aggregates for use in reinforced concrete which do not comply with British Standard Specification BS:882 and aggregates for use in concrete which do not comply with the provision of British Standard Specification BS:882 and aggregates for use in concrete which do not comply with the provisions of British Standard Specification BS.8110.

g) Urea-formaldehyde foam or materials which may release formaldehyde in quantities which may be hazardous with reference to the limits set from time to time by the Health & Safety Executive.

h) Silicate bricks or tile.

i) Crocidolite.

j) Tropical Hardwoods

k) Any other substances not in accordance with British Standards and Codes of Practice and good building practice current at any relevant time.

3.18 FIXING TO THE STRUCTURE

These Works shall include for the provision of all necessary supports and fixings to the structure. The Contractor shall seek approval of the Contract Administrator before commencement of work on site, to the proposed method of support, drilling, clamping or securing to the structure.

3.19 ATTENDANCE

The Main Contractor shall provide attendance upon the Contractor in accordance with the Conditions of Tender, preliminaries and Main Contractor documentation.

3.20 DRYING OUT THE BUILDING

The Main Contractor will provide temporary equipment, fuel and attendance for drying out and controlling the humidity of the building works. The Works shall not be used for this purpose.

3.21 USE OF INSTALLATION PRIOR TO HANDOVER

The Main Contractor may wish to make use of all or part of the completed installation, e.g. for heating, ventilation, site lighting, power for hand tools, etc. The Contractor

shall only be permitted the use of any part of the completed installation if all of the following conditions are fulfilled:-

a) The Contract Administrator has given his written approval to the proposal.

b) The section of the installation to be made live has been completed and tested in accordance with the requirements of this Specification.

c) The Main Contractor has confirmed in writing that for the period in question, he has control of the installation and is the occupier culpable for injury to any party as the result of an accident occurring in the installation.

d) Arrangements have been made to monitor the cost of fuel consumed for eventual settlement by the Main Contractor and such arrangements are approved by the Contract Administrator.

e) Arrangements have been made to monitor the hours of use of any plant and lamps and a formula agreed for the rate of charge to be made for eventual settlement by the Main Contractor.

3.22 BUILDER'S WORK

In general the Builder's Work etc., required in connection with the Works, will be carried out by the Main Contractor, unless otherwise specified. The Contractor shall be responsible for the accurate detail drawings or marking out of such builder's work and the cost of any work due to the Contractor failing to comply with this condition shall be borne by the Contractor.

Builder's Work by the Main Contractor will include the following:

- The excavation of trenches for pipes, cables, etc., backfilling and reinstatement.
- The building of manholes, pits, ducts, etc., and the provision of all covers and frames, except chequer plate covers and their frames where these are specified, to be supplied by the Contractor.
- The formation of concrete bases, plinths, foundations, etc.
- The cutting and forming of chases, recesses and holes in or through walls, floors, ceilings, partitions, roof etc., and making good.
- The cutting away for and the building in of brackets, bolts, holderbats, clips and other forms of fixings, etc., and making good except the drilling of holes not exceeding 20mm diameter and 100mm depth for plastic, fibrous or other similar proprietary plugs which shall be supplied and fixed by the Contractor.
- The Contract Administrator's approval shall be obtained before cutting or drilling structural steelwork or using any expanding type bolts.

3.23 UNDERGROUND SERVICES

All underground services shall be laid with due regard to existing services, drains, culverts, etc.

In laying any underground services, the Contractor shall be responsible for establishing and checking the exact positions of existing services.

Pipes, ducts, cables, etc., shall be laid at least 1m from any existing underground service, drain, etc., crossovers excepted. Where this is not practicable, the Contract Administrator's ruling shall be obtained before proceeding with excavation.

The Contractor shall be held responsible for any damage caused to existing underground services, drains, etc., that is deemed due to negligence or bad workmanship on his part or due to his failure to work to this Specification.

3.24 CONNECTIONS TO EXISTING CIRCUITS

Connections shall be made to the existing mains supply at the position(s) indicated, but no alterations shall be undertaken without first obtaining the approval of the Contract Administrator.

The Work shall be executed in such a manner and at such times as may be necessary in order to cause the minimum of interference with existing services.

Where it may be necessary to interrupt existing services, notice of such intention shall be given by the Contractor to the Contract Administrator one month in advance to enable any necessary re-arrangements to be made.

FORTY-EIGHT hours notice shall be given to the parties as above prior to actual commencement of this work.

3.25 DISPOSAL OF FLUORESCENT LAMPS

Where these Works involve the disposal of fluorescent lamps the waste from these shall be regarded as hazardous waste and shall be disposed of in accordance with the Control of Pollution Act 1974.

The waste lamp(s) shall either be crushed in proprietary lamp crushers and bagged in special bags marked "hazardous waste", or the Local Authority shall be contacted and their advice sought on the proper disposal of these lamps.

3.26 DISPOSAL OF PCB'S (POLY CHLORINATED BIPHENYLS)

Where these Works include the stripping out and disposal of electrical equipment containing PCBs:- eg. capacitors in fluorescent luminaires, power factor correction capacitors and oil insulated switchgear and transformers, these shall be regarded as hazardous waste and shall be disposed of in accordance with the Control of Pollution Act 1974.

This type of waste shall not be disposed of into skips unless the waste contractor is fully aware of the contents and has obtained the correct licences for the disposal of PCB materials.

3.27 IDENTIFICATION

This shall be in accordance with BS. 1710 employing the Optional Colour Code Appendix D and as the example Appendix E.

In plant rooms, ducts, false ceilings, roof spaces, etc., identification shall be fitted to all main cables, trunkings, conduit runs and pipework adjacent to valves and at approximately 3m centres on straight runs.

This shall also apply to all services in exposed areas where positioned 3m or higher from finished floor level, except that in these positions the spacing may be extended to 5m.

On electrical installations connected to 3 phase supplies, each phase conductor throughout the installation shall be plainly marked adjacent to its termination by coloured sleeves to indicate the phase to which it is connected.

3.28 LOOSE MATERIALS

Items of "loose materials" or "unfixed materials" shall be handed to the Contract Administrator at handover.

3.29 ELECTRIC SHOCK NOTICE

In every Plant Room/Switch Room, a Notice shall be hung giving details of the methods to be employed when treating persons suffering from Electric Shock (published by IPC Business Press Ltd. - Mouth to Mouth Resuscitation).

3.30 RUBBER MAT

In front of all main switch panels a 600mm wide rubber mat the length of the switch panel shall be provided.

3.31 LABELS, IDENTIFICATION AND NOTICES

Unless otherwise specified, all multiple components, control and monitoring equipment shall be identified by Labelling to correspond with the terminology used in this Specification and the legend used in relative drawings.

All distribution and control equipment, metal clad switches, switch fuses, distribution boards, bus bar chambers, link boxes, contactors, time switches, etc., shall have Labels with characters of at least 5mm height on each.

All Labels and Notices unless otherwise scheduled, shall have black letters on a white background made from laminated self-coloured materials or a hot stamping process. The engraving shall penetrate the outer lamination and expose the appropriate coloured lamination beneath. Each Label shall be firmly fixed on to or adjacent to its item of equipment by self-tapping screws, or drive pins. Sufficient screws or drive pins shall be used to ensure that the Label or Notice does not buckle. Adhesive labels shall not be permitted.

The identification of multiple components within control and distribution equipment, e.g. relays and fuses, may be by self-adhesive, printed paper labels, varnished over.

3.31.1 Auto Start Motors

A notice having red characters on white of 10mm minimum height, shall be provided in a prominent position, wherever these Works include for the final connection to any motor which is arranged for automatic re-start. The legend shall be as follows:

MOTOR AUTOMATICALLY CONTROLLED AND MAY START WITHOUT WARNING

3.31.2 Supplies to SolidState Controls

Wherever Solid State Electronic Controls are connected to a distribution board, or part of a Control Panel, a notice shall be provided as described for CIRCUIT LISTS, to warn of possible accidental damage to equipment during insulation tests.

3.32 QUIETNESS IN OPERATION

Every effort shall be made to minimise noise generation from the various systems. Anti-vibration fixings and ferrules shall be used wherever practicable, and essentially the whole installation and every item thereof shall be free from drumming and rattle.

The Contractor shall trace and remedy the source of any noise considered greater than the permissible level set out in the Operating Conditions specified herein, including replacement of items as may be necessary.

When attenuation equipment is specified, this shall be installed such that, wherever practicable, it is bolted to the wall of the plant room so as to avoid "flanking" noise which might otherwise occur.

3.33 LOCATION AND MOUNTINGHEIGHTS FOR APPARATUS

Mechanical/Electrical fittings and/or appliances, conduits, cables, pipework, ducts, etc., are indicated on the drawings for tendering purposes and guidance during installation. Exact positions and routes shall be settled on Site in relation to other services and fixtures and in accordance with the Contract Administrator's Detailed Room Layouts, where issued. The Contract Administrator reserves the right to make minor alterations up to one metre in route length to the position of wiring accessories or plant shown on the drawings without incurring additional charges.

SECTION 4

4 INSTALLATION METHODS

4.1 INSTALLATION METHODS TO BE ADOPTED

4.1.1 General

The installation shall be entirely flush except for the plant rooms and roof void areas where the installation shall be surface.

4.1.2 Lighting and Power Final Circuits

Lighting final circuit cables shall be run within ceiling voids that exist between the floor boards and ceiling soffits of the timber suspended floors or within ceiling voids created below the existing and new ceilings of the building. All cables shall be supported throughout their length in accordance with the manufacturer's requirements. In floor voids cables shall pass through holes cut in the middle third of wooden joist or in old previously cut notches in joist. No new notches shall be cut and were old notches are used the metal plates shall be installed to protect cables. New holes shall be to a size agreed with the project structural Engineer.

Vertical cable runs up or down walls to switches or other outlets shall be protected by earthed steel conduit recessed into walls. These conduits shall protrude into the ceiling void to ensure that it is possible to withdraw the cables, if necessary, back into the horizontal void. All conduit ends shall be bushed using screwed brass bushes.

Lighting scene setting control cables shall not be run parallel with mains voltage cables and shall run in separate holes/notches.

The majority of the luminaires shall be flush or recessed fitted. Where holes require cutting in ceilings to accommodate recessed circular light fittings, the holes shall be cut using correctly sized hole cutters and not by padsaws.

Great care shall be taken in locating lighting transformers to ensure they are well ventilated and not subject to overheating.

4.1.3 Sub-Main Cables

Sub-main cables shall run horizontally in ceiling voids and vertically in riser locations. Where sub-main cables run in ceiling voids they shall be fixed to the building fabric or clipped to cable tray.

4.1.4 Fire Alarm Cables

Fire alarm cables shall be installed in the same manner as lighting and small power cables. Fire alarm cables shall not be run on common containment with mains voltage cables.

4.1.5 Voice/Data/Security and Audio/Visual Cables

The cables for these systems shall be installed in the same manner as lighting and small power cables. However, under no circumstances shall they run parallel to mains voltage cables unless separated by a minimum distance of 150mm, or 750mm for Audio Visual cabling. Where cables are buried in walls they shall be protected by recessed bushed steel conduits which protrude into the horizontal ceiling void.

4.2 WIRING SYSTEMS TO BE ADOPTED

4.2.1 Internal Lighting and Power

For lighting and power final circuits, the wiring system shall generally be LSF (Low Smoke & Fume) insulated, LSF sheathed multi-core cables with integral CPC.

Within plant areas and garage where the installation is surface the wiring system shall generally be LSF single insulated copper cable enclosed in steel galvanised conduit and trunking.

4.2.2 External Lighting
For external lighting the wiring system shall comprise XLPE/SWA/PVC cables.

4.2.3 Fire Alarm Wiring
Fire alarm wiring shall comprise a hard-skinned, flexible, fire-resistant, multi-core cable to BS 7629 and BS 6387, as manufactured by Pirelli FP200 flex, or equal and approved.

4.2.4 Security Wiring
The cabling requirements are set out in the specific sections of this specification.

4.3 FINAL CIRCUIT ARRANGEMENTS – GENERAL

The final circuit wiring throughout shall be carried out by looping cables progressively from point to point and no joint will be permitted between points.

In no case shall cables be drawn into the conduits until all conduits, boxes and other conduit fittings have been fixed permanently in position, tested for continuity and approved by the Contract Administrator, except that subject to the prior approval of the Contract Administrator, wiring may be commenced in a clearly defined section of the building or a complete floor.

No cables associated within single phase circuits connected to different phases of the system shall be drawn into the same conduit or conduit box.

No cables forming final circuits connected to different sub-distribution boards shall be drawn into the same conduit or conduit box, but they may run through the same adaptable box provided that adequate warning notices are fixed adjacent, or are printed on the barriers which shall be placed in the box to separate physically the main circuits, or provided that conduit(s) for circuits other than that for which the adaptable box is mainly used, shall be run solid through the adaptable box.

4.4 SCHEDULE OF MOUNTING HEIGHTS FOR APPARATUS

In general outlets and apparatus shall be located as indicated on the Architect's or Interior Designer's room elevations. Where outlets or apparatus do not appear on these drawings then the following schedule shall be used as a guide only.

SCHEDULE OF MOUNTINGHEIGHTS FOR APPARATUS

(Unless stated otherwise on the Interior or Architect's drawings)

Item	**Height (mm)**	**Measured to:**
Pendant	2050	Lowest part of shade
Local Switch(es) (for lighting)	1200	Centre
Socket Outlets in Kitchen	150 above work surface	Centre
Socket outlets	150 above skirting or not less than 450mm AFFL	Centre
Socket outlets in other accommodation	400 to 1070	Centre
Telephone/Data/TV/Audio Visual Outlets		
Thermostat, room type	1350	Centre
Bell push, wall type	1370	Centre
Cord-operated switches	1980	Ground from Acorn
Fire Alarms BGCP	1200	Centre

SECTION 5

5 CABLES

5.1 ARMOURED CABLES

Armoured cables shall be XLPE insulated and LSF sheathed to BS 6724.

Voltage designation 600/1000V.

Armoured cables over 35mm² in CSA shall comprise sector shaped conductors.

Conductors shall bestranded copper/solid aluminiumas indicated on the drawings.

Armouring shall be steel wire (SWA)as indicated on the drawings.

5.2 INSTALLATION OF XLPE INSULATED, ARMOURED CABLES

XLPE insulated, armoured cables shall be laid on cable ladders or trays, racked on hangers, run in cleats, laid in service ducts, drawn through stoneware ducts or buried direct in the ground or clipped direct to building fabrics as specified or indicated.

These Works shall include the supply of all such cable ladders, hangers and cleats.

Every cleat, hanger or cable ladder or other fixing shall be of adequate size and securely fixed to the structure as indicated.

All hangers and similar metal accessories used externally shall be galvanised. In other situations they shall be protected with one coat of metal primer red lead paint, and one coat of black bituminous paint.

Plastic type cable ties shall not be used.

5.3 JOINTING AND TERMINATING ARMOURED CABLES

Joints in armoured cables shall be avoided as far as possible and joints will only be allowed with the prior written approval of the Contract Administrator.

Joints shall be of the cast resin type and shall be made utilising only components and techniques recommended by the Cable Manufacturers for the particular application, and strictly following the manufacturer's published instructions.

The jointed cores shall be insulated over the ferrules with PVC tapes coated with a PVC paste and arranged inside a split mould. The mould shall then be filled with resin which, on setting, produces sufficient heat to cure the PVC paste and provides an impervious PVC covering over the ferrules, firmly 'vulcanised' to the core insulation.

The cable armouring bond shall be made electrically continuous by means of two continuity clamps on each side of the joint and a copper bond shall be provided across the joint such that the final continuity of the completed joint is at least twice that of the equivalent conductivity of the armouring removed.

Cables shall not be cut jointed or terminated in the open during inclement weather, unless adequate precautions to the satisfaction of the Contract Administrator are taken, to prevent the ingress of moisture into the joint or cable end.

Every joint made shall be witnessed and approved by the Contract Administrator before the joint is encapsulated.

A minimum of seventy-two hours notice shall be given to the Contract Administrator prior to the commencement of any joint.

Each joint shall be completed on the day started.

All armoured cables shall be terminated using proprietary cable dividing boxes and glands.

Cable glands shall be to BS.6121.

All glands shall be fitted with polychloroprene (PCP) gland shrouds, or where LSF sheathed cables are used, then LSF gland shrouds shall be fitted.

Armoured cable conductors shall be terminated or jointed strictly in accordance with the cable manufacturer's recommendations, using components and tools manufactured by them and following their published instructions.

All armoured cable connections to components terminals where the rated current carrying capacity is more than 60A shall be fitted with cable sockets, appropriate to the system of termination adopted.

Cable terminations shall be made using either compression crimped ferrules or sockets

5.4 FIRE RESISTANT CABLES (FP)

Fire Resistant cables shall be single or multicore and shall comply to BS 4066, BS 6387, BS 7629 and shall conform to IEC 331.

Conductors shall be stranded plain annealed copper to BS 6360.

Insulation shall comprise extruded silicone rubber to BS 6899 with the cores coloured for identification.

The sheath shall comprise extruded silicone rubber to BS 6899 with the cores coloured for identification.

The sheath shall comprise Aluminium/hard grade LSOH material laminate.

Plastic ferrules shall be fitted following removal of the sheath to prevent any possible damage to conductor insulation.

Terminations shall generally be made into nylon packing glands, coloured the same as the sheath.

The minimum bending radius shall be not less than 6 x overall cable diameter.

Clipping distances shall not exceed the dimensions indicated below:-

Vertical runs	-	60 x cable diameter
Horizontal runs	-	40 x cable diameter

The clips employed shall be of the wrap around type faced with a non-ferrous round screw head. 'P' shaped clips secured with masonry nails shall not be accepted.

5.5 CABLES LSF INSULATED

Single core low smoke wiring cables shall consist of stranded annealed copper conductors. LSF insulated only to BS 7211. No LSF insulated cables of nominal

cross-sectional area less than 1.5mm² will be permitted. No through joints will be permitted without the Contract Administrator's prior approval. (Maximum conductor temperature 90°C)

5.6 CABLES LSF INSULATED AND SHEATHED

Cables shall consists of copper conductors, insulated with LSF flat twin or three core incorporating earth continuity conductor and sheathed with LSF to BS. 6004, Table 5.

No cable smaller than 1.5mm² will be permitted.

No through joints will be permitted in any cables, without the Contract Administrator's prior approval.

LSF insulated and sheathed cables shall be supported as recommended by the manufacturer.

5.7 INSTALLATION OF LSF INSULATED AND SHEATHED CABLES

LSF Insulated and Sheathed Cables shall be installed in ceiling spaces, in floor voids,or protected and buried in wall chases as specified (See Clause INSTALLATION METHODS).

Cable entries into all components shall be fitted with brass, neoprene or rubber bushes to protect the cables from damage.

Cables buried in wall chases shall be protected by steel conduit, or as otherwise specified or indicated for various situations (See Clause INSTALLATION METHODS).

PVC insulated and sheathed cables liable to come into contact with polystyrene insulation materials shall be protected by conduit or trunking.

All cable cores at live potential, i.e. switch lines shall be coloured red or marked with a red band of 25mm plastic insulation tape.

5.8 TERMINATION OF LSF CABLES

LSF insulated cable terminations at distributions boards, accessories, lighting fittings, etc., shall be run in a neat and uniform manner, to the appropriate terminals and wherever possible, a length of slack cable shall be left at each termination.

Conductors up to 4mm cross-sectional area shall be doubled over before insertion into terminal barrels wherever possible.

5.9 CABLES AND CORDS - FLEXIBLE

No Flexible Cords having conductors of less than 0.75mm² shall be used.

Where an earthing conductor is required for the earthing of metalwork or apparatus, it shall be included in the flexible cord or cable.

Flexible Cords or Cables shall be of the following types:-

EPR insulated, Heat and Oil Resisting, Flame Retardant sheathed cords, shall be to BS. 6007, Table 4.

5.10 CABLES FOR COMMUNICATION SYSTEMS

Requirements for Communication System Cables where included as part of these Works can be found in Section 14of this Specification.

SECTION 6

6 CONDUIT AND TRUNKING

6.1 STANDARDS

Screwed steel conduit and fittings shall be to BS EN 61386 (ALL PARTS).

Non-metallic conduit and fittings shall be to BS EN 61386.

Trunking shall be to BS EN 50085 (ALL PARTS).

Non-metallic trunking shall be to BS 4678-4.

No conduit having a nominal outside diameter of less than 20mm shall be used.

6.2 SCREWED STEEL CONDUIT

Conduit and fittings installed in the following areas shall have Class 2 protection (i.e. Medium Protection both inside and outside) black enamel.

- All internal areas.

Conduit and fittings installed in the following areas shall have Class 3 protection, i.e. Medium Heavy Protection Finishes as Class 2, outside on Class 4.

- Plant Rooms and garage

Conduit and fittings installed in the following areas shall have Class 4 protection (i.e. Heavy Protection both inside and outside) galvanised.

- All external areas.

With galvanised conduits, all accessories used in conjunction therewith shall be galvanised.

6.3 LAYOUT

Conduit runs shall be determined by the Contractor and agreed by the Contract Administrator before any work is started. Conduit shall be run at least 150mm clear of plumbing and mechanical services, unless otherwise indicated, or with the Contract Administrator's prior written approval.

Conduit run on the surface shall be run truly vertical, horizontal or parallel with the features of the building. Where bends and sets occur in multiple conduit runs, they shall be arranged symmetrically to present a uniform and neat arrangement.

When installing conduit, care shall be taken to ensure that the runs do not obstruct equipment or impeded access for maintenance purposes or obstruct headroom.

Deep boxes or extension rings on standard boxes shall be used where necessary to bring the front face of each box flush with the finished surface of the wall or ceiling.

Where many conduits converge, large malleable cast iron boxes or approved sheet steel adaptable boxes may be used, in order to preserve neatness and avoid crossing of conduits. At sheet metal boxes the conduits shall be rigidly connected mechanically and electrically by screwed couplings.

In all accessories mentioned, conduits shall be screwed tightly.

6.4 INSTALLATION OF CONDUIT, GENERAL

Where the finish of steel conduits has been impaired by installation operations or rust, it shall be made good by thoroughly wire brushing and painting with zinc rich paint.

Where conduits cross structural expansion joints, the rigid conduit shall terminate in a circular through box at either side of the joint and the joint shall be spanned with a short length of flexible conduit. Earth continuity shall be maintained between the two sections of conduit by a circuit protective conductor of appropriate cross-section.

This circuit protective conductor shall be terminated at a tag type connector and fixed by means of a brass round head screw drilled and tapped into the bottom of the conduit box and clamping the earth continuity conductor between two suitable brass washers.

The conduit shall be properly and tightly jointed between the various lengths and into the fittings into which it runs or terminate, so that the wiring is continuously and effectively protected throughout its length.

Fixing saddles generally shall be of the distance or spacer bar type.

For use in external situations, adaptable conduit boxes shall be of the malleable cast iron galvanised type with a machined surface around the perimeter mating with a similar machined surface on the box.

Where special fixings or straps are required, these shall be protected and painted as specified.

The inside surface of the conduit, the ends of the conduit and all fittings used in connection therewith shall be smooth, free from burrs and other defects.

Where conduits are laid 'in situ' concrete or laid on structural floors for concealment within floor screeds, the Contractor shall provide proper attendance and supervision by a competent person whilst concrete pouring or screed-laying is being carried out by others, to ensure that the conduit work remains in good condition and in the correct position and that any damage or displacement is remedied.

Manufactured tees or elbows will not be permitted, except that with the prior written approval of the Contract Administrator, "back outlet" inspection elbows may be used in such special circumstances as and when surface run conduit is necessarily taken around beams or columns.

The total conduit length between draw-in points shall not exceed 10m for straight or near-straight runs, or 8m for runs including 2 right-angle bends, without the Contract Administrator's prior written approval.

Where necessary, conduits may be fixed to structural steelwork by approved purpose-made clips, but drilling of such steelwork will not be permitted without the Contract Administrator's prior written approval.

The Contractor shall supervise the preparation of chases by others and shall ensure that they are sufficiently deep to provide at least 15mm cover over conduits.

Where it is necessary to cross conduits in floors they must be so set as to form the minimum diversion compatible with the provision of adequate cover over the conduits.

Conduits must be securely fixed to prevent movement and mechanical damage by others during building operations.

In all cases where a sunk conduit leaves a ceiling, wall or floor, a joint shall be made such that the conduit coupling is left accessible at or near to the point where the conduit becomes exposed.

All conduits or accessories shall be fixed and completed before wiring in any particular section is commenced. On flush installations, draw-in boxes shall remain accessible on completion for possible future re-wiring. Cables shall not be drawn-in until plasters, screeds, etc., have been applied and have set and the conduits have been swabbed out.

Plugs shall be fitted at all open conduit ends to prevent the ingress of plaster, or other foreign matter which could cause blockage of the conduit.

All accessory boxes used in conjunction with conduit systems shall be standard depth. Plaster depth boxes will not be permitted.

In no case shall cables be drawn into the conduits until all conduits, boxes and other conduit fittings have been fixed permanently in position, tested for continuity and approval by the Contract Administrator, except that subject to the prior approval of the Contract Administrator, wiring may be commenced in a clearly defined section of the building or complete floor.

No cables associated with single phase circuits connected to different phases of the system shall be drawn into the same conduit or conduit box.

6.5 INSTALLATION OF SCREWED STEEL CONDUIT

Surplus screwing lubricant shall be wiped from threads prior to fixing of the conduit.

For screwed steel conduit termination, a hexagonal smooth bore male brass bush shall be screwed into the socket from the inside of the case and the shoulder of the bush shall be pulled up tightly against the inside of the case or box.

Bends shall be made on a pipe bending machine fitted with formers of the correct size and radii for the particular conduit.

Exposed conduit threads shall be given a coat of zinc rich paint.

The fixing centre dimensions shall not exceed 1.5m on vertical runs or 1.2m on horizontal runs.

6.6 TRUNKING STEEL

Steel cable trunking shall be provided where indicated or agreed by the Contract Administrator to avoid multiple conduit runs. Steel cable trunking shall be to BS EN 50085, Part 1. Protection shall be as follows except where otherwise specified for particular trunking systems, (e.g. Lighting Trunking).

All cable trunking shall be steel unless specifically indicated or specified otherwise.

Trunking shall have Class 3 Protection (i.e. Heavy protection, inside and outside), galvanised.

6.7 TRUNKING, INSTALLATION

Trunking shall be at least 150mm clear of plumbing and other mechanical services, unless otherwise indicated, or with the Contract Administrator's prior written approval. When installing trunking, care shall be taken to ensure that the runs do not obstruct equipment or impede access for maintenance purposes, or obstruct headroom.

Where fixed surface trunking traverses construction expansion joints, the trunking shall incorporate a sliding joint capable of taking up the possible structural movement. This shall be achieved by means of an inner sleeve to the body and an outer masking section to the lid of the trunking. A flexible copper braided tape shall be fixed across the joint to ensure continuity.

Where trunking passes through floors, walls, partitions or ceilings, internal fire resisting barriers shall be provided to prevent the spread of fire. The fire barriers shall comprise 'Fireblock' material as manufactured by Dufaylite Developments Ltd., Cromwell Road, St. Neots, Cambridgeshire, or other approved asbestos-free material.

Where steel trunking has been cut after manufacture, the cut ends shall be protected by painting with two coats of zinc rich paint and two coats of paint to match the trunking finish.

Where special fittings or sections of trunking are fabricated, they shall be prepared and finished to the same standard as manufacturer's standard items.

Standard flanged couplings shall be used to terminate trunking at apparatus and at adaptable boxes.

The practice of cutting and bending the material of the trunking to form flange attachments will not be accepted.

Connections between trunking and apparatus shall be by screwed coupler and bush, or a standard flange coupling or an adaptor neck, fabricated or cast. Direct attachment of trunking to apparatus will only be permitted if cable entries are provided with smooth bore bushes or grommets and the return edge of the lid of the trunking is left intact.

Fixing screws shall be round head except where countersunk holes are provided when countersunk screws shall be used. Countersunk holes shall be sufficient to prevent screw heads projecting into trunking and abrasing cables.

Steel screws shall be used with Class 1 and 2 Protection. Brass or sheradised screws shall be used with Class 3 Protection.

Vertical runs of trunking shall be fitted with pin racks or other types of cable support approved by the Contract Administrator at not more than 2m intervals to carry the weight of the cables.

Internal cable retaining clips shall be provided at intervals of not greater than 900mm to retain cables in trunking when covers are removed.

The access cover plate of the trunking shall be removable in easily handled sections over the entire length of straight runs and fixed by rustproof mushroom or dome head screws. Self-tapping screws will not be accepted. Overlapping collar sections or other similar linking arrangement shall be provided at the junction of the various sections of the trunking. The cross-sectional area of the trunking shall not be restricted at any point.

Positive continuity links shall be supplied and fixed at all trunking joints and inter-connection points.

Manufacturer's standard fittings shall be used. Only where these are inadequate to meet special local situations will fabricated fittings be accepted.

6.8 CABLE TRAY

Cable Tray throughout shall be formed from sheet steel, with hot dip galvanised finish or epoxy coated to the following dimensions:-

NOMINAL WIDTH	MININUM HEIGHT OF UPSTAND	NOMINAL THICKNESS OF SHEET STEEL
100mm	12mm	1mm
150mm	12mm	1mm
225mm	12mm	1.5mm
300mm	20mm	1.5mm
450mm	20mm	1.5mm
600mm	20mm	1.5mm
100mm	12mm	2.5mm*)
150mm	12mm	2.5mm*)
300mm	12mm	2.5mm*)
* External Installation.		

Bends shall have an inner radius of 50mm and a straight length of 100mm at each end.

No perforation shall be made in the circular portion of 100mm and 150mm bends. On 225mm and 300mm bends perforations shall be made only along a line set at 45°. On 450mm and 600mm bends perforations shall be made only along lines set at 30° and 60°.

Equal tees and cross-pieces shall have a distance of 150mm between the point of intersection and the end of the fitting.

Mushroom head steel bolts and hexagon nuts with washers complying with BS. 1494, Part 1, shall be used to fix together adjacent sections of cable tray and/or accessories.

Cable Tray shall only be cut along a line of plain metal, i.e. not through the perforations. All cut edges of galvanised cable tray shall be prepared and treated with zinc rich paint followed by two coats of matching paint.

Site fabrications of accessories WILL NOT BE ALLOWED and manufacturer's standard items shall be used. Where specific sections are required the material thickness and finish shall be as specified for standard items.

Edging strip shall be provided where cables traverse the cable tray edge. A clear space shall be left behind all cable trays, sufficient to facilitate the fitting of nuts.

Fixings for cable tray shall be disposed at regular intervals not exceeding 1.2mm and at 250mm from bends and intersections.

Fixings shall be fabricated from mild steel painted and protected as specified.

6.9 CABLE BASKET SYSTEM

Cable basket systems shall be installed into the main risers and ceiling voids to support various cable systems. The cable basket system shall be as manufactured by Mita Ltd., their Cablefill type, catalogue reference CF54.

SECTION 7

7 UNDERGROUND SERVICES

7.1 GENERAL

Underground services shall be laid in accordance with the details indicated on the drawings.

Unless otherwise indicated all cables laid under hard standings or made up surfaces shall be drawn through cable ducts or sleeves.

Cables in soft earth or below removable paving slabs shall (unless otherwise indicated) be laid direct in the ground and protected with cover tape.

All underground services shall be laid with due regard to existing services, drains and culverts.

7.2 CABLE TRENCHING

The excavation, backfilling and reinstatement of trenches for cables shall be carried out by the Main Contractor. The Contractor shall include for liaising with the Main Contractor and ensuring that the excavation and backfilling is carried out in accordance with the following clauses:-

When excavating trenches, the length opened at any time shall be reduced to a minimum. The top soil must be removed carefully and must be replaced as soon as possible after reinstatement. During excavation particular care shall be taken to avoid damaging any other services which may cross or run adjacent to the cable route.

Any services uncovered shall be adequately supported where necessary by slings or other suitable means.

The depth of the trench shall be sufficient to provide the cover specified in the Schedule located at the end of this Section of the Specification.

Before cables are laid, the bottom of the trench shall be evenly graded and completely cleared of stones or other abrasive matter. The cables shall be carefully laid in this bed without unnecessary or undue dragging and they shall then be covered with fine, stone-free earth to a minimum of 50mm cover after tamping.

Before the trench is backfilled, the cable shall be marked by temporary wooden pegs in order to ensure that when warning tapes are placed in position they shall be centrally over the cable. After laying warning tapes the trench shall be backfilled and consolidated in layers to provide complete reinstatement.

7.3 CABLE MARKERS

Route and joint markers shall be installed on all cables buried direct in the ground. Markers shall be of reinforced concrete, and shall be buried appropriately marked with surface indentations and shall be buried flush with the ground surface. Markers shall be provided at all significant route deviations, or as indicated on the drawings.

7.4 WARNING TAPES

Warning tapes shall be provided and laid over all cables buried in the ground. Warning tapes shall be 150mm wide, heavy gauge polythene, coloured yellow and printed 'CAUTION - ELECTRIC CABLE BELOW'.

Tapes shall be installed at a depth of 150mm below ground level.

7.5 CABLE DUCTS

Cable ducts will be supplied and laid by the Main Contractor, but the Sub-Contractor shall include for the rodding out, drawing through and sealing, and for liaising with the Main Contractor and ensuring that all such ducts are correctly positioned and set out.

Cable ducts shall be as indicated on the drawings, and of not less than 100mm minimum bore.

The total cross-sectional area of all cables installed in a duct shall not exceed 35% of the internal cross-sectional areas of the duct.

Except where otherwise indicated, cable ducts shall be fibre with suitable collar joints.

Ducts shall be laid so as to provide the minimum cover and spacings specified in the Schedule at the end of this Section of the Specification.

To prove the alignment of the 100mm ducts a wood mandrel 250mm long and 93mm diameter shall pass through. For 150mm ducts each mandrel shall be 143mm diameter.

If it is necessary to deflect from a straight line, or to vary the depth as in passing from footway to carriageway, or in entering an underground chamber, a lateral set not exceeding 25mm in a length of 1520mm shall be given to the joints, but the deflection shall be small enough to pass the alignment tests.

Ducts shall be plugged with wooden plugs before and after each test. Wooden plugs shall be inserted at the ends of each section of duct to prevent entry of soil or stones.

Trenches for earthenware ducts shall be scooped out at all points where the sockets rest so that the body of the duct lies upon solid ground. In rocky soils a layer of loose earth shall be spread over the bottom of the trench and rammed to afford a bedding for the ducts. In water-logged or unstable soils a foundation for the ducts shall be provided by laying 75mm of concrete (14Nm/m²) using a 10mm aggregate followed by 75mm of soil on top of the concrete.

Fibre ducts shall be laid on and surrounded with concrete to provide a minimum cover of 150mm above and below and 100mm on each side of the collars. The concrete shall be mixed in the following proportions:-

Cement	50kg
Fine Aggregate	0.1m³
Coarse Aggregate	0.2m³ (nominal max. size 10mm)

Ducts shall be kept clear of gas and water pipes, drains, sewers and other electrical services. In order to allow the use of 'tamping' machines on gas and water mains that may be adjacent, at least 150mm clearance shall be given wherever possible.

This clearance shall also be given, if practicable, to other services. No clearance shall be less than 25mm. Where services cross, the minimum clearance shall be 50mm.

All cable ducts shall be rodded through with a circular brush before the drawing-in of cables. Care shall be taken to avoid undue strain on cables when drawing-in.

All spare ducts shall be sealed as described in this Specification under "CABLE DUCT ENTRIES"

7.6 EXISTING SERVICES

Before any excavation is commenced the area shall be checked for existing services by the use of specialist equipment to locate buried pipes, cables, etc. Any services found shall be pegged by the use of suitable markers.

7.7 MINIMUM COVER AND SPACING CABLES

The disposition of mains services as issued by the National Joint Utilities Group Provision of Mains and Services by Public Utilities shall apply for straight routes under pathways or where indicated.

Elsewhere the minimum cover and minimum spacing between other services, is defined in the Schedule located at the end of this Section of the Specification. Where the services cross and the minimum spacing cannot be achieved then each cable shall be protected by a 600mm section of earthenware duct encased in concrete at the point where it crosses the other service.

7.8 CABLE DUCT ENTRIES

These Works shall include the sealing of all cable entries into the Building against the ingress of water, gas, dust, vermin and spread of fire. This includes cable entries for all mains voltage systems, alarm and communication systems and aerial systems unless specifically indicated otherwise elsewhere in this Specification.

The seal shall be effected by means of an approved method specially marketed for the purpose and comprising an epoxy self-foaming compound injected into the ducts or service entry with a syringe, the subsequent generation of foam being able to completely fill the cavity. To complete the seal, the two ends of the service entry and the surrounding area for about 500mm shall be further treated with a liquid sealant brushed on to form a completely fire, water, acid, gas and alkali-proof seal. The following precautions shall be observed:-

1. Prepare all surfaces properly to ensure good adhesion of the foam.

2. All loose particles, dust and other extraneous matter shall be removed from the interstices by the use of suitable brushes or vacuum cleaning equipment.

3. Plastic covered cables shall be clean and dry. Any grease shall be removed by the use of a suitable solvent.

4. Hessian wrapped cables shall be treated with a waterproofing compound to remove all dampness.

5. To prevent the foam issuing from the inside surface of the cable entry during the injection period, the end shall be temporarily plugged using cotton waste or any other suitable material. This plug shall of course be removed prior to the application of the fire- stop sealing compound.

6. Care shall be taken to prevent any foam bridging a wall cavity above damp-proof course level.

7. The active process shall be carried out in strict accordance with the manufacturer's recommendations.

7.9 MINIMUM COVER AND SPACINGS OF UNDERGROUND CABLES

TABLE 1

MINIMUM COVER FOR CABLES

TYPE OF CABLE	LOCATION AND DEPTH OF COVER			
	IN OPEN GROUND UNDER PAVEMENTS mm	UNDER ROADWAYS mm	UNDER OR ALONGSIDE RAILWAYS mm	IN OTHER SITUATIONS mm
HV	800	1000	1800	As indicated
LV Telephone Co-Axial	500	800		

TABLE 2

MINIMUM SPACING OF CABLES

CABLE	HV mm	LV mm	TELEPHONE	CO-AXIAL	EQUIPMENT PIPEWORK DUCTWORK
1. Buried:					
HV	50	300	300	300	300
LV	300	25	150	150	300
Telephone	300	150	50	50	200
Co-axial	300	150	50	50	200
Alarm/Security	300	150	50	50	200
2. In Air:					
HV	50	300	300	300	300
LV	300	25	150	150	150
Telephone	300	150	-	-	100
Co-axial	300	150	-	-	100

SECTION 8

8 MAIN AND SUB-MAIN DISTRIBUTION EQUIPMENT

8.1 INCOMING ELECTRIC SUPPLY

At present the building is connected to a 200Ampere single phase supply which enters at the Basement Level. A new 200Ampere three phase supply has been applied for through UKPN. The new 200Ampere three phase supply will enter at the Basement Level and be terminated within the new intake location within the basement.

The declared characteristics of the electric supply are 400/230V +10% -6%,
3 phase, 4 wire, 50Hz +/- 1%, TNCS.
Fault level = 18 KA. TBC by UKPN
Earth Loop Impedance Ze – 0.04 ohms. TBC by UKPN

The Contractor shall be responsible for giving notices to the appropriate REC, and the payment of all fees, if any, arising there under in connection with testing of the installation by such REC, whether or not such notices are, in fact, so given in respect of these Works.

8.2 SYSTEM DESCRIPTION

The new 200Ampere three phase supply shall be connected with a main LV cable to the MCCB Panelboard. The panel board shall be supplied and installed in the Lower Ground Floor Electrical Cupboard as indicated on the drawings.

Distribution boards shall be located at various floor levels as indicated on the drawings for general lighting and power together with a local distribution board for the Kitchen. These distribution boards shall each be fed with a local sub main LV cable.

Final circuit distribution boards shall generally be of the metalclad type and located within the riser cupboard or plant space. The rating and types of MCBs or RCBO's shall be as indicated on the drawings.

Main distribution schematic drawings shall be framed and displayed within the main intake areas.

The main distribution panel and distribution boards shall be as manufactured by Delta/ MEM Ltd., or equal and approved.

8.3 INTAKE

The Basement Intake location as described above shall also house the clients selected electricity supplier and meter companies meter for the premises.

8.4 METERING

The premises is currently metered by ……..

8.5 METAL CLAD SWITCH AND DISTRIBUTION GEAR

All metal clad switch and distribution equipment shall be 500V rating of capacity to suit the load and manufactured to BS. EN 60947-3 for switchfuses and BS 5419 for fuse switches.

All switches shall be provided with a padlocking facility ON and OFF, but padlocks shall not be included.

Switches in single phase circuits shall be single pole with neutral link (SP&N), in three phase circuits with neutral they shall be three pole with neutral link (TP&N).

Changeover switches incorporated for the interconnection of the diesel alternator shall be break before make type, 4 pole.

Switch and distribution gear for use in dry, internal situations shall be properly prepared, primed and stove enamel finished to the satisfaction of the Contract Administrator. Enclosure protection shall be to IP41 Classification at least BS. EN 60947-3.

Switch and distribution gear in external situations or subjected to damp conditions shall be properly prepared, zinc sprayed and stove enamel finished to the satisfaction of the Contract Administrator. Enclosure protection shall be to IP44 Classification at least BS. EN 60947-3.

Switchgear in the following locations shall be finished and protected to this Category:

- Plant Room.
- Vaults

All finishes damaged in transit, during erection, or at any time before final completion and handing over of the work shall be made good or the whole assembly retreated and/or refinished to the satisfaction of the Contract Administrator.

Each fuse-switch, isolator or switch-fuse shall be so arranged and interlocked that access to the fuses or to other live connections is only possible when the switch is open.

Neutral links shall be enclosed in the same metal case as the appropriate switch-fuse, fuse switch or distribution board.

All connections shall terminate either in sweated lugs or in substantial mechanical clamps, with suitable washers and locknuts.

Neutral bars shall have the same number of terminals for outgoing cables as there are ways on the board. Where installation or single phase circuits from multi-phase boards is specified or indicated, suitable provision shall be made for these by the incorporation of additional neutral bars and/or terminals.

Where PVC insulated and sheathed cables or systems with separate circuit protective conductors are used, distribution equipment shall be equipped with earth connection terminal blocks to enable independent connection to each C.P.C.

8.6 MOULDED CASE CIRCUIT BREAKER

Moulded Case Circuit Breakers shall be to BS. EN 60439-1, with short circuit performance of 36kA, unless otherwise indicated.

The short circuit rating of the MCCBs shall be selected to comply with the calculated fault capacity. All multiple pole devices shall be designed such that a trip condition detected on one pole will cause the disconnection of all poles.

Moulded Case Circuit Breakers shall be as manufactured by Schnieder Electrical Ltd., their PowerPact 4 Panel Board range or equal and approved.

8.7 MAIN SWITCHBOARD

The Main Switchboard shall incorporate the various items of switch and fusegear as indicated on the drawings, together with all necessary ancillary items, interconnections, labels, instruments, cable glands and entries.

For all purpose-made or factory assembled switchboards, drawings shall be submitted to the Contract Administrator for his written approval before proceeding.

Main switchboards shall be manufactured and tested at the works in accordance with BSEN 60 439 - 1 IEC 439-1 to conform with designation Form 3b, Type 2.

Switchboards designed for internal use shall only be erected once the area in which they are to be installed is dry and weatherproof.

Bus-bars shall comprise high conductivity copper mounted on robust insulating supports. The bus-bars shall be of rated capacity at least equal to that shown on the drawings.

Bus-bar Chamber shall be by the same manufacturer and protected and finished to the same standard as specified for the switchgear in the appropriate area.

The switchboard shall be so designed that all maintenance functions and connections of future additional outgoing services are possible when the switchboard is positioned as indicated, i.e. with access restricted to the front only.

The main switchboard shall be as manufactured by MEM Electrical Ltd., from their Memshield3 Panel Board range of switchgear or equal and approved.

Main and Sub-Main Switchboards shall be factory assembled but shall, as necessary, be delivered to the Site in sections of such dimensions that no undue difficulty is experienced in handling the gear into position and for final installation.

The Main Switchboard shall incorporate a compartment with a hinged door into which the Supply Authority can mount their meters and cut-outs.

The Main Switchboard shall incorporate the following instruments:-

- Voltmeter Scaled 0-500V with phase selector switch.
- Ammeter Scaled 0-750A with selector switch and suitably rated current transformers
- Power Factor Meter
- Maximum Demand Indicator Reading in kVA

Except where otherwise permitted by the Contract Administrator, or where otherwise indicated, solid conductor shall be used for interconnections between items of switch and fusegear, including bus-bar chambers incorporated in the board(s).

8.8 SUB-MAIN SWITCHBOARDS

Sub-main switchboards shall incorporate the various items of switch and fusegear as indicated on the drawings, together with all necessary ancillary items, cables glands and entries.

Sub-main Switchboards shall be by the same manufacturer as the Main Switchboard.

The sub-main switchboards shall be as manufactured by Schnieder Electric Ltd., from their Powerpact4 range.

Sub-main switchboards shall be constructed with due regard to the means of access applicable to each location.

8.9 DISTRIBUTION BOARDS

Distribution Boards shall be by the same manufacturer as the Main and Sub-Main Switchboards. Unless otherwise indicated on the drawings, each distribution board shall have at least 2 no. spare circuits.

Distribution boards shall conform to BS EN 60439.

Distribution boards shall be of the metalclad type with a hinged and lockable cover. All distribution boards shall be manufactured to BS EN 60439-B and BS 5486, Parts 12 and 13.

The distribution boards shall as a minimum offer a level of protection against ingress to IP41.

The distribution board shall provide the following features:
- Shall accept DIN-rail devices and accessories.
- Shrouded bus-bar.
- Shrouded neutral bars
- Earth & Neutral bars shall accept up to 25mm² cables.
- Suitable for split loads (All circuits shall be RCBO protected).

The distribution boards shall be fitted with a double pole switch disconnector rated at no less than 100A.

Unless otherwise directed all distribution boards shall have at least 2 spare circuit ways to the RCD protected section and the non-RCD protected section.

Distribution boards shall be as manufactured by Schneider Electrical Ltd. From their Isobar 4c range or equal and approved.

All Drawings to show number and rating of spare ways.

8.10 METAL CLAD SWITCHES

All independently mounted Metal Clad Switches shall be by the same manufacturer as the Main and Sub-Main Switchboards.

8.11 FINAL CIRCUIT PROTECTION

Final circuit protection throughout shall be by means of MCBs and RCBOs.

8.12 FUSES

HRC Fuses shall be to BS. 88, with Class Q1 fusing factor, except where otherwise indicated.

8.13 MINIATURE CIRCUIT BREAKERS

The short circuit rating of the miniature circuit breakers shall be M10.

Miniature circuit breakers shall be manufactured bySchneider Electric Ltd., theirIsobar 4 range.

8.14 CONTACTORS

Contactors shall comply with BS EN 60947-4-1. They shall be rated in accordance with 'uninterrupted duty' and utilisation Category AC3, unless otherwise indicated or directed by the Contract Administrator.

8.15 DIAGRAMS

At each main switchboard or sub-main switchboard a schematic block diagram shall be mounted. The diagram shall be framed or encapsulated such that it is possible to remove and revise the drawing if necessary. The diagram shall show all cable sizes and types together with the rating of all protective devices.

8.16 CABLE IDENTIFICATION

Each cable feeding to or connected from a Main or Sub-Main Switchboard shall be identified. A traffolyte label shall be fixed to the cable by means of cable ties and shall identify the number of cores, conductor size and indicate what equipment it feeds or where it is fed from.

Any references given in addition shall correspond with the block diagram.

8.17 CIRCUIT LISTS

A stencilled or typewritten circuit list shall be provided for each distribution board, set out with the relevant circuit information as indicated on the sample chart.

The circuit list shall be mounted within or adjacent to the relevant distribution board and protected by purpose-made circuit chart holders as manufactured by Chartrac, Telephone 0191 268 5670, or equal and approved.

8.18 SAMPLE DISTRIBUTION BOARD CHART

DB NO. GLP			**VOLTAGE** 230/L1 ph	**SUPPLIED FROM** Main Switchroom MP1
SUPPLY CABLE 16mm² XLPE/SWA/LSF			**E. LOOP IMPEDANCE** 0.06 Ω	**MAX. FAULT CURRENT** 16 KA
CIRC	**AMPS**	**CABLE**	**LOCATION - DESCRIPTION**	
1	10	LSF	8 No. Lighting Points : Public Office	
2	10	LSF	9 No. Lighting Points: Public Office	
3	10	LSF	10 No. Lighting Points: Counter/Supervisor	
4	10	LSF	7 No. Lighting Points: Toilets	
5	10	LSF	5 No. Lighting Points : Kitchen	
6	10	LSF	6 No. Lighting Points : Retiring Room	
7	-		Spare	
8	-		Spare	

Notes Ways numbered from left to right and/or top to bottom.

For Phase 3 boards the circuit column to read 1/L1, 1/L2, 1/L3, etc.

For 1 phase boards the connected phase shall be indicated with the voltage.

SECTION 9

9 EARTH ARRANGEMENTS

9.1 EARTHING SYSTEM

The means of earthing will be provided by UKPN at the main intake position.

Protective multiple earthing (TNCS) System will be provided by UKPN.

These works shall include the provision of main earthing terminals located at the Main Intake areas and the provision of a main earth conductor.

9.2 MAIN EARTH TERMINAL

The main earth terminal shall be mounted to the wall adjacent to the main switch panels in the basement intake location for the connection of the main earth conductor and equipotential bonding conductors.

To comply with I.E.E. Regulations 542-04-02, the main earth terminal bar shall include in an accessible position, provision for disconnecting the earth conductor to permit testing.

This joint shall be such that it can only be disconnected by means of a tool.

The main earth terminal shall be as manufactured by MEM Electrical Ltd., catalogue reference 1000 MEB.

9.3 BONDING TO OTHER SERVICES

After the main earthing terminal has been connected by the Supply Authority to their earth system, it shall be bonded by means of equipotential bonding conductors to the metalwork of:

i) The incoming water main.
ii) The incoming gas main.
iii) The main heating pipework.
iv) The main cooling pipework.

These bonding connections shall be by means of copper main bonding conductors in accordance with the requirements of the BS 7671 and in the case of TNCS Systems, any special requirements of the Supply Authority.

Connections to the pipework of other services shall be by means of clamps complying with BS.951

The bonding connections shall be made as close as possible to the point of entry of the gas and/or water services into the building.

9.4 PROTECTION AGAINST ELECTRIC SHOCK

The system of Protection Against Electric Shock shall be by the provision of Basic Protection and Fault Protection to all circuits and Additional Protection where specified elsewhere in this specification. All circuits and parts of the installation shall be provided with a means automatic disconnection of supply, protective earthing and protective equipotential bonding as prescribed in BS 7671:2008 17th Edition Wiring Regulations.

The means of satisfying the requirements of the I.E.E. Regulations in respect of the permissible impedance of the earth fault loop is indicated for each final circuit in the

Schedule of System Data included at the end of this Section of this Specification. ThisData Sheet which gives an indication of the maximum permitted length of the final circuit conductors which has been allowed by the System Designer for compliance with this requirement of the Regulations. The length of circuit so indicated shall not be exceeded by theContractorin arranging cable, trunking or conduit runs. In case of difficulty, the Contract Administrator's decision shall be sought.

9.5 RESIDUAL CURRENT BREAKER WITH OVERCURRENT DEVICES (RCBOs)

All RCBO devices shall be designed for Additional Protection to operate at the earth leakage tripping current as indicated on the drawings, or as indicated herein.

Residual Current Devices shall be designed to operate at a maximum earth leakage tripping current of30 mA at a maximum operating time of 0.4 seconds, or as indicated on the drawings.

9.6 BONDING OF EXPOSED AND EXTRANEOUS CONDUCTIVE PARTS

Bonding of Exposed and Extraneous Conductive Parts to BS 7671 shall include specifically, the following:-

All metalsinks and tanksshall be provided with supplementary bonding. All pipes entering or leaving water tanks shall be independently bonded together, so that effective bonding is maintained even if a steel tank is replaced with a tank of non-conductive material.

All radiators, ductwork and exposed metal pipes shall be provided with supplementary bonding, but where metal to metal joints exist and form a continuous electrical circuit of negligible impedance, one supplementary bonding connection may serve for a group of radiators or pipework. However, in these circumstances at least one such bonding connection shall be made for every 200m² of floor area served by the radiators and pipes.

Where suspended ceilings are supported on metal suspension tees or channels, each of the main support members shall have supplementary bonding, but not the 'clip in' secondary supports - except that where such secondary supports occur within 600mm of an exposed conductive part, e.g. the metalwork of a luminaire, then that secondary support shall also have supplementary bonding.

In Kitchen areas supplementary bonding shall be provided to all fixed metal benches or tables, fixed metal racking, metal hoods and valances and metalwork of all exposed services, etc.

Supplementary bonding connections to extraneous metalwork shall be made as unobtrusively as possible, connections to pipework being made in service ducts or voids when practicable. Such connections shall not be made where pipes are buried and to do so would render the connection inaccessible.

Wherever it is necessary for supplementary bonding connections to be made outside of service ducts or voids, the following methods shall be adopted:-

Where the installation comprises insulated cables in conduit, supplementary bonding connections shall be made where necessary, by extending the conduit system to a convenient point adjacent to the metalwork and terminating the conduit with a circular BS Box containing an earthing terminal. A yellow/green insulated supplementary bonding conductor shall be taken from this point through a bushed hole in the lid of the Box and bonded to the metalwork.

Where the installation comprises insulated and sheathed cables, supplementary bonding connections shall be made where necessary by means of insulated and sheathed single core cables of the same type specified for the circuit wiring and installed in the manner specified for these cables, from the nearest convenient earthing terminal on the system. Where the Specification calls for insulated and sheathed cables to be protected by conduits, this shall apply also to such supplementary bonding connections.

Where the installation comprises mineral insulated metal sheathed cables, supplementary bonding connections shall be made to extraneous metalwork where necessary by installing a single core MICS cable of the type specified for the circuit wiring, terminating in a circular BS Box with an earthing terminal at a convenient point adjacent to the metalwork. A yellow/green insulated supplementary bonding conductor shall be taken from this point, through a bushed hole in the lid of the box and bonded to the metalwork.

Excessive drilling of earth tapes or other operations which reduce the effective cross-sectional area of the tape shall not be permitted.

The ends of every supplementary bonding conductor, whether stranded or solid, shall be connected by an approved mechanical clamp or soldering socket.

All connections shall be accessible and made secure by screws of non-rusting material.

Where the circuit protective conductor is formed by metal conduit trunking, ducts or metal sheaths of cables, all joints shall be mechanically sound and electrically continuous. For any part of a circuit the resistance of the earth continuity path shall be not more than twice that of the current carry conductors of the circuit.

9.7 CIRCUIT PROTECTIVE CONDUCTORS AND EARTHING CONDUCTORS

The sizes of Protective and Earthing Conductors shall be as indicated on the drawings. Where no size is indicated the minimum conductor size shallbe in accordance with Table 54.7 of the I.E.E. Regulations (BS 7671).

Unless specifically indicated otherwise in this Specification, Drawings or Schedules, circuit protective conductors not part of a cable or formed by conduit, ducting or trunking, shall be of copper.

A separate CPC conductor cable shall be installed for every part of every circuit.

9.8 SCHEDULE OF SYSTEM DATA

PROJECT:	**PROJECT NO.**	
DISTRIBUTION BOARD REF:	**LOCATION:**	**MAINS DIAGRAM NO.**
***MCB or HRC (DELETE WHERE NECESSARY)**	**MCB TYPE:**	**RCD TYPE IF FITTED**

Circuit Ref.	Protective Device HRC/MCB HRC/RCD/ RCBO	Protective Device Rating A	Design Load A	Size of Phase Conductor mm²	Maximum Length Phase Conductor M	Separate CPC installed (show size) mm²	Maximum Circuit Impedance Ze Ω	Circuit Description

REMARKS: If, on installation, the maximum length of phase conductor is exceeded from that indicated, then the Contract Administrator's decision shall be sought.

SECTION 10

10 LIGHTING INSTALLATION

10.1 LIGHTING – GENERAL

The lighting installation to the house is indicated indicatively on the drawings but will be further developed in the future. Some luminaires, for the project have yet to be selected confirmed and hence a provisional sum is included in the summary of tender to take account of this.

All final circuits serving the lighting shall be installed flush within the building fabric or in false ceiling zones except within plant areas where the installation shall be surface.

The work requires that the luminaires are installed with the utmost care and located to precise locations as indicated and dimensioned on the Interior Designer's/ Lighting Designers drawings.

The majority of lighting within occupied areas of the house and external lighting is to be controlled by dimmer switches or conventional switches.

Circular downlighter holes must be accurately drilled using a tank cutter. Please note most downlights are square. Ragged hand-sawn holes, visible around the edges of downlighter bezels shall not be accepted.

The position of any obstructions which may interfere with the location of a light fitting position indicated on the drawings shall be notified to the Contract Administrator. The Contractor shall verify all luminaire positions prior to ordering of the luminaires. In particular where recessed luminaires are proposed the Contractor shall ensure the proposed location is achievable and that a suitable void exists for the luminaire proposed. Where downlights are adjustable the space around the luminaire must facilitate full adjustment.

All luminaires shall be installed in accordance with the manufacturer's recommendations.Please note plaster in downlights require secure fixing back to the fabric of the building to ensure the plaster does not crack during maintenance.

The Contractor shall ensure that final circuit wiring is not installed above or close to recessed downlighters. A distance of 300mm shall be maintained away from cables.

Final circuits for lighting shall be as indicated on the drawings.

10.2 WIRING SYSTEM TO BE ADOPTED

REFER TO SECTION 4

Configuration:

10.2.1 Wardrobe Cupboard Door Contact Switches

Where indicated on the drawings door contacts to control lights inside wardrobes/cupboards shall be provided.

Where wardrobes/cupboards have sliding doors then contacts as made by Jeani Accessories, catalogue reference 143W shall be used.

Where wardrobes/cupboards have hinged doors then flush push to make/break contact shall be used, as manufactured by Jeani Accessories, catalogue reference 140 LPC.

The Contractor shall determine before ordering if push to make or push to break contacts are required.

10.3 LAMPS

10.3.1 General

These Works shall include the supply and installation of all lamps, for all lighting outlets and all lampways as indicated. 75% of all lighting shall be low energy.

10.3.2 Lamps - Tungsten Filament

Within the general range and excepting special applications, or where otherwise indicated, lamps up to 60 watts rating shall have bayonet caps and all lamps above 60 watts shall have ES caps. The lamps shall be 230V rating.

Tungsten filament lamps generally shall be general service, single coil, standard envelope. Mushroom lamps or reduced envelope size lamps will not be allowed.

Where fittings as shown in Schedule E5 are indicated for use with special lamps, e.g. tungsten halogen, or internally silvered spot floodlamp, etc., these such special lamps shall be supplied and fitted as part of these Works.

10.3.3 Lamps - Linear Fluorescent

All lamps shall be 26mm diameter.

Fluorescent lamps shall be designed for use with high frequency control gear and triphosphor coated.

Colour Temperature to be 3000k and Ra 85+

10.3.4 Lamps - LED

All LED lamps to be colour temperature 2700k and Ra 90+

Colour consistency to be within 2 MacAdam Ellipse (SDCM)

10.4 LIGHTING OUTLETS

10.4.1 Plain Pendant

Where plain pendant outlets are indicated, these shall comprise a ceiling rose incorporating an earth terminal and cord grip, a length of EPR insulated HOFR sheathed flexible cord and a cord grip BC lampholder with shade ring.

10.5 LAMPHOLDERS

Lampholders shall be of the heat-resisting type to BS.52, except where otherwise indicated. Lampholders shall be of the safety type, automatically disconnecting the lamp contacts when the lamp is removed.

10.6 LUMINAIRES

These Works shall include the supply, connection and erection complete with all necessary suspensions, accessories, lampholders and lamps, of all luminaires indicated in the schedules or on the drawings and described in Schedule of Luminaires located at the end of this section of the Specification.

These Works shall include the responsibility for the condition and cleanliness of all luminaires until taken over, except that where, by instruction, luminaires are erected in advance of completion by certain other building trades, clear agreement as to responsibility shall be made between the Contractor and the Main Contractor.

Wherever these Works incorporate fluorescent luminaires connected to circuits protected by fuses or circuit breakers of rating greater than 6A, then the luminaire shall be fitted with an integral cartridge protective fuse.

All luminaires with inductive circuits shall be corrected to a minimum of 0.9 lagging power factor.

10.7 CONNECTION OF LUMINAIRES

10.7.1 Ceiling Mounted Luminaires

Where fluorescent luminaires are ceiling mounted, they shall be directly secured to standard circular BS boxes. Conduits or MICS cables shall not be taken directly into surface luminaires.

Where PVC final-circuit cables enter fluorescent luminaires they shall enter at the correct cable entry point so that the cables do not pass the choke on the way to the terminal block. Under no circumstances shall PVC insulated cables be allowed within 50mm of the choke.

Tungsten ceiling luminaires shall be mounted on, or adjacent to, standard BS boxes. Final connection to the luminaire shall be by means of glass fibre insulated and braided flexible cord from a terminal block within the BS box. The terminal block shall be of the porcelain type, plastic moulded terminal blocks shall not be allowed in this situation. PVC final-circuit cables within the BS box shall be sleeved with silicone bonded glass fibre sheathing.

10.7.2 Recessed LED Luminaires

Where **LED** luminaires are recessed, the final connection thereto shall be by means of a 3-core flexible cord, EPR insulated, HOFR sheathed, from an adjacent 2 ampere 3-pin socket outlet installed within the void, within physical reach of the ceiling aperture.

The support of these luminaires shall be by means of independent suspension from the building structure unless approval is obtained from the Contract Administrator to support luminaires from the ceiling.

Where luminaires are recessed and fitted into fire-rated ceilings the luminaires must be fitted with a 1-hour rated fire protective box or tent, as manufactured by Environmental Seals Ltd., from their Envirograf range, or equal and approved. These come in various sizes to suit luminaires.

10.8 EXTRA-LOW VOLTAGE LIGHTING

Extra-low voltage luminaires shall be supplied and installed where indicated on the drawings.

They shall be connected to the mains electrical supply via 240/12V drivers.

Low voltage lights shall be connected in groups to drivers where indicated on the drawings.

Transformer VA shall not be more than 10% higher than the lighting VA.

Where extra-low voltage luminaires are connected in a group to a single transformer then a separate radial cable shall be provided from the transformer to the luminaire. The transformer shall have a corresponding number of terminals to the number of luminaires connected.

Fuse protection shall be provided on both the primary and secondary side of group transformers

All drivers shall be securely fixed to the building structure or brackets. They shall not rest on the top of the ceiling tiles or grids.

Flexible cable to extra-low voltage lights shall have a minimum conductor cross-section of 1.5m². The following cable lengths shall not be exceeded:

		CABLE SIZE (mm²)	
Luminaire Output	**Output Current**	**1.5**	**2.5**
20W	1.67A	10.7m	17.6m
35W	2.92A	6.1m	10.7m
50W	4.17A	4.2m	7.05m

10.9 EXTERNAL LIGHTING

External lighting shall comprise:

1. Wall mounted luminaires to the front stairway to the lower ground floor.

2. Lighting to the garden courtyard.

Types of luminaire are to be determined by the Interior Designer or Lighting Designer.

10.10 EMERGENCY ESCAPE LIGHTING

10.10.1 General

These Works shall include the provision of emergency lighting by means of self-contained, non-maintained, maintained and sustained emergency lighting luminaires as defined in BS.5266, Part 1, and as indicated on the drawings.

10.10.2 Test Facilities

Key operated switches of the same range and finish as specified for lighting switches shall be provided in the live supply to the emergency lighting luminaires, as indicated on the drawings, to facilitate testing. For maintained emergency luminaires key-test switches should be double-pole to interrupt both the live and switched supply.

10.10.3 Operation

The circuit wiring to the fittings shall be so arranged that a live feed is maintained to the fitting when the local controlling switch is 'OFF'. Under circuit failure conditions, however, the escape light shall be illuminated.

The emergency luminaires shall be capable of providing escape lighting for a period of at least 3 hours after a 24-hour charge period.

All emergency luminaires regardless of their definition shall be mounted so that it is possible to see that the red LED charging indicator light is on.

Where luminaires of the maintained type and the batteries, charger and inverter are mounted remote from the luminaire, then these remote items must be located in an accessible location and the charge LED must be visible and fitted adjacent to the maintained luminaire.

10.11 SCHEDULE OF LUMINAIRES

C		Client Chosen Fitting	NA
D1		Orluna True Tilt with White RAL 9010 Bezel OR-TRU-27-M-M-W-WB	Phase Dimmable
D2		Orluna True Twin with White RAL 9010 Bezel OR-TRU2-27-M-M-W-WB	Phase Dimmable
D3		Orluna True Tilt with White RAL 9010 Bezel IP54 OR-TRU-27-M-M-W-WB-54	Phase Dimmable
D4		Orluna Timo Tilt & Rotate OR-TI-27-M-M-W-WB	Phase Dimmable
D5		Orluna Timo Tilt & Rotate IP54 OR-TI-27-M-M-W-WB-54	Phase Dimmable

D6		Orluna True Twin with White RAL 9010 Bezel IP54 OR-TRU2-27-M-M-W-WB-54	Phase Dimmable
DM		Thorlux Microdot 13W LED MID 16449l	ND
R		MK Electric Pendant Set for future installation of chandelier / pendant Allow £200 per point for future pendant/chandelier. Structural allowance to be made for future proofing	NA
S1		KKDC SEN 100 IP54 2800K	1-10V

T		Thorlux Thoroproof 30W LED TP 16486D	ND
W1		Astro Lighting Pella Plaster Wall Light 7140 IP20	Phase Dimmable
W2		Astro Lighting Enna Square Switched LED Matt White 7360 Colour Temperature (K):2700 IP Rating:IP20 CRI:80	Phase Dimmable
W3		Elite shaver light with push plate and shaver socket TC-S 11W G53 Colour Chrome IP rating 21 Lamps 1 x TC-S 11W G23 Voltage (V) 120/240	ND

W4		John Cullen Lighting Riena LED Steplight IP54 2700k 61Lm	Phase Dimmable

SECTION 11

1 POWER AND MINOR POWER

1.1 POWER FINAL CIRCUITS

For general purpose power distribution, outlets shall be of 13A rating.

The circuits for the 13A outlets shall be as indicated on the drawings.

13A socket outlets within the same room shall not be connected to different phases of the supply, except with the Contract Administrator's prior approval.

Where however, no specific circuit is indicated, outlets shall be connected in accordance with the following:-

(i) By means of a ring connected circuit using cables having conductors of 2.5mm² (7.067mm) or (1.5mm² for MICS cables) or greater, both ends of the ring being brought into one 32A way. In this arrangement no more than ten outlets shall be connected, one only of which may be connected as a spur to the ring. The final circuit ring loop shall not exceed 65 metres.

(ii) By means of looping up to four outlets together using cables having conductors of 4mm² (7/0.85mm) or (2.5mm² for MICS cables) or greater, connected to a 32A way. The size or section of the cable shall remain unchanged throughout.

(iii) One outlet may be connected by means of cables having conductors of 2.5mm² (7/0.67mm) or (1.5mm² for MICS cables) or greater to a 16A way.

13A outlets and other accessories shall be mounted at the height indicated on the Schedule of Mounting Heights, unless indicated on the drawings.

1.2 WIRING SYSTEMS TO BE ADOPTED

SHALL BE AS DESCRIBED IN SECTION 4

1.3 SOCKET OUTLETS 13A RATING

1.3.1 General

13A socket outlets throughout shall be switched with rocker operated switches.

Where equipment is supplied as part of these Works, the Contractor shall supply and fit a correctly fused plug to the equipment lead.

These Works shall include the supply of a 13A plug for each outlet installed (2-gang socket to count as one outlet for this purpose).

13A socket outlets throughout shall be of matching range, type and finish as other small power accessories in shared locations.

13A socket outlets shall be for flush or surface mounting as described for the particular area.

13A sockets incorporated in duct or trunking systems shall be as described in the appropriate Section of this Specification.

The final circuit wiring throughout shall be carried out by looping cables progressively from point to point and no joint will be permitted between points.

1.3.2 Flush Outlets

In accordance with the schedule given in the appendix, the following socket outlet types shall be installed:-

i) Where ‘white’ is stated in the schedule this shall mean a white plastic finish, as manufactured by MK Electric Ltd. from their Logic Plus range. Catalogue ref. for a 2-gang 13A switched socket outlet (without pilot lamp) K2747 WHI.

ii) Where ‘satin stainless steel’ is stated this shall mean a flat plate outlet from the Wandsworth Series 2 range. Catalogue ref. for a 2-gang 13A switched socket outlet (without pilot lamp) P354/BSS – black socket inserts, black nickel rockers.

iii) Where ‘Perspex’ is stated this shall mean a Forbes & Lomax invisible socket. Catalogue reference for 2-gang switched socket outlet DS13 white inserts.

iv) Where ‘paintable plate’ is stated this shall mean a Wandsworth flat plate outlet from the Wandsworth Series 2 range with a yellow etched primed plate fitted. Catalogue ref. for a 2-gang 13A switched socket outlet (without pilot lamps) P354/pp – white inserts.

1.3.3 Surface Outlets

Surface outlets shall be contained in steel surface mounting boxes. The plate shall be made to coincide evenly with the edge of the box. Boxes designed for flush mounting accessories will not be allowed.

Surface 13A socket outlets shall be as manufactured by MK Electric Ltd., from their Metalclad Plus range, catalogue ref. for 2 gangs switched socket outlets 2446 ALM.

1.4 FUSED CONNECTION UNITS

Fused connection units shall be switched or unswitched as indicated on the drawings, with removable fuse link to BS.1362. The fuse shall have the correct rating for the apparatus connected.

Fused connection units shall be to the same finish as adjacent socket outlets. For example for a switched fused connection unit with neon indicator and flex outlet the catalogue reference shall be as follows:-

White	MK Electric Ltd. Logic Plus range, catalogue reference K1070 WHI.
Satin Stainless Steel	Wandsworth Ltd. Series 2 A300 and P300/SS plate.
Perspex	Forbes & Lomax Invisible range ISFCC/PSX.
Paintable Plate	Wandsworth Ltd. Series 2 A300 and P300/PP.

1.5 SHAVER OUTLETS

Electric Shaver Outlets shall be to BS.3052, flush or surface mounting as required for the particular location and described in the Clause headed "INSTALLATION METHODS". The outlets shall incorporate a double-wound safety transformer and self-resetting automatic overload protection.

The front plate of the shaver outlet shall be engraved "SHAVERS ONLY" with the appropriate voltages available, the plates shall be finished satin stainless steel.

Shaver outlets shall be as manufactured by Wandsworth Electrical Ltd., their catalogue reference A939 and P939SS.

1.6 KITCHEN EQUIPMENT SWITCHES

Where indicated on the drawings double pole switches shall be installed to provide isolation of kitchen equipment. These shall be 45A DP or 32A DP as indicated on the drawings.

45A DP switches shall be as manufactured by MK Electric Ltd. catalogue reference K5215 WHI and 32A DP switches catalogue reference K 5105 WHI.

Final connection to the kitchen appliances shall be made using a flush cooker connection unit, catalogue reference K 5045 WHI.

1.7 LOCAL EXTRACT FANS

Where indicated on the drawings, others will supply and install local Extract Fans, and these Works shall include for each fan the following:-

(i) Provision of power supply and PIR unit.

(ii) Acceptance of fan controller where shown supplied by the Mechanical Contractor, mounting and connection of this at the position indicated. Alternatively connection to a PIR unit fixed in the same room, as shown.

(iii) Provision and installation of the control wiring between controller or PIR and extract fan.

(iv) Provision and installation of a suitable 3 pole switch with flex outlet adjacent to the fan, and final connection by means of PVC insulated, PVC sheathed flexible cable.

1.8 WIRING FOR MECHANICAL SERVICES

These Works shall include the main power supply for the Mechanical Services Equipment in the plant room and any local power supplies required for such items as are indicated on the drawings remote from the Plant Rooms.

These Works shall include the termination of the main Mechanical Services supply cable and the making of the final connection to the control panel supplied and installed by others.

The works shall include for the provision of local 230V power supplies to local control module unit located on each floor.

All wiring associated with the Mechanical Services from the point of supply indicated on the drawing(s), will be carried out by the Mechanical Contractor.

1.9 PASSENGER LIFT

There will be a passenger lift installed by others.

The passenger lift shall be a motor-room-less (MRL) type fitted into a new lift shaft.

For the lift these works shall include the following:

- Provision of a three-phase, four wire power supply as indicated on the drawings.
- The power supply shall terminate with a four-pole switch or switch fuse as required by the lift installer.

The rating and exact location of the service termination shall be agreed with the Lift Contractor.

For the motor-room-less lift the works shall include the provision of a 3 phase, 4 wire power supply terminating to a 3P N&E BS 4343 socket outlet at the top of the lift shaft. The exact rating of the supply and outlets shall be agreed with the Lift Installer.

1.10 KITCHEN EQUIPMENT

Kitchen equipment will be supplied and placed in position by others, but for all such equipment these works shall include for making the connections, including final connections thereto.

Where socket outlets are indicated for the connection of portable appliances, appropriate correctly fused plugs shall be provided and fitted as part of these Works.

The units shall be by the same Manufacturer and of matching range, mounting and finish as specified for the 13 A socket outlets or other accessories in similar locations.

Switches incorporated in the units shall be double pole.

All fused connection units in Kitchens shall be fitted with red pilot lights.

1.11 FLUSH FLOOR BOXES

Where indicated on the drawings the works shall include for installation of recessed floor boxes within the floor spans. The floor boxes shall be as manufactured by Cableduct their 700 series. The base unit shall be carefully fixed and supported below the floor to ensure that the finished edge and lid is truly flush with the finished floor.

1.12 AUDIO VISUAL EQUIPMENT

Dedicated circuits shall be provided to serve Audio/Visual equipment as indicated on the drawings within the AV cupboard.

1.13 ELECTRIC UNDERFLOOR WARMING

These Works shall include the supply and installation of all the necessary electric underfloor warming cables or mats for each bathroom indicated on the drawings. As part of these works the contractor shall also provide a power supply for the underfloor warming as indicated. The system shall be as manufactured by Warmup Plc, their PFM Matting System (200Watts per Square Metre).

All circuits serving underfloor heating shall be provided with additional protection by means of an RCD or RCBO device with a rated residual operating current of 30mA.

All electrical underfloor warming shall be dedicated circuits to allow for them to be controlled by a time switch. The time switch shall be included for as part of the Works.

The power supply shall emanate from a local distribution board and shall terminate to a fused connection unit local to the bathroom, or via a flex outlet plate connected to the load side of a fused connection unit.

The underfloor warming system shall be controlled through a local 3iE programmable thermostat for each bathroom/ shower/ WC.

The final connection of the underfloor heating mat shall be included.

1.14 MIRROR DEMISTERS

Where indicated on the drawings mirror demister panels shall be fitted to the rear of bathroom mirrors. The demister panels shall be as manufactured by Enerfoil Ltd. and shall be of the low voltage type. The transformers serving the units shall be located in accessible voids as close as possible to the mirror demister panels.

The demister panels shall be fitted in accordance with the manufacturer's recommendations and in particular their recommendation in regard to cut and drilled mirrors.

The demister pad shall be selected to suit the size of mirror. The demister panels shall be controlled by PIR units that also control the bathroom extract fans.

1.15 TOWEL RAILS

The towel rails shall be provided with the manufacture's wall brackets.

The towel rails shall be electric. The electric wall mounted outlet plates for the towel rails shall be installed in such a position as to line up with the electric element and to reduce the cable length between the two. The final position of the outlet plate is to be agreed on site.

The heating element shall be thermostatic type IPX4 rated, splash-proof, with non-freezing setting. Temperature range 30 to 60℃ and chrome plated.

The flex outlet plate shall be installed with due consideration to aesthetics, in line with the thermostatic element and to keep the flex length to a minimum.

The towel rails will be specified by the Interior Designer.

Time control of the Towel Rails shall be effected by the installation of Timer/Fused connection units as manufactured by Timeguard FST24 units or equal and approved.

1.16 ELECTRIC CAR CHARGING POINT

SECTION 12

2 FIRE ALARMS

2.1 FIRE ALARM SYSTEM

These Works shall include for the supply, installation and commissioning of a complete electrically operated fire alarm system.

The system shall be designed and installed in accordance with BS 5839 and has been designated a Grade A LD2system.

The fire alarm system shall incorporate the following:-

- Battery and charger unit.
- Alarm sounders.
- Central indicator and control panel including alarm silencing switch with supervisory buzzer.
- Automatic smoke detectors.
- Automatic thermal detectors.

The control/indicating equipment and installation shall be manufactured and installed in accordance with BS 5839 and EN54.

The system shall be of the single stage type giving a continuous 'Evacuate' signal only.

All components of the system shall be obtained from the same manufacturer.

These Works shall include for the system to be tested, commissioned and demonstrated on completion, to the Contract Administrator.

The system components shall be as manufactured by Kentec and Apollo and shall be supplied and installed by Genesis Integrated Systems Ltd, Unit 8 Bassett Business Units, Hurricane way, North Weald, CM16 6AA, Tel 0870 3333 479 or equal and approved.

2.2 POWER SOURCE

The power shall be derived from a 24V DC trickle charged battery.

The battery shall be Nickel Cadmium, 24 +/- 2 Volts

The battery and charger unit shall be located at the position indicated on the drawings.

The mains supply to the charger unit shall be derived from the main switchboard, from a separate 16A SP&N switchfuse coloured red, or MCCB which shall be labelled "FIRE ALARMS DO NOT SWITCH OFF".

Any power supplies to other fire alarm equipment such as repeat panels, mimic panels and mains powered interfaces shall be similarly identified.

2.3 ANALOGUE/ADDRESSABLE SYSTEM

The central indicator and control unit shall be located at the position indicated and shall be as manufactured by Kentec their KA 11080M2 8 Zone control panel or equal and approved.

The unit shall be suitable for flush mounting.

The front panel of the unit shall be constructed in steel and finished in white stove enamel.

The central indicator and control unit shall contain the standby batteries and charger.

The unit shall include the following:-

- 8 No. dual parallel red lamp/led indicators, which shall be connected and labelled to give zone or sector indication as follows:

  (The label shall be permanently marked or illuminated by the indicator lamps)

  - Zone 1 - Plant Area
  - Zone 2 –Lower Ground Floor
  - Zone 3 –Ground Floor
  - Zone 4 –First Floor
  - Zone 5 –Second Floor

- Fault indication as defined in BS 5839 shall be provided by means of amber lamps and a buzzer. An amber fault lamp indicator shall be provided for each zone so that a fault on the alarm contact circuit is readily traceable to the particular zone.

- An alarm silence switch and supervisory buzzer. The operation of the switch shall silence the sounders, and give audible and visual indication until the alarm system and silence switch have been reset.

- An evacuation switch, arranged so as to initiate the 'Evacuate' signal to the alarm sounders.

- Provision for linking alarm to a DOC or other remote location as later described, i.e. auxiliary relays.

- Provision for initiating emergency procedure on operation of mechanical ventilation plant, operation of fire doors, etc., as later described.

- A key-operated alarm restoration switch which shall silence the alarms after all contacts have been reset and the 'Evacuate' switch has been restored to normal. Until this switch has been restored the alarm condition shall continue.

- A key-operated test switch which shall by-pass the restoration switch for testing purposes. This switch shall operate in conjunction with an amber indicator lamp and buzzer to give indication that the alarm's restoration switch is by-passed.

- A 'lamp test' facility shall be included by means of a push button which, when pressed, shall illuminate all lamps.

- Indication that mains is available.

2.4 INTERFACE UNITS

Interface units shall be provided as indicated on the drawings. The interface shall be loop driven with four output channels, each channel shall be able to be programmed separately.

2.5 COMMUNICATIONS MODULE

The fire alarm system shall be provided with a communications module to allow the system to be linked to the fire emergency services and keyholder via the BT GSM RedCARE network.

The system shall allow dual path signalling using both an analogue telephone line and the GSM cellular network.

2.6 ADDRESSING OF FIRE ALARM DEVICE

Each fire alarm device shall be given a unique address. The Contractor shall be responsible for presenting a schedule of proposed addresses for the approval of the Contract Administrator and Client. The Contractor shall allow a period of 14 days for the schedule to be approved.

2.7 OPERATION OF SYSTEM

Operation of any alarm contact or automatic detector shall:

- Cause an 'alert/evacuate' signal to be broadcast throughout the building.
- Illuminate the appropriate zone/sector indicators/LCDs on the main indicator panel/repeat/mimic panels.
- Initiate alarm call to Central Monitoring Station.

Upon operation of the 'Evacuate' switch, the 'Evacuate' signal shall sound.

It shall not be possible to cancel an alarm signal until the call point or detector from which the alarm was initiated has been restored.

Following activation of an alarm and restoration of the call point(s) initiated the signal, the fire alarm system shall continue to respond to the signal until the fire alarm system itself is restored.

It shall be possible to operate the 'Evacuate' signal without prior operation of the 'Alert' signal.

Initiation of the 'Evacuate' signal while the 'Alert' signal is being given shall cancel the 'Alert' signal and the 'Evacuation' signal shall then be sounded.

2.8 WIRING SYSTEMS

The wiring for the fire alarm system shall be as described in Section 4.

Cables for the fire alarm installations shall be run at high level, fixed to cable tray/basket. Cables dropping to wall mounted equipment shall be protected by steel conduit. The glands would have to be omitted in these cases.

Where the removal of a detector isolates any of the fire devices within the zone or loop, the Contractor shall ensure that all manual break glass units are wired to first and directly from the control panel.

2.9 ALARM SOUNDERS

Alarm sounders shall generally base mounted to detectors.

The sounder specified shall be used throughout the fire alarm installation.

2.10 AUTOMATIC SMOKE DETECTOR

Automatic smoke detectors shall be of the optical type as manufactured by Apollo from their Alarmsense 55000-390 smoke sensor with 45681-510 sounder base.

Detectors shall be installed so as to ensure that the sensing element is not more than 150mm below the ceiling and more than 500mm below the ceiling and more than 500mm from any vertical obstruction, (walls, partitions, beams, etc.).

2.11 AUTOMATIC THERMAL DETECTOR

Automatic heat detectors shall be of the rate of rise type as manufactured by Apollo from their Alarmsense 55000-190 heat sensor with 45681-510 sounder base.

2.12 END OF LINE MONITORS

All end of line monitors shall be fitted as integral parts of break glass call points or detectors. End of line resistors provided within separate enclosures will not be accepted.

2.13 GSM Communicator

The works shall include for a Dual landline/GSM communicator to provide the provision to set up external monitoring of the Fire alarm system by a registered DOC.

2.14 COMMISSIONING OF FIRE ALARM SYSTEMS

The Contractor shall fully commission and certify the commissioning of the fire alarm system and shall in addition, conduct all reasonable tests required by the Contract Administrator/Client.

Such tests would normally include:-

- Operation of each automatic detector by a means approved by the manufacturer.
- Verification that the correct message/address/indication is displayed at control panels/repeat panels/mimic panels.
- Correct operation of interfaces.
- Correct operation of bells/sounders.

The Contractor shall not offer to carry out such tests until he is fully satisfied that the system is suitably complete.

2.15 ZONE CHARTS

The Contractor shall provide A4 encapsulated drawings, coloured to show the F.A. zones of the building. The drawings shall be perforated and hung on a wall fixed ring binder to a position adjacent to the main fire control panel. Further copies shall also be provided with the O&M Manual.

2.16 MAINTENANCE

The Contractor shall present at the time of Practical Completion costs for 12 month Maintenance of the Fire Alarm System. The costs shall reflect the recommendations in the Operating & Maintenance Manuals.

SECTION 13

3 SECURITY SYSTEMS

3.1 SCOPE

The security systems installed to the house as part of these works shall comprise the following:-

- Electronic intruder alarm system.
- CCTV system.
- Controlled access.

A security system shall be installed by a NSI Gold approved installed such as:

- ECS
- AEON, 7 York House, Langston Road, Loughton Essex. IG10 3TQ
  Tel. 020 8502 4400
- Or equal and approved ISO 9002 Quality Certificate Installer.

These works shall be designed, installed and commissioned in accordance with:

BS EN 50131 all parts	Intruder alarm system.
PD 6662:2010 BS 8243	The UK Implementation of EN 50131.
BS 5979	Code of Practice for remote centres receiving signals from security systems.
BS 6799	Code of Practice for wire-free intruder alarm systems.
BS 7230	Code of Practice for article theft detection system.

The system shall be Grade 2 as described in PD 6662:2010.

The intruder alarm system shall be to Security Grade of System:3L Notation Grade 2.

3.2 INTRUDER ALARM SYSTEM

3.2.1 General

The intruder alarm system shall comprise a wired system based around a single microprocessor-based control panel.

Each room shall be wired as a separate circuit to enable easy and quick identification of the location from which the system has been triggered.

It shall be possible to ‘part set’ the building to allow intruder alarm detectors to be armed to part or the whole of the building.

The system shall also provide a link (volt free contact) to the lighting control system to operate all external lighting in alarm conditions.

Keypads with proximity readers shall be located as indicated on the drawings to allow the system to be set or part set by the input of a code or by presentation of a valid proximity card or key fob.

3.2.2 Control Panel

The system shall be controlled by a Pyronix Grade 2 Expandable microprocessor control panel, or equal and approved. The panel shall be located in the main intake room adjacent to the electrical distribution board and voice/data hub.

- Capacity for a maximum of 144 independent zones/circuits.
- Capacity for 8 group settings (sub-systems) to provide three separate alarms in the one system.
- Provision of outputs for possible integration of external detection/lighting/ access control systems.
- Illuminated keypad operation.
- Capacity for individual user codes and management controlled access levels.
- A minimum of 1500 event memory log.
- Alpha numeric LCD screen.

Expansion modules shall be located as required and indicated on the drawings and shall be as manufactured by Pyronix expansion modules with 4 No. outputs and installed in conjunction with RIO units with anti-tamper protection.

3.2.3 Keypads

Remote keypads to activate/deactivate the system shall be located at the main entry/exit point of the house and in the master bedroom suite. The units shall incorporate proximity modules to provide a setting/unsetting procedure to meet the latest Police requirements DD 243.4

The keypad units shall be as manufactured by Pyronix Euro67 , or equal and approved. Keypads shall also include a proximity reader for 'fob' settings with bespoke back box and flush mounted cover plate.

3.2.4 Communications Module

The intruder alarm system shall be provided with a DUAL COM G3 communications module to allow the system to be linked to the Police and keyholder via the BT GSM RedCARE high security network.

The system shall allow dual path signalling using both an analogue telephone line and the GSM cellular network.

The BT Redcare telephone line will be organised by the Client.

The system shall send a test signal to the Alarm Receiving Centre every 25 hours.

3.2.5 Magnetic Reed Switches

Magnetic reed switches shall be fitted to windows and doors as indicated on the drawings. The units shall be suitable for flush fitting and great care shall be taken to ensure the reed switches are carefully fitted. Typical model type EN3 - QFC -GN flush contact, Grade 3 risk level and environment Class 2 rating.

Note: sash windows will require 2 No. contacts per window frame and shall be included by the Tenderer.

3.2.6 Passive Infrared Movement Detectors

Anti-masking dual technology (infrared and microwave) movement detectors shall be as manufactured by Pyronix KX15DT, or equal and approved. Detectors shall be of

the dual technology type and incorporate anti-tamper software and to EN grade 2 and an environmental Class 2 rating.

Coverage to be 15 metres x 15 metres at 85 degree angle.

3.2.7 Vibration Detectors

Viper GL shock sensors type vibration detectors shall be fitted to doors and windows as indicated on the drawings. The units shall be fitted with great care and only to locations agreed prior to installation. Grade 3 rated and an environmental Class 2 rating.

3.2.8 Panic Alarm Buttons

Flush style panic alarms shall be fitted to locations indicated on the drawings. The units shall comprise dual buttons that require to be pressed consecutively to operate the alarm and a key to reset the unit once operated. The unit shall be single accessory size and be finished the same as adjacent electrical outlets, generally brushed stainless steel. Panic alarm shall operate the system 24 hours per day even when the main alarm is not in set condition. Typical model number CQR, EPA, flush double pole or equal and approved, but finished as stated above. Sample to be presented prior to installation.

Note: In most rooms the finish of electrical accessories will be Focus SB Screwless Polished Chrome, as required by the Architect's Schedule of Finishes, and the Tenderer/Contractor should make due allowance in his tender.

3.2.9 Wireless Panic Buttons

These works shall also include for the provision of wireless panic buttons and a radio signal receiver within the main control panel.

3.2.10 Break Glass Detectors

Where indicated on the drawings glass rooflights or windows shall be protected by break glass detectors incorporating anti-tamper protection as manufactured by Sentrol, cat. no. 5822A or equal and approved.

3.2.11 Cabling

All intruder alarm cabling shall be installed flush with horizontal cable runs in ceiling/floor void and vertical drops concealed within steel conduits in wall chases.

3.2.12 Internal Sounders

Internal sounders shall be flush mounted and located as indicated on the drawings. The internal sounders shall operate upon initiation of the system and also give warning tones when the system is armed/disarmed. The units shall comprise high volume sirens with an output of 110 dB at 1 metre. Internal sounders shall be fitted with anti-tamper devices using an Askari sounder and flush cover plate.

3.2.13 External Warning Devices

External warning devices comprising 115 dBA sirens and blue integral strobes shall be located on the external façade of the building as indicated on the drawings. Prior to cabling and installation it shall be confirmed by the Contract Administrator that the installation of an external sounder is permitted by the Planners, Heritage Architect and Landowner.

The external sounder shall be constructed from white polycarbonate, louvre-less with anti-tamper protection. The unit shall incorporate a twin piezo sounder that will ring from its own power supply in the event of the signal from the control panel being disconnected. The manufacturer/Installers name shall not be displayed on the unit.

A strobe/siren assembly shall be fitted to the rear of the building to a location agreed on site with the Contract Administrator.

In accordance with the Environmental Protection Act 1990 the external warning device shall operate for a maximum of 15 minutes and then silence.

The unit installed shall be as manufactured by Rapier, model 200S or equal and approved.

Provision shall be made for future beam detection. Cabling shall be installed to areas that shall not be accessible after project completion, as indicated on the Security Drawings and Site Services Drawing (14/105-E21).

3.2.14 Commissioning and Training

The works shall include for the full commissioning of the system and demonstration of the completed system and operation. After the demonstration is completed the Contractor shall programme into the system the Client's final alarm requirements including part set strategies.

The Contractor shall include for 1 full day's training to demonstrate and train the Client's staff and representatives in the operation of the intruder alarm system.

3.3 CCTV SYSTEM

3.3.1 General

The works shall be installed in accordance with BS EN 5013. The system shall comprise a number of cameras as indicated on the drawings and described elsewhere in the specification, an Intelligent Video Management System (IVMS) comprising a hard drive recording device capable of storing the camera images for a period of 31 days, and an interface with the TV distribution system which allows the camera images to be viewed on all TV monitors throughout the buildings. The works shall initially be set up to operate 7 No. cameras but shall be able to be extended in the future to operate up to 14 cameras as may be installed in the future by the future building owner.

3.3.2 Cameras

The works shall include the provision of an internal CCTV system to allow the user to view the camera output from monitors within the apartment but also from remote devices such as a PC, Smartphone or Tablet.

Geovision GV-MFD120, 1:3:H264 Low Lux mini fixed dome featuring:-

- 2.1 Megapixel Progressive Scan CMOS.
- Dual video streams from two of H.264, MJPEG and MPEG4.
- Up to 30 frames per second in megapixel resolution (1280 x 1024).
- Built-in microphone.
- Micro SD/SDHC card slot.
- Active tampering alarm.
- Motion detection.
- Privacy mask.
- IP address filtering.
- iPhone, iPad, Android compatibility.
- PoE (Power over Ethernet).
- Megapixel lens.
- 16 languages on Web interface.
- Access into the router to access the communication points.
- Equal and approved.

3.3.3 Digital Recorder

The Works shall include for the provision of Dedicated Micros Digital Sprite 2 digital recorder with 16 camera inputs. This unit shall have 1 Terabyte of hard disk memory

and shall provide sufficient storage capacity without the need for any form of archiving. The unit has an integral DVD-RW for the transfer of any incidents to a separate removable DVD. The unit shall be located to a position to be agreed.

The system shall be suitable for the remote monitoring of camera views either within the house via the LAN or externally via an internet browser via Dedicated Micros NetVu Observer.

A digital evidence pack for the safe and compliant transfer of potential evidence shall be provided as part of these works.

3.3.4 Networking

The works shall include for a suitable network connection to enable images to be viewed on the Client's LAN from a connected PC loaded with viewing software.

3.3.5 Keyboard

The works shall include for the provision of a Pelco keyboard with joystick for PTZ control and camera selection options. The PTZ units can also be controlled via the mouse with a virtual on-screen keyboard. The location for this unit is to be agreed.

3.3.6 Monitors

The works shall include the provision of 1 x 17" flat-screen monitors for multiplex and spot viewing dedicated to the CCTV system. The cameras shall also be able to be monitored via a networked PC. The monitor shall be as manufactured by Samsung Electronics co. Ltd their model no. SMT-1721/1921.

3.3.7 Interface to TV System

The CCTV pictures shall be able to be viewed on the house TV system. All suitable interface and modulators shall be included as part of these works.

3.4 CONTROLLED ACCESS SYSTEM

3.4.1 General

A system of video controlled access shall be installed as part of these works. The system shall comprise a single button video door entry panel, as manufactured by BPT Security UK Ltd., catalogue reference VRVP/1, fitted flush at the following location:

- Main House Entrance.
- Side Door Entrance.
- Main Gate Entrance.

The units shall be finished in polished stainless steel.

Within the house and staff accommodation and at the locations indicated on the drawings, receiver units, as manufactured by BPT Security Ltd, catalogue reference Opale, shall be located and mounted flush on the wall.

The system shall comprise a 3.5" LCD colour monitor, twin channel receiver module, power supply and control buttons in one composite box, along with a white finish plate.

The door release buttons on receiver units shall be programmed to open the main entrance gates.

3.4.2 Power Supply Unit

A power supply unit shall be located in the basement and shall comprise the following:

- 1 x video modulator.

- 1 x Echelon interface.
- 2 x AS/200 power supplies.
- 1 x XA/300LR power supply and control unit.
- 2 x VAS/100.30 power supplies.
- 2 x Video distributor XDV/304.
- 2 x IOD/303LR coded call actuator.

3.4.3 Integration with TV Distribution and Telephone System

The door entry system shall be interfaced via video modulators to enable the pictures viewed by the door entry cameras to be viewed over the TV distribution system and to be recorded on the CCTV hard drive video recorder.

The audio output shall also be integrated with the telephone system to allow two-way speech between the video entry call unit and the telephone system anywhere in the house.

3.4.4 Commissioning

The works shall include for the full commissioning and demonstration of the equipment upon completion of the works.

The works shall include for 1 day's training of the system to the Client's staff.

SECTION 14

4 COMMUNICATION SYSTEMS

4.1 SCOPE

All the Audio Visual, Data, Voice, Access Control, TV, CCTV, etc. will be supplied and installed by the Specialist AV installer.

These works shall include the supply and installation of all the requisite equipment, panels, speakers, wiring, cabling, etc.

4.2 INSTALLATION METHODS

The cabling shall be installed flush throughout with the exception the installation within the basement plant rooms where the installation shall be surface. The cables for the home network shall be installed horizontally within the ceiling voids of the building. Where Home network cable drop or rise vertically to outlet locations the cables shall be flush in the building fabric and protected by bushed steel conduits. The conduits shall terminate to the accessory box and within the floor void such that it is possible to be able to withdraw the cables form the horizontal void.

Cable trays shall be installed in the risers as part of these works to support rising cables.

4.3 CABLE INSTALLATION PRACTICE

In the floor voids the cables shall be tied at regular intervals in bundles of no more than 40, by the means of suitable cable ties at 400mm centres and secured to appropriate fixtures beneath the floor levels.

All cable terminations shall be with connectors of an approved type to Cat. 6 levels of operation and shall incorporate grommets and strain relief boots where applicable to ensure durable and robust connections.

All cables shall be terminated in or on connectors, distribution frames, punch down blocks or other terminating devices such as hubs in specially designed areas.

All connectors applied to data cables shall be crimp or IDC type. Connections between cables and connectors shall not be solder type except where specifically specified.

4.4 CABLE PROTECTION

All efforts and precautions shall be made to protect cables at all times, both during the actual installation process and in terms of the design where trunking and enclosure of exposed cable shall be necessary where cable is to be run above floor voids.

Strain relief boots must be utilised where applicable to provide protection and connection incorporating grommets must be used.

Particular care shall be exercised to ensure that the cable manufacturer's recommendations are adhered to in terms of maximum strain applied during the cable pulling process.

The cable manufacturer's minimum bend radii must be strictly observed.

4.5 LIGHTING CONTROL

Lighting Control and management is to be based on Lutrons's DIN rail mount QS lighting control system. This is based upon dimming racks and scene setting keypads and has the capacity to handle any fixture type and load as well as becoming a further interface for devices such as blinds, curtains, fans and pumps if required.

All dimming panels to be fully compliant with 17th edition regulations by the use of integral RCBO devices. The type of RCBO device used must be carefully selected and approved to negate the possibility of nuisance tripping by the adoption of SI devices, one device per 4 circuit dimming module. Each circuit must also have an appropriately rated MCB to allow individual testing and isolation.

All dimming panels to be clearly labelled for every circuit.

Dimming panels are to be inclusive of all circuit protection and be fully wired internally.

A fully balanced landing schedule should be provided for all circuits, this must be approved by the electrical contractor prior to wiring.

Astronomical time clock programming must be provided to automatically control lighting to external areas and provide a holiday mode.

The Lutron Lighting system is to be directly linked to the intruder alarm system thereby allowing an alarm condition to activate specified lighting circuits in a manner to be determined. Suitable volts free contacts are to be included for this purpose in each apartment.

For cost purposes the Lutron C2NI-CB series keypad should be used with a finish to match surrounding electrical outlets, as detailed by the Architects.

In addition lighting control to be interfaced with and be available through Lutron touch screens and iPad/iPhone devices including cordless devices where indicated in the product matrix.

4.6 MOTORISED CURTAINS/ BLINDS

Motorised window treatments are to be provided at locations as shown on the drawings.

Full containment is to be provided in the AV Cupboard and all cables are to be labelled for simple addition of motorised window treatments in the future.

Cables should be brought into a single 35mm deep UK 1G back box within the window reveal and finished with a white plastic blank plate.

4.7 DISTRIBUTED AUDIO

For convenience and ease of use the main audio system is to be of the distributed type with all main items in a chosen central location, providing access to the functionality of the system from remote points in other rooms (zones).

These zones to be operated from touch screens as indicated giving control of the system on a room-by-room basis, including on-screen status and operation display (name of radio station, album, artist, volume setting, etc.).

Cables will be supplied by the AV Specialist Installer for installation by the Electrical contractor.

Audio sources are to be Internet radio, stored iTunes Libraries, premium streaming services such as Spotify and air play to allow direct streaming the client's or guest's from their iOS or Android device

All ceiling speaker locations indicated on the drawings are to have speakers fitted.

Where flush loudspeakers are required the contractor shall cut the apertures and fit the appropriate back box as required. All back boxes shall be obtained from the A/V specialist, and fitted as part of these works however some areas may require the construction of such an enclosure within ceiling voids. Any such requirements to be detailed by the A/V Specialist.

The loudspeakers will be supplied and installed by the A/V Specialist to the locations indicated on the Architect or Interior Designer's reflected ceiling plans.

The ceiling speakers shall be as manufactured by Sonance with their 6" Visual Performance series models being used. All speakers shall be installed with fire rated hoods.

All low level or wall mounted speaker locations are to be terminated with specialist plates to allow the simple connection of speakers during final fit. Plates are to be finished to match surrounding electrical outlets.

4.8 DISTRIBUTED VIDEO

In addition to the required RF TV Distribution system specified, wiring systems will allow for the inclusion of a High Definition distribution system is to be included providing distributed HD services complete with room controllers/ballans as per the product matrix. At present a pre-wire and terminated cable structure is only required.

It is proposed that the High Definition distribution be based on Crestron DM and associated products or equal and approved. All equipment will be housed in the central rack locations as detailed in the drawings and product matrix.

Video sources are to be catered for as detailed by the client and be suitable for interface with the AV system. Enough capacity is to be included in the main rack for the easy addition of these sources by the client at a later date

A suitable wiring structure is to be included for the addition of HD quality images from CCTV cameras or other ancillary devices such as local in room satellite receivers or Blu-Ray players onto the distributed video system.

4.9 HOME AUTOMATION

The use of a touch screen control system will integrate the functionality of the house entertainment systems into one environment as well as having significant processing power to integrate other house functions such as lighting, security, heating and comfort cooling.

Wiring systems should be designed in order that the manufacturer of the home automation system should be Crestron and primary control interface as per the schematic drawings.

4.10 RACKS AND HEAD END

Build quality and reliability are essential for this project. All AV Room equipment therefore should be built into a Middle Atlantic ERK system rack with caster base. All fascias to be full fitting using custom rack shelves and product specific cut fascias as required. All cables to be tethered by lacing bars and be clearly labelled. All cables to be loomed with connections appropriate for connection to a full Head End system.

Head End system is to be by a Middle Atlantic HPM hinged wall mounted system with custom made connection panels, all incoming services to be connected to appropriate sockets in readiness for connection to the system rack loom.

Drawing examples of 'as installed' rack and head end to be provided with the tender documents.

All Racks and Head Ends to be located in the AV cupboard, located in the Basement Family room. As indicated on the drawings.

4.11 NETWORK

A data network design, wired and wireless, supported by a structured cable design will be required in order to ensure that the services arrive securelythroughout the building allowing access either by direct connection or by adding wireless devices as required.

A star wired home network based Category 5e for telephony and Category 6a for Data, all to be 4 pair UTP cables delivered to RJ45 twin outlets at strategic points around the dwelling. For networking and broadband distribution this should be supplemented by a managed Wi-Fi system for easy connection of laptop computers, iPhone, iPads etc.

Networking equipment to be as manufactured by Ruckus and Draytek

In addition a wiring protocol will be required for a full Panasonic PBX digital telephone system.

A data network will also be required to all television locations for the provision of current and future on-demand services.

The cabling system shall be based on a star topology with each outlet cable to the main hub console in the basement AV hub as a 'home run'. Each cable run shall not exceed 90m.

All outlet plates shall match adjacent electrical accessory plates.

Only the highest standards of workmanship will be accepted in terms of cable laying, marking, termination and testing. Tenders shall show that they comply with the cable manufacturers' installation standards as well as the following industry standards:-

a) BS 7671 - Wiring Regulations.

b) Recommendations as issued by B.T. or other carrier concerned.

c) British standards and Codes of Practice, BS 6701/BS 6301 for the Installation of Apparatus Intended for connection to certain Telecommunications Systems.

d) TSB 40 & TSB 36.

e) Recommendations of the International Telecommunications Union (ITU).

f) Recommendations of the International Standard Organisation (ISO) and Standards relating to the installation of IEEE 802 and IEEE 802.3 Ethernet networks.

g) British Approvals Board for Telecommunications.

h) Relevant OFTEL and DTI Regulations.

i) NCOP Network Code of Practice.

j) EIA/TIA.568 Commercial Wiring Standards.

Cost should be provided for a full data structure including router. A VPN link must be included for off-site monitoring and updates/downloads, diagnostics and servicing. The chosen installer must provide a fully monitored, off site support service. The tender document must include confirmation and description.

Subscriptions and the supply of phone and broadband services are to be arranged by others. However the AV installer will provide advice and assistance where required.

4.12 TELEPHONE SYSTEM

A wiring system shall be provided which will support the inclusion of a PBX style digital telephone system.

All outlet plates are to be supplied by the AV contractor with a finish to match surrounding electrical outlets, as detailed by the Architect.

The Property is to be provided with a minimum of 4 No phone lines and internet services. Provision for incoming services is to be from BT open reach or similar. It is the main contractor's responsibility to ensure incoming Phone and Data services are brought into the property.

4.13 CONTOLLED ACCESS SYSTEM

A system of video controlled access shall be installed as part of these works. The system shall comprise of 2 No. video door entry panel, as manufactured by BPT Security UK Ltd. From their XIP series, fitted flush at the locations detailed on the drawings.

These units shall be from the vandal resistant range and finished in brushed stainless steel.

The Entry system is to be made available on all touch screens, 4 No. BPT nova entry phones and will provide the end user full two way Audio communication and one way video with each entry point.

Provision will also be made to interface the entry system with any future phone system added by the client. The interface will be installed and commissioned as part of these works.

Suitable door and gate release will be included for by the AV contractor. Locks and operating mechanisms for the vehicle and pedestrian gate will be provided by others.

4.14 TV DISTRIBUTION INCLUDING SATELLITE SERVICES

An Integrated Reception system (IRS) will be required for the receiving and distribution of digital TV signals, Radio signal both FM and DAB and Satellite TV and associated satellite services.

This must allow for access to all free services such as Freesat and Freeview, as well as subscription services such as SKY. Provision should also be made for the inclusion of overseas satellite services namely Arab Sat satellite transmissions. The IRS will be able to distribute signals for HD content and SKY + services both via the distributed system and at each TV location.

Due to the phasing out of analogue services and transmissions a modulated output from any capable device such as satellite receivers or CCTV equipment is not recommended. The AV installer will allow for the distribution of HD quality images from both sources via the HD distribution system as detailed in section 5.

4.15 TELEVISION AERIAL SYSTEM

The works shall include the provision to the house of an Integrated Reception System (IRS) as detailed in this section of the specification. The system shall comply with the following:-

- BS EN 50083 Cabled Distribution Systems for Television, Sound and Interactive Multimedia Systems.
- BS EN 50117 Specification for Coaxial Cables.
- BS EN 60966 Radio frequency and Coaxial cable assembles.
- CAI Code of Practice for the installation of Terrestrial and Satellite TV Reception Systems.
- Sky Homes Specification for New Build Integrated Reception Systems.

The basic infrastructure for the television/FM radio system shall be 75 ohm, foam dielectric co-axial cable to feed various outlets on all floors from an aerial array installed on the roof.

The TV/FM/DAB shall be of near broadcast quality at all the outlets.

These works shall include the supply and installation of the aerials, fixings, brackets, cabling, amplifiers, tuners, filters, outlet faceplate, etc. to achieve a fully operational system as described herein. All outlet plates shall match adjacent electrical accessory plates.

The services to be provided using the proposed system are as follows:-

Service	**Programmes**	**Frequency**
Terrestrial Digital	All channels locally available i.e. all Freeview channels	UHF Band IV/V
Satellite Digital	All horizontal and vertical transmissions, both Low Band and High Band from the 28° east orbital position, in the transmission range from 10,700 Mhz – 12,750 Mhz.	IF Astra 2
FM Radio	The national and local services, legally transmitted to the area both mono and stereo.	Band II
DAB	All locally available services	Band III

4.16 TELEVISIONS

As per the drawings where sizes are indicated TV's are to be as manufactured by Samsung and be from their HU7500 range. All to be installed to the indicated locations using products as manufactured by Future Automation. Manual swivel brackets are to be used for wall mounted devices. In Bathroom televisions to be as manufactured by Aquavision and be their 22" Nexus Classic model.

4.17 INTERFACES

The Automation system will have the ability to control both HVAC and heating systems. This will require the installation of interface connections between the Automation control processor and the HVAC control units.

These works shall be undertaken as part of these works. In the absence of identified HVAC and heating systems, provision should be made for programming time only.

Specific interfaces for these systems will be identified and supplied by the HVAC, and heating sub-contractor/s.

It is noted that the Automation system will not perform as a BMS and will only give the client an easy and convenient means to adjust comfort settings. The HVAC system will operate on its own without input from the Automation system.

These works shall be undertaken as part of these works. In the absence of identified Alarm and Fire systems, provision should be made for programming time only.

Specific interfaces for these systems will be identified and supplied by the intruder alarm and fire alarm suppliers.

4.18 CABLES

All cables are to be of the highest quality and to perform to all standards indicated in the tender documents and the manufacturers' specification.

The AV specialist will include a full schedule of cable rates as part of their tender bid.

The cabling shall be obtained (purchased) from the A/V specialist to lengths determined by the contractor. The contractor shall obtain detailed schematic and installation drawings from the A/V specialist prior to installation work.

Great care shall be taken to ensure the correct cables are installed. The cables shall be installed in horizontal ceiling voids, but where run vertically shall be enclosed in flush steel conduits. Cables shall not run parallel with mains cables, but where this is unavoidable a distance of 500mm shall be maintained.

Cables shall not be subject to kinking, pinching or twisting.

All cables shall be terminated by the A/V specialist however the contractor shall ensure sufficient slack is left at each end to allow termination.

All cables shall be clearly labelled using the cable references indicated on the A/V specialist's drawings and tested.

Upon completion of the cabling the electrical contractor shall request an inspection of the cabling from the A/V specialist to ensure the cabling is correctly installed.

SECTION 15

5 PROTECTION AGAINST TRANSIENT OVER-VOLTAGES FOR ELECTRONIC SYSTEMS

5.1 PROTECTION FOR MAINS POWER DISTRIBUTION SYSTEMS

Transient over-voltage protectors shall be installed on all power cables entering or leaving the building, in order to protect equipment connected to the power distribution system against transient over-voltages coming into the building from outside.

Protectors shall also be installed at local power distribution boards as shown on the schematic, in order to protect these against transients generated downstream of the protectors in 2.1.

Protectors shall conform to:

- BS EN 62305:2006.Protection of structures against lightning (
- BS EN 60099-1: Surge diverters for low voltage installation,
- I.E.E.E. C62.41 Guide for surge voltages on low voltage ac power circuits.

The protector must not interfere with or restrict the systems' normal operation. It should not:

- corrupt the normal mains power supply
- break or shut down the power supply during operation
- have an excessive earth leakage current

The protector shall be rated for a peak discharge current of no less than 10kA (8/20 microsecond waveform).

The protector shall limit the transient voltage to below equipment susceptibility levels. Unless otherwise stated the peak transient 'let-through' voltage shall not exceed 600 volts, for protectors with a nominal working voltage of 230 or 240 volts, when tested in accordance with BS 6651: Category B - High (6kV 1.2/50 microseconds open circuit voltage, 3kA 8/20 microseconds short circuit current).

This peak transient 'let-through' voltage shall not be exceeded for all combinations of conductors:

- phase to neutral
- phase to earth
- neutral to earth

The protector shall have continuous indication of its protection status. Visual status indication shall clearly show:

- full protection present
- reduced protection - replacement required
- no protection - failure of protector

Remote indication of status shall also be possible via a volt free contact.

The status indication shall warn of protection failure between all combinations of conductors, including neutral to earth.

The protector shall be supplied with detailed installation instructions. The installer must comply with the installation practice detailed by the protector manufacturer.

5.2 PROTECTION FOR DATA COMMUNICATION, SIGNAL AND TELEPHONE LINES

Transient over-voltage protectors shall be installed on all data communication/signal/telephone lines entering or leaving the building, in order to protect equipment connected to the line, against transient over-voltages. (Where data lines travel between buildings linking equipment in each building, transient over-voltage protectors should be installed at both ends of the line in order to protect both pieces of equipment).

Protectors shall conform to BS. 6651: Protection of Structures against Lightning (Appendix C) CCITT IX K17.

The protector must not impair the system's normal operation. It should not:

- restrict the system's bandwidth or signal frequency
- introduce excessive in-line resistance
- cause signal reflections or impedance mismatches (on high frequency systems).

The protector shall have a low transient 'let-through' voltage for tests conducted in accordance with BS. 6651: Category C - High (5kV 10/700 microsecond test).

This 'let-through' performance shall be provided for all combinations of conductors:

- signal line to signal line
- signal line to screen/earth

The protector shall be rated for a peak discharge current of 10kA.

The protector shall be supplied with detailed installation instructions. The installer must comply with the installation practice detailed by the protector manufacturer.

The protector manufacturer shall allow for the facility to mount and earth large numbers of protectors through an accessory combined mounting and earthing kit.

SECTION 16

6 INSPECTION, TESTING AND HANDOVER

6.1 TESTS

The complete installation and all systems forming part of these Works shall be tested prior to handover and the Tender sum shall include the provision of all labour, materials and certified test instruments as required.

14 days notice shall be given to the Contract Administrator prior to testing, so that he may witness the Tests if he so desires.

The Tests shall include demonstration of the operation and function of complete systems, installed as part of these Works.

The Tests on the Electrical Installation shall be carried out in accordance with the latest edition including amendment of Regulations for Electrical Installations issued by the Institution of Electrical Engineers (17th Edition).

6.2 INSPECTION

Prior to the commencement of the test, a visual inspection of the appropriate section of the installation shall be made in accordance with Chapter 61 of the Regulations for Electrical Installations. The test shall not proceed until the results of the visual inspection are satisfactory. The test shall be carried out in the sequence required by Chapter 61 and indicated on the test result sheets. The Test Results for the complete Installation shall be recorded in the Inspection Certificate and the Record of Test Results. The Works shall not be regarded as complete for the purpose of issuing the Certificate of Practical Completion until all Tests have been carried out and the systems are properly performing to the satisfaction of the Contract Administrator.

Tests shall include the following:-

- Continuity of Protective Circuits
- Continuity of Ring Final Circuits
- Insulation Resistance Tests
- Phase Proving Tests - (to ensure that Phases are connected in the specified manner and proper sequence throughout)
- Earth Fault Loop Impedance Test
- Operation of residual current operated devices.

6.3 HANDOVER

Handover of the Works shall include:-

1. Supply of all Test Certificates of equipment items provided by the manufacturer.

2. Supply of Inspection Certificate for the Electrical Installation (set out, completed and signed in accordance with example included at the end of this Section of the Specification, with readings for each circuit).

3. Completion Certificate for the Electrical Installation.

4. Completion Certificate for Emergency Lighting System.

5. Fire Alarm Completion Certificate and Log Book.

6. Completion Certificate for Intruder Detection System.

7. Supply of Record Drawings.

8. Supply of Operating & Maintenance Instructions.

9. Completion of all Identification Labelling and Circuit List.

10. Supply of loose materials and spares as specified.

11. Agreeing with the Contract Administrator, a list of any outstanding items or defects on the basis that the items so listed shall be dealt with and cleared within 28 days, unless otherwise agreed with the Contract Administrator.

6.4 TEST AND COMPLETION CERTIFICATES

These Works shall include, as a pre-requisite to Practical Completion of the Works, comprehensive Record Documents finalised in detail and subject to the approval of the Contract Administrator. Great importance will be placed upon the quality, accuracy and completeness of the Record Documents and upon their being made available promptly.

The Contractor shall demonstrate from time to time as required by the Contract Administrator throughout the execution of the Works, that adequate and accurate Records are being kept, such as will ensure the ultimate completeness and accuracy of the Record Documents, and that the Record Documents are themselves being progressively compiled as the Work on site proceeds.

The following pages show model Test and Completion Certificates to be presented at Practical Completion and to be included in the Record Document issue.

Other similar forms such as those produced by the NICEIC and ECA based upon the model forms in the IEE Regulations will be accepted provided that the same information as required by the enclosed forms is provided.

INSPECTION CERTIFICATE FOR ELECTRICAL INSTALLATION

ESTABLISHMENT
(FULL ADDRESS)

DRAWINGS

SPECIFICATIONS

ELECTRICAL INSTALLATION INSPECTION CERTIFICATE

I/We hereby certify that the Electrical Installation described above, has been Inspected and Tested in accordance with the Regulations for Electrical Installations, issued by the Institution of Electrical Engineers, that the results are satisfactory in the respects mentioned below, except as indicated in the comments below, and that the Installation in areas where explosive atmospheres are present complies as defined in this Specification with BS 6941/5345.

Specific Test Results were as indicated in the attached Schedules of Readings.

I/We recommend that the installation be further inspected and tested after an interval of not more than …….. * years.

* Period to be inserted by the Contractor.

ITEMS INSPECTED OR TESTED

ITEM	DESCRIPTION	RESULT
1.	Type of Earthing Arrangement	TN.S. ( ) TN.C.S.( )
2.	Prospective short circuit current at the origin.	……. A
3.	Earth Fault Loop Impedance at the origin	……
4.	Continuity of protective conductors and equipotential bonding	( )
5.	Insulation resistance of the fixed installation. (i) All poles or phases to earth (ii) Lowest reading between phases or poles	…… …….
6.	Conductors secure and identified	( )
7.	Polarity and single pole devices for protection or switching connected in phase conductors only.	( )
8.	Socket outlets and lampholders correctly connected throughout	( )
9.	Presence of fire barriers and protection against thermal effects	( )
10.	Correct setting of protective and monitoring devices	( )
11.	Labelling of circuits, fuses, switches, terminals, etc.	( )
12.	Presence of safety signs and other warning notices	( )
13.	Presence of Record Drawings, Operating and Maintenance Instructions	( )
14.	Installation in areas where explosive atmospheres are present complies with BS 6941/5345	( )
15.	List of fixed equipment inspected and tested	1. …… 2. …… 3. …… 4. …… 5. ……
16.	Lift of portable equipment inspected and tested.	1. …… 2. …… 3. …… 4. …… 5. ……
17.	Check on condition of flexible cables and cords, switches, plugs and sockets	( )
18.	List of Test Result Sheet Nos. applicable to this Inspection Certificate	Nos……. to ……. inclusive

DETAILS OF DEPARTURES (IF ANY) FROM THE REGULATIONS OR CODES OF PRACTICE:
COMMENTS (IF ANY) ON EXISTING INSTALLATION, WHERE THIS CERTIFICATE RELATES TO AN ALTERATION OR ADDITION:

Signed …… (Contractor)

For and on behalf of ……

Address ……

……

……

Date ……

ELECTRICAL INSTALLATION COMPLETION CERTIFICATE

ESTABLISHMENT ……..

(Full Address) ……..

……..

……..

I/We hereby certify that the Electrical Installation as referred to above, has been inspected and tested in accordance with the Regulations of Electrical Installations issued by the Institution of Electrical Engineers and to the best of my/our knowledge and belief, the Installation complies at the time of my/our test with the above Regulations, except as mentioned below.

Details of the test results, any Departures from Regulations and recommendations for future inspections are as recorded in the Inspection Certificate.

Signed …….

for and on behalf of …….

Address …….

…….

…….

Date …….

MODEL FORM FOR RECORDING OF TEST RESULTS

Circuit Ref.	Rating of Fusing Device In A	C.S.A. of Phase Conductor mm²	C.S.A. of C.P.C. mm²	Continuity of Protective Conductor IEE Reg 612.2.2.1	Continuity of Ring Conductor IEE Reg. 612.2	Insulation of Resistance IEE Reg 612.3 ohms	Protection by Separation of Circuits IEE Reg 612.4	Protection against Direct Contact by Barrier IEE Reg 612.4.5	Insulation of Non-conducting Floors and Walls IEE Reg 612.5 ohms	Polarity IEE Reg 612.6	Earth Fault Loop Impedance IEE Reg. 612.9 ohms	Earth Electrode Resistance IEE Reg 612.7	Operation of RCDs IEE Reg. 612.13 mA	Comments/ Qualifications	Circuit Ref.

We certify that the tests where applicable were carried out in the order shown and the test instruments used were known to be correctly calibrated.

Signed ……..

On behalf of ……

Date: ……..

SCHEDULE OF ELECTRONIC EQUIPMENT

TO BE COMPLETED BY THE CONTRACTOR

ATTENTION

Electronic controls which can be damaged during 500V insulation testing are connected to this supply – disconnect them prior to tests.

ROOM NO./CIRCUIT NO.	ELECTRONIC EQUIPMENT CONNECTED

EMERGENCY LIGHTING COMPLETION CERTIFICATE

FOR NEW INSTALLATIONS FOR ALTERATIONS

ESTABLISHMENT …….

(FULL ADDRESS) …….

…….

…….

Work carried out and covered by this Certificate shown on Drawings Nos. ……. (See BS 5266, Part 1, Clause 3.3)

I/We hereby Certify that the Emergency Lighting Installation, or part thereof, at the above Premises, has been Inspected and Tested by me/us and to the best of my/our knowledge and belief, the Installation complies, at the time of my/our test, with the recommendations of BS.5266 'Emergency Lighting' Part I, 'Code of Practice for the Emergency Lighting of Premises other than cinemas and certain other specified Premises used for Entertainment', published by the British Standards Institution, for a category ..... Installation, except as stated below.

Complete as necessary

Signature of person responsible for Inspection and Test:

…….... (Contractor)

Date ……..

For and on behalf of ……..

……..

……..

Details of Deviations from the Code of Practice (BS 5266, Part 1)

……..……

……..……

FIRE ALARM SYSTEM COMPLETION CERTIFICATE

(CLAUSE REFERENCE TO BS 5839)

Certificate of installation and commissioning of the fire detection and alarm system at:

Address ……

……

……

……

It is certified that the fire detection and alarm system at the above address conforms to the recommendations of BS 5839 : Part 6 for a type ……., grade ……. system, other than in respect of the following deviations:

……

……

The entire system has been tested for satisfactory operation.

Instructions in accordance with the recommendations of clause 22 of BS 5839 : Part 6 have been supplied to:

……

Signed .....……

Date .....…….

For and on behalf of

……

SECTION 17

7 RECORD DOCUMENTS

7.1 PROVISION OF RECORD DOCUMENTS

These Works shall include, as a pre-requisite to Practical Completion of the Works, comprehensive Record Documents finalised in detail and subject to the approval of the Contract Administrator. Great importance will be placed upon the quality, accuracy and completeness of the Record Documents and upon their being made available promptly.

The Contractor shall demonstrate from time to time as required by the Contract Administrator throughout the execution of the Works, that adequate and accurate Records are being kept, such as will ensure the ultimate completeness and accuracy of the Record Documents, and that the Record Documents are themselves being progressively compiled as the Work on site proceeds.

7.2 SCOPE OF RECORD DOCUMENTS

Record documents shall comprise, all as described in this Specification, with the following:-

(i) Record Drawings;

(ii) Operating and Maintenance Instructions.

All Record Documents shall be provided in triplicate and in electronic format.

Drawings shall also be presented in electronic format on a CD-R disk using the latest AutoCAD format. Drawing files shall be clearly labelled and shall be complete with all necessary associated files (e.g. X-refs, Blocks, etc.).

The Record Documents shall:-

i) Record clearly the arrangements of the various Sections of the Works as actually installed, and identify and locate all component parts thereof;

ii) Make it possible, by the use of Block Schematic Diagrams, to comprehend the extent and purpose of the Works and the Method of Operation itself.

iii) Set out clearly the extent to which maintenance and Servicing is required and how, in detail, it should be executed.

iv) Provide sufficient and readily accessible information properly to facilitate the ordering spares and replacements.

v) A list of the Record Drawings.

7.3 RECORD DRAWINGS

The Record Drawings shall be correlated so that the scale, terminology, and the numerical and/or other references used are consistent with that used for the Tender Drawings, which shall show the following as installed:-

i) The location, including level if buried, of Public Service connections provided within these Works, whether carried out by the Sub-Contractor or by the appropriate Authority.

ii) Mains Distribution Diagram including the position, number of ways, rating type and phase of all items of main and sub-main switch and distribution gear and the type, number and size of cores of all main and sub-main cables.

iii) Final-Circuit Schedule showing duty of each way in all Distribution Boards.

iv) Plans showing the location of all lighting points, including emergency lighting, power outlets, ancillary outlets, with main trunking or cable runs defined.

v) Circuit Diagrams for the Security Systems including Intruder Alarms, Controlled Access and CCTV.

vi) Circuit Diagrams and Schematics of the Structured Wiring Installations and Voice/Data Installations.

vii) Circuit Diagrams and Schematics of the Audio/Visual Wiring Installations.

viii) Circuit Diagrams of the Fire Alarm System and all communication, call or other Alarm or Indicator Systems.

ix) Circuits Diagrams of any Control System installed as part of these Works.

x) Detailed general physical arrangement of:

(a) Main and Sub-Main Switchboards
(b) Ducts
(c) Switchrooms
(d) Other Sections of the Works where, in the opinion of the Contract Administrator, the smaller scale drawings cannot provide an accurate record.

7.4 OPERATING AND MAINTENANCE INSTRUCTIONS

Operating and maintenance instructions shall comprise the following (all contained in volumes strongly bound in flexible covers and suitable for heavy usage over a long period) written to be read in conjunction with the Record Drawings:

i) A general description of the scope, purpose and manner of working of each system and the apparatus forming part of the Works.

ii) A detailed description of the scope, purpose and manner of working of each system of automatic controls.

iii) Data on general design parameters and associated normal operating temperatures, pressures etc., based on the commissioning tests.

iv) Clear and comprehensive instructions for the starting up, running and shut down of each system or apparatus.

v) Clear and comprehensive instructions for dealing with emergency conditions for each system or apparatus.

vi) Instructions in respect of any precautionary measure from time to time necessary (e.g. against corrosion or freezing).

vii) Instructions in respect of the care of apparatus normally subject to seasonal disuse.

viii) Instructions as to the nature, extent and frequency of servicing necessary, properly to maintain the Works in good condition, and also as to the material

to be used for the purpose. This information shall be supported by maintenance instructions provided by the suppliers of particular component apparatus.

ix) A schedule of Names, Addresses and Telephone Numbers of all Contracting Firms and Manufacturing Firms responsible for the installations or Supply of Equipment Items comprising the Works, also a List of Manufacturers and Catalogue/Reference Numbers of all Luminaires.

x) List of recommended spares.

xi) Manufacturers' literature.

xii) An electronic version of the Operating & Maintenance Manual shall also be provided in PDF format.

Copies of manufacturer's data shall be supplied with regard to the nature, type and method of operation of individual maintenance instructions. Such data, in the form of individual booklets and the like, shall be indexed and cross-referenced to the operating and maintenance instructions and presented suitably protected in stout binders with D shaped rings.

Draft copies of all record drawings and instruction manuals shall be made available in advance of the completion date in order that the Contract Administrator has the opportunity to comment, and the corrections/amendments recorded, thereby allowing sufficient time for the approved documents to be available.

7.5 HEALTH & SAFETY FILE

In accordance with CDM Regulations, the Contractor shall include a Health & Safety File within the Record Documents.

The file shall set out any operational hazards inherent in the systems installed and how they should be dealt with and any special precautions required during maintenance set out.

7.6 BUILDING LOG BOOK

The Contractor shall supply to the Contract Administrator as a pre-requisite to Practical Completion of the Works, comprehensive building log books finalised in detail and subject to the approval of the Contract Administrator.

The Contractor is advised that great importance will be placed upon the quality, accuracy and completeness of the record documents and upon their being made available promptly.

The Contractor shall demonstrate from time to time, as required by the Contract Administrator throughout the execution of the Works, that adequate and accurate records are being kept such as will ensure the ultimate completeness and accuracy of the record documents and that the record documents are themselves being progressively compiled as the Work on site proceeds.

The building log book shall give details of the installed mechanical services plant and control, their method of operation and maintenance, and other details that collectively enable energy consumption to be monitored and controlled.

The information shall be provided in summary form, suitable for day-to-day use. This summary shall draw on, or, refer to the information within the Record Documents and Health and Safety File.

The building log book shall comprise all as described in the specification with the following:-

i) a description of the whole building, its intended use, design philosophy and intended purpose of the individual building services systems.

ii) a schedule of the floor areas of each of the building zones categories by environmental servicing, i.e. comfort cooling, heating etc.

iii) the location of all relevant plant and equipment, including simplified schematic diagrams.

iv) the installed capacities (input power and output rating) of all services plant.

v) simple descriptions of the operation and control strategies of the energy consuming services in the building.

vi) a copy of the report confirming that the building services equipment has been satisfactorily commissioned in accordance with the Specification.

vii) operating and maintenance instructions that shall include provisions enabling the specified performance to be sustained during occupation.

viii) a schedule of the building's energy supply meters and sub-meters, indicated for each meter, the fuel type, its location, identification, description and instructions on their use. The instruction shall indicate how the energy performance of the building can be calculated from the individual metered energy readings to facilitate comparison with published benchmarks.

The building log book shall be contained in one volume strongly bound in flexible cover and suitable for heavy usage over a long period of time.

The Contractor shall use the CIBSE "Building Log Book" template for this project.

SUMMARY OF TENDER

All items to be priced, no item shall be priced as 'included'.

1.	General Conditions and Preliminaries	£
	ELECTRICAL ENGINEERING SERVICES	
2.	Supply and Installation of New Distribution Equipment, Final Circuit Distribution Boards.	£
3.	Supply and Installation of New Lighting Circuits.	£
4.	Supply and Installation of Luminaires.	£
5.	Supply and Installation of External Luminaires.	£
6.	Supply and Installation of New Small Power.	£
7.	Supply and Installation of Power Supplies to MechanicalBuilding Services.	£
8.	Supply and Installation of Underfloor Warming.	£
9.	Supply and Installation of Towel Rails.	
10.	Supply, Installation of New Fire Alarm System.	£
11.	Supply and installation of Security Systems	£
12.	Supply and installation of cabling to the Audio Visual Systems.	£
13.	Supply and Installation of Transient Over-Voltage to MCCB Panel.	£
14.	Provision of Earthing and Bonding.	£
15.	Any items not listed by the foregoing	
	……	
	……	
	……	£

16.	Provisional Sums	
17.	Provision of As Fitted Drawings and O&M Manual.	£
18.	Testing and Commissioning of all Systems.	£
19.	Training of Client's Staff in the Operation of all Systems	£
	Total	£

Amount in words ……..

……..

Contractor ……..

Address ……..

……..

Signed for and
on behalf of ……..

Date ……..

APPENDIX A

SCHEDULE OF ELECTRICAL WIRING ACCESSORIES

ALL FINISHES TO BE CONFIRMED BY INTERIOR DESIGNER BEFORE PURCHASE

Schedule of Electrical Wiring Accessories							
Floor	**Location**	**Lighting Switch/ Dimmer Switch**	**13A Socket Outlet**	**5A Socket Outlet**	**TV Outlet & A/V Outlets**	**Structured Wiring Outlet**	**Fused Spur Units, Fire Sounders & Panic Buttons**
Basement	Plantroom Areas	3	3	3	3	3	3
	All other areas	1	1	1	1	1	1
Lower Ground	All areas	1	1	1	1	1	1
Ground	All areas	1	1	1	1	1	1
First, Second, Third and Fourth	All areas	1	1	1	1	1	1
NOTE: ALL FINISHES MUST BE CONFIRMED WITH THE INTERIOR DESIGNER BEFORE PURCHASE							

1 Polished Stainless Steel – Forbes & Lomax
2 Paintable Finish - Wandsworth
3 Metalclad – MK Electric Ltd