

ELECTRICAL ENGINEERING SPECIFICATION

SECTION 4

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ELECTRICAL ENGINEERING SPECIFICATION

01. INTRODUCTION

This specification describes the Client's particular technical requirement pertaining to the electrical services installation.

This specification, schedules and drawings shall be read as one, together with all related architectural specification/drawings; structural engineering specification/drawings; mechanical services specification/ drawings as applicable.

Should any clauses, words, expressions or definition used in this specification conflict with the Contract Conditions and Particulars, then the Contract Conditions and Particulars shall take precedence.

The Electrical Contractor shall be an approved contractor with the National Inspection Council for Electrical Installation Contracting (NICEIC) or Electrical Contractors' Association (ECA).

Where the contract includes the installation of key operated equipment and special fittings the Electrical Contractor shall supply 1 No. duplicate set of keys and/or special tools to the Client and receive an official receipt.

The Electrical Contractor shall maintain and conform to the building's existing security arrangements. The Electrical Contractor shall put in place throughout the contract adequate protective measures to prevent unauthorised entry into the building and to protect property and individuals from damage, theft or assault.

01.1 Definitions

The definitions detailed in Part 2 of BS 7671 shall also apply and be read in conjunction with this specification.

Where in this specification the singular word and/or number are denoted, it shall be deemed to include the plural and vice versa.

The words and expressions used throughout this specification shall have the following meaning:

The Client shall mean: The individual or organisation for whom the works are to be carried out.

The Quantity Surveyor shall mean: The Company responsible for financial matters acting for the Client.

The Architect shall mean: The company responsible for the general and detail design of the building and where appropriate act as lead consultant for the project.

The Structural Engineer shall mean: The Company responsible for the design of the above and below ground main structural/drainage services.

The Electrical Consultant shall mean: The Company responsible for the design of the Electrical Engineering Services and/or the overall responsibility for checking compliance of the installation with the relevant criteria and standards.

The CDM Principle Designer shall mean: The Company responsible for provision of a Pre-tender Health and Safety Plan and for the compiling of the Health and Safety file together with health and safety matters.

The Main Contractor shall mean: The Company carrying out the main building works and by whom the Electrical Contractor may be directly employed, for the purpose of the Contract.

The Electrical Contractor shall mean: The Company tendering for /carrying out the electrical installation works, including their appointed Specialist Installer.

The Mechanical Contractor shall mean: The Company tendering for /carrying out the mechanical/public health installation works.

Materials/Plant/Equipment shall mean: Equipment; Plant; Machinery; Tools; Apparatus; Fixtures; Fittings; Supports; Bracketry; Cables; Containment, together with incidental sundry components and expendables etc., necessary for the complete and safe execution of the works, either existing or brought on to the site by or on behalf of the Electrical Contractor.

Dwelling, Building or Working area shall mean: The site as a whole and all structures within the boundary of the site, which shall include all the areas detailed in Section 2 – The Project and as shown on the drawings.

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01.2 Discrepancies

Should an item be detailed in this specification, but not on the schedules/drawings (or vice versa) then the cost shall be deemed to have been included within the tendered price. If the Electrical Contractor considers that any discrepancies, omissions, variations or ambiguities exist between the drawings, specification and/or any other contract documents, then they must bring this to the attention of the Electrical Consultant and clarification sought, during the tender period and before submitting a tender. Any correspondence or documents from the Electrical Consultant to the Electrical Contractor dated before the submission of the Tender and relating to any such discrepancies, omissions, variations or ambiguities shall form part of the Contract documents.

01.3 Manufacturer's Instructions

All Materials/Plant/Equipment shall be located and installed in accordance with the manufacturer's instructions. The manufacturer's instructions shall take precedence over the installation methods detailed in this specification or shown on the drawings.

01.4 Manufacturer's Catalogue List Numbers

References made to manufacturer's catalogue list numbers are to include for all required and necessary component parts. While every effort has been made to ensure that the manufacturers list numbers quoted are correct, it shall be the Electrical Contractor's responsibility to check that the catalogue list numbers quoted fully correspond with the accompanying description and the details given in the relevant Section/Clause of this specification and/or shown on the drawings, before placing any order.

If the Electrical Contractor considers that any discrepancies exist between the catalogue list number and the equipment description, then they must bring this to the attention of the Electrical Consultant and clarification sought, before submitting their tender.

01.5 Alternatives

Unless detailed otherwise, the Materials/Plant/Equipment, preferred manufacturers, brand names etc. detailed in this specification shall be 'acceptable and equivalent to' and are provided as a benchmark in respect of safety, reliability and performance etc., giving the Electrical Contractor the discretion to select alternative equivalent products/solutions.

Should the Electrical Contractor wish to offer an alternative product or manufacturer to that specified then they shall submit to the Electrical Consultant a 'Schedule of alternatives' at the time of their tender submission for consideration.

The 'Schedule of alternatives' shall contain documentary evidence that the proposed alternative product is equivalent to that specified and shall contain the following additional information:

The reasons for the proposed substitution.

Details of the increase/decrease cost to the Electrical Contractor's tendered sum.

Manufacturer and product reference.

Compliance with relevant standards.

Copies of any warranty/ guarantee.

Provision or drawings, circuit diagrams etc. as applicable.

Should the Electrical Contractor wish to offer an alternative luminaire(s) then the Electrical Contractor shall provide the following additional information:

Photograph of the proposed luminaire.

Manufacturer's data sheet for the proposed luminaire detailing photometric and other relevant data such as dimensions, construction details, colour/finish, diffuser type, control gear type, IP rating, lamp type and rating etc. as applicable.

Full lighting calculations to confirm that the design criteria have been met.

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The Electrical Consultant has the right to accept or reject any product, which in their opinion are deemed to be unsatisfactory or not fit for purpose. The decision of the Electrical Consultant in this matter shall be final. Should the Electrical Consultant reject the alternative offered by the Electrical Contractor, then the specified product shall be provided and since these were deemed to have been included in the tender in the first instance, no price adjustment shall be permitted. **NOTE:** Where the use of an alternative product results in amendment to the Electrical Consultant's drawings, then all such amendments shall be carried out by the Electrical Contractor as part of their working drawings.

02. THE PROJECT

The site is presently an open field with free access at all times.

The newly formed properties will be Electrically heated (air source) with gas supplies for cooking

The project consists of the construction of 6 No. new 2 bedroom semi-detached bungalows and 1 no new 3 bed roomed detached bungalow earmarked for social housing all with pitched roof, off road parking space to the rear with enclosed gardens. The Electrical Contractor shall supply and install new electrical services throughout each dwelling, which shall also include an air source heat pump, and an electric vehicle charging point.

The Electrical Contractor shall refer to the Architect's drawings and associated documentation for construction information, including details of ceiling types and void depths etc.

NOTE: All references to the 'Dwelling', or 'Building' or 'working area' used throughout this specification shall mean all the areas detailed above/or as shown on the drawings.

02.1 Site Address

Laithes Lane
Athersley South
Barnsley
South Yorkshire

02.2 Visiting Site

The Electrical Contractor shall visit the site if required before completing their tenders and shall be deemed to have satisfied themselves on the full nature of local conditions as regard accessibility, transport and storage of Materials/Plant/Equipment, the supply of and conditions affecting labour and to have obtained all necessary information on all matters affecting the execution of the works. Claims on the basis of want of knowledge in respect of site condition shall not be accepted.

02.3 Site Occupation

Refer to the main contractor's programme of works for the new build programme

03. SCOPE OF WORKS

The Electrical Contractor shall be responsible for carrying out all the works, as detailed in the Specification, schedules/drawings. These works shall comprise of , the procurement and supply of Materials/Plant/Equipment etc., together with all required expendables and incidental sundry components; delivery to site; unloading; storing and protection of Materials/Plant/Equipment etc., in a manner to avoid damage and/or deterioration and/or theft; transporting about the works; fixing in position; erecting; installing; connecting, testing, commissioning and leaving in a fully functional and working order ready for handing over to the Client.

The Electrical Contractor shall be responsible for providing all labour of every kind, whether skilled or unskilled, as required in the provision and fixing of the work and for co-ordinating their works with other trades on site.

It will be the Electrical Contractor's responsibility to liaise with the Main Contractor regarding detailed programming at the time of appointment.

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The Electrical Contractor shall locate and arrange the various Materials/Plant/Equipment that form part of the works so they can, where necessary, be easily reached and/or operated and provide good access for future maintenance, repair, dismantling and replacement.

The electrical services part of the project shall include, although not necessarily be limited to the provision of the following:

Utilities - Main incoming Electrical and Telephone supply installations.

Meter box - External.

Air Source Heat pump installation.

P.V installation

Builder's work in connection with electrical services installations.

Enabling works.

Temporary Works.

Accessories, cables and containment etc. for each installation.

Appointment of specialist Installers, as described within this document.

Consumer unit installations.

Lighting – Internal & external.

Small power.

Cooker installation - Electric.

Doorbell installation.

Electric vehicle (EV) charging system.

Fridge/freezer and Washing machine installations.

Mechanical services – Associated electrical works only.

Shower – Electric located in walk-in wet room.

Telephone/data installations.

Digital TV Aerial System – No Satellite dishes to be installed.

Smoke, heat detectors installation – Mains operated stand-alone system.

Labelling and engraving of accessories, equipment etc.

Earthing and bonding as prescribed by BS 7671.

Testing, commissioning and setting to work the whole of each electrical installation. The issuing of the tests and commissioning results, together with the required test and electrical installation certificates in an approved format as prescribed by the appropriate British Standards.

Spares and special tools.

Co-ordination of builders' work and electrical services installations with other services installations, disciplines and trades involved in this project, including the preparation and provision of 'BUILDERS' WORK' and 'COORDINATION' drawings.

Liaison with BMBC Building Control, The Planning Department, the Fire Officer and all other statutory authorities with jurisdiction over the works.

Provision of samples for comment and approval (in principle) by the Client.

Demonstration to the Client, the Client's representatives, the Client's insurers and the Contract Administrator, (as applicable) that the various electrical installations correctly perform their functions.

The preparation and issuing of 'AS BUILT' record drawings and 'OPERATING & MAINTENANCE' MANUALS' including any other relevant record documentation.

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The preparation and issuing to each building a 'TENANTS HANDBOOK', to enable each building occupier to operate the various electrical installations that have been installed in the building.

The preparation and provision of all documentation and information required under the Construction, Design & Management Regulations (CDM) and all information required by the CDM Principle designer.

The provision of a comprehensive maintenance and emergency call out service for the whole of the 12 months Defects Liability Period (which shall start from the certified completion date) to cover all electrical works carried out by the Electrical Contractor as part of this contract, including the repair/replacement of defective items that arise during the defects liability period.

Disposal of all redundant electrical equipment in accordance with The Waste (England and Wales) Regulations and EC Directive on the disposal of Waste Electrical and Electronic Equipment (WEEE).

Provide the Client with a 6-year NICEIC insurance backed warranty (Platinum Promise) to cover all works carried out by them. This warranty shall be appended to the operating and maintenance manuals.

NOTE: The above installations shall be arranged and located so they can, where necessary be easily reached and/or operated and provide good access for future maintenance, repair, dismantling and replacement.

04. REGULATIONS & STANDARDS

The Electrical Contractor shall be responsible for all relevant aspects of the following regulations in so far as they apply to the Materials/Plant/Equipment and working methods used in the works carried out by Electrical Contractor on site.

All electrical equipment, manufacturers and works associated with the electrical installations shall conform to and be executed in strict accordance with the requirements of this specification and all relevant British Standards (BS) European Harmonised Standards (BS EN), Regulations, Codes of Practice, etc. which shall be the latest edition/amendment that is current at the time of tender (unless detailed otherwise in the contract documents) and as further described under the various sections of this specification, with particular reference to the following:

BS 7671. Requirements for Electrical Installation as issued by The Institution of Engineering and Technology (IET) and with any Statutory Regulations and Associated Memoranda as detailed in Appendix 2 of BS 7671.

Building Control Officer; Fire Officer; Local Authority Planning Officer.

Building Regulations Approved Document Part B – Fire Safety (all relevant parts).

Building Regulations Approved Document Part L1A - Conservation of fuel and power in new dwellings.

Building Regulations Approved Document Part L1B - Conservation of fuel and power in existing dwellings.

Building Regulations Approved Document Part M - Access for Disabled People.

CIBSE - Chartered Institution of Building Services Engineers publications.

Construction (Design and Management) Regulations (CDM).

Control of Substances Hazardous to Health Regulations (COSHH).

Electricity at Work Regulations.

Electricity Safety, Quality and Continuity Regulations (ESQCR).

Electricity Supply Regulations.

Equality Act (formerly the Disability Discrimination Act - DDA).

Fire Precautions Act. Applicable to dwellings if located above a commercial premise such as a shop etc.

Health and Safety at Work Act and relevant HSE documents.

Manufactures' guides, instructions and commissioning procedures.

Regulatory Reform Fire Safety Order (RRO).

Secure by Design

SLL Code for Interior Lighting.

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The Control of Asbestos at Work Regulations.

The Domestic Building Services Compliance Guide.

The Waste (England and Wales) Regulations and EC Directive on the disposal of Waste Electrical and Electronic Equipment (WEEE).

Workplace (Health Safety and Welfare) Regulations.

05. CDM REGULATIONS

This project is notifiable under Construction (Design and Management) Regulations (CDM).

06. ASBESTOS

Not applicable as part of this project.

07. DRAWINGS

The specification shall be read in conjunction with the Schedule of Drawings showing the engineering installation.

Notwithstanding the provision of these drawings, the Electrical Contractor will be held responsible for the works embodied therein and shall take their own particulars and provide at their own expense working detailed drawings.

Prior to the preparation of the co-ordinated working drawings, the Electrical Contractor shall liaise with the other trades to ensure that due consideration of other services is taken into account.

The drawings listed below show the approximate location of electrical services and equipment and do not purport to be builder's work, co-ordinated, Working/Shop/Fabrication drawings, fabrication details or wiring diagrams for the project.

Drawing No	Drawing Title	Rev
103684-DR-E-001	2 BEDROOM BUNGALOW ELECTRICAL SERVICES LAYOUT	P2
103864-DR-E-002	3 BEDROOM BUNGALOW ELECTRICAL SERVICES LAYOUT	P2

The above drawings are not necessarily to scale in all respects and as such should be regarded as diagrammatic. The Electrical Contractor shall be responsible for interpreting these drawings, making due allowance for offsets to avoid the building structure or other services, whether indicated or not. Where the positions of Materials/Plant/Equipment are indicated on the drawings and where setting out dimensions are not given, these shall be taken as approximate only and are intended to indicate generally the arrangement of the works under this contract. The Electrical Contractor shall be responsible for the setting out of the whole works in relation to the works of other trades.

07.1 Working Drawings

The Electrical Contractor shall be responsible for the preparation and provision of 'Working drawings' for each electrical installation carried out by them or their appointed specialist Installer, as applicable. Working drawings shall include all circuit references, switch lines and details of mounting heights etc. The Electrical Contractor shall submit to the Electrical Consultant their Working drawing for comment before the start of any work.

07.2 Builders' Work Drawings

The Electrical Contractor shall be responsible for the preparation and provision of 'Builders' Work' drawings for each electrical installation carried out by them or their appointed specialist Installer, as applicable. Builders' work drawings shall detail the fully dimensioned position and size of all holes, chases, etc. required for the installation of the electrical services. Each drawing shall be marked with the words 'BUILDERS' WORK DRAWING' in close proximity to the

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title block. The Electrical Contractor shall submit to the Electrical Consultant their Builders' work drawings for comment before the start of any work.

07.3 Co-ordination of services

The Electrical Contractor shall be responsible for fully co-ordinate their works with respect to building constraints, setting out of builder's work and other service installations, installed by other disciplines and/or trades.

The Electrical Contractor shall carry out their works in such a manner that they do not obstruct or hinder the operation of any other trade or the operation of equipment on site. Prior to the start of any work the Electrical Contractor shall fully liaise with each discipline and/or trade so that their own works are correctly sequenced and accommodated (especially in voids, ducts and cavities). The Electrical Contractor shall fully check the details of the structure and other services before preparing their WORKING DRAWING. Abortive works resulting from the Electrical Contractor failing to co-ordinate their works shall be at their own cost.

08. MAIN CONTRACT CONDITIONS AND FORM OF CONTRACT

It is the responsibility of the Electrical Contractor to obtain details of the main contract preliminaries and general conditions at the time of tendering from the Main Contractor and/or the Electrical Consultant/Architect.

No additions to the tender sum will be considered for lack of knowledge or inclusion of items necessary by the Electrical Contractor for items required by the main contract preliminaries and general conditions.

09. QUALITY OF WORKMANSHIP/MATERIALS/PLANT/EQUIPMENT

All work shall be performed by skilled workmen under the supervision of the on-site supervisor during the execution of the contract. Work shall be carried out in the best workmanlike manner and in accordance with the current rules and regulations of the Professional Engineering Institute as appropriate, the Fire Officer, the requirements of the Supply Authority and to the satisfaction of the Client and Electrical Consultant.

The Client or there representative shall have the right to ask the Electrical Contractor to remove from site any person who in their opinion has misconduct themselves or are deemed to be incompetent or negligent in the performance of their duties. All such persons shall not be re-employed again in any portion of the works.

The whole of the Materials/Plant/Equipment used in the installation, are to be new and the best of their respective kind, suitable for their intended use and shall comply with relevant British Standard.

Unless detailed otherwise, the preferred Materials/Plant/Equipment, manufacturers and brand names etc., named in this specification shall be 'acceptable and equivalent to' and are provided as a benchmark in respect of safety, reliability and performance etc. giving the Electrical Contractor the discretion to select alternative equivalent products/solutions.

NOTE: The preferred manufacturers listed in this document may not have been contacted regarding the project. It shall be the Electrical Contractor's responsibility to forward all relevant information to the preferred manufacturer to enable them to prepare a quotation.

10. DAMAGE TO WORKS AND/OR BUILDINGS

The Electrical Contractor shall be held entirely responsible for all damage done to the Works or the fabric of the building as a result of their installation or actions, whether such damage be wilful or due to carelessness.

The Electrical Contractor shall make good at their own expense any damage which they have caused

10.1 Cleaning the Working Area

The Electrical Contractor shall maintain the working area and all main and emergency access routes and corridors in a safe, clear and tidy condition (free of all waste and obstructions) at all times throughout and on completion of the works. At no time shall waste be allowed to accumulate on site. All such rubbish shall be set aside in a designated 'safe'

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area so as not to cause a hazard to any persons or the environment. Good housekeeping standards shall be strictly enforced.

The Electrical Contractor shall be responsible for providing all cleaning materials and tools (including vacuum cleaner) which they shall use at the end of each day to clean their working area.

11. ACCESS FOR MATERIALS/PLANT/EQUIPMENT

Before any work is put in hand on any equipment, the Electrical Contractor shall check on site the dimensions of all doorways, access doors etc., so that Materials/Plant/Equipment can be admitted to its allotted position.

12. SCAFFOLD AND ACCESS EQUIPMENT

The Electrical Contractor shall provide all access equipment including scaffolding, planking, ladders etc., necessary for the full and proper completion of the work.

The use of Main Contractor's access equipment can be negotiated providing competence can be proved via valid Prefabricated Access Suppliers' and Manufacturers' Association (PASMA) and International Powered Access Federation (IPAF) cards, as applicable.

13. SITE REPRESENTATIVE

The Electrical Contractor shall keep a competent site representative in charge of the work, who shall be in constant attendance during progress of the works undertaken by them.

14. SITE MEETINGS

The Electrical Contractor shall attend site meetings as required by the Consultant and Main Contractor and due allowance should be made in the tender for attendance at such meetings.

15. VARIATIONS

Variations such as alterations, additions or omissions shall be agreed with the QS and determined by one of the following methods: Measurement or Quotation or Day Work.

16. SCHEDULE OF RATES

If requested, the Electrical Contractor shall prepare a detailed Contract Sum Analysis (CSA) highlighting the breakdown of the total tender price. The CSA shall be broken down so as to provide a pricing schedule of quantities and unit rate for each 'package' item.

17. SPECIALIST INSTALLER

The specialist Installers named in this specification may not have been contacted regarding the project. It shall be the Electrical Contractor's responsibility to forward all relevant information to the specialist Installer to enable them to prepare a quotation.

The Electrical Contractor shall include in their tender submission for employing specialist Installers, as described within this specification, who shall develop the design, supply, install, test, commission and set to work each new installations and carry out all required modifications, extensions and enhancements to each existing installation on behalf of the Electrical Contractor. Each specialist Installer shall, where applicable, provide the Electrical Consultant with signed commissioning and installation certificates upon completion of the works.

The Electrical Contractor shall allow in their tender for paying all bills associated with the appointment of the specialist Installer and for making all enquiries, placing all orders, overseeing, checking, supervising and programming their works. The Electrical Contractor shall also give the specialist Installer full details of the works they are to carry out,

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during the tender period. The Electrical Contractor shall also be fully responsible for the quality of the design and standard of workmanship carried out by the specialist Installer.

18. CABLES & CONTAINMENT

The Electrical Contractor shall supply and install all power, telephone, data and control cabling and associated containment to each of the various installations, as described in this specification, indicated on the drawings or deemed necessary to render the installation as a whole safe, fully functioning and in a working order.

Cabling and containment shall be hidden from view, being either concealed in dwelling fabric, or run above ceilings or below floors etc. All cabling and containment shall be fixed and supported by fire-resistant, non-combustible metallic cable clips, saddles, steel cable banding, ties, cleats etc. which cannot prematurely collapse under conditions of extreme heat or affected by fire. This applies throughout the installation and not just in escape routes. All cable clips, saddles, ties cleats etc. shall be the same colour as the cable or containment they are fixing and shall be acceptable and equivalent to those manufactured by Partex Marking Systems UK Ltd or D-Line Ltd etc.

In general cabling and containment shall conform to the following:

Service	Cable	Installation type
Internal lighting and Small power	(Cu) Multi-core XLPE/LSZH non-armoured flat (Twin & Earth) thermosetting cable, with integral CPC and 'WHITE' sheath	Clipped direct in ceiling voids. However, where these cables drop down from ceiling level or rise up from floor level to accessory positions then the cables shall be protected by robust, heavy gauge galvanised steel channel.
External lighting and Small power	As lighting and small power above	Where conduit is run on the external face of the dwelling the conduit shall be surface mounted earthed galvanised metallic conduit (20mm dia. min size).
Telephone	CW1308, Round 2 Pair, 4 Core telephone cable with 'WHITE' sheath	Run in earthed (20mm dia. min size) HGSW metallic conduit concealed in the dwelling fabric.
Data Cables	4 Pair Cat 6E UTP with LSZH Sheath	Run in earthed (20mm dia. min size) HGSW metallic conduit concealed in the dwelling fabric.
Smoke/Heat detectors	(Cu) Multi-core LSZH non-armoured 'FLEXISHIELD' cable, with integral CPC, bonded aluminium tube screen and 'WHITE' sheath	Clipped direct in ceiling voids. However, where these cables drop down from ceiling level or rise up from floor level to accessory positions then the cables shall be protected by robust, heavy gauge galvanised steel channel.
Final connection wiring to pendant luminaires or to fixed items of equipment, such as fans etc.	(Cu) Multi-core LSOH 90 °C thermoplastic heat resistant flexible cable, with integral CPC and 'WHITE' sheath	

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18.1 Cable

Unless detailed otherwise, the wiring installations shall also conform to the following:

All cabling shall have copper conductors and be approved by the British Approvals Services for Cabling (BASEC).

All indoor cabling installations shall be carried out using low smoke, zero halogen (LSZH) cable.

Voltage drop between the origin of the installation and any load point should not exceed that given in BS7671.

Cables shall be routed to follow the natural contours of the dwelling, either parallel along joists or at right angles, to joists and vertically fixed when routed down walls. Diagonal routes shall not be accepted. Where cables are routed within new partition walls and pass through horizontal wood or metal beams/sections they shall be protected at each side by the use of metal round box lids or other suitable metal protection to avoid nails penetrating the cables when boards are fixed.

Where cables are concealed in the dwelling fabric they shall be run in in earthed metallic conduit. The chasing shall be of sufficient depth to permit a minimum covering of 4 mm of plaster.

Where cables are run in roof voids, they shall be run around the edges of the roof space and shall be fixed/clipped at the side of the wood joists.

Where cables are run under floors, the joists shall be drilled so that the cables are at least 50 mm below the top of the joist, otherwise the cables shall be enclosed in metallic conduit, particularly when laid in existing slots,

Final connection to luminaires mounted in or suspended from a false ceiling shall be wire using a multi-pin plug and socket assembly (acceptable and equivalent to MK Electric 'LINK' range).

Final connection wiring to pendant luminaires or to fixed items of equipment, such as panel heaters etc. shall be (Cu) multi-core LSZH 90° C thermoplastic heat resistant flexible cable.

No cable shall be routed through a switch or socket outlet box.

Routing cables within boxed in pipework routes shall not be permitted.

Cables and containment shall be kept away from any heating/ hot water pipes or heat source by a distance of at least 500mm. Where practically possible cables and containment shall be located below heating/ hot water pipes or heat source. However, where this cannot be avoided, then the Electrical Contractor shall supply and install suitable thermal shielding (such as Armstrong Armaflex Thermal Installation, which shall be permanently secured with Nil-flam adhesive) for a distance of 300 mm beyond either side of the position where cables and the pipes are unavoidably routed together, to try and protect the cables and containment from the detrimental effects of overheating.

18.2 Minimum Conductor Size

The minimum circuit protective conductor (CPC) size shall be 1.0 mm². The minimum phase/ neutral conductor size shall comply with the following:

Sub-main cables - 4.0 mm².

Lighting circuits - 1.5 mm².

Socket outlet ring circuits - 2.5 mm².

Socket outlet radial circuits (Protected by 20A Overcurrent device) - 2.5 mm².

Socket outlet radial circuits (Protected by 32A Overcurrent device) - 4.0 mm².

Controls wiring - 1.5 mm².

18.3 Containment

The Electrical Contractor shall be responsible for designing and developing the containment strategy throughout each dwelling and for co-ordinating this strategy with other services and the physical structure of the dwelling. The Electrical Contractor's containment strategy shall be detailed on the Electrical Contractor's Working drawings.

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All containment shall be complete with all required lids; covers; boxes; bends; couplers; saddles; adapters; elbows; cross-over units; tees and end caps; brackets; drop-rods; supports and fixings etc. NOTE: Only purpose made containment accessories as produced by the containment manufacturer shall be used. Site fabricated mitred bends; butt and tee joints shall not be permitted.

All containment and accessories shall be truly aligned with each other and the dwelling, plumb or level.

Cable trunking and conduit systems shall provide the IP degree of protection relevant to the particular location where they are installed.

Cable trunking shall provide IPXXD or IP4X degree of protection when used with single insulated (non-sheathed) cabling.

All containment shall be sized to accommodate a maximum fill capacity of 45%; this shall incorporate a minimum of 25% spare capacity for possible future expansion.

Thermoplastic conduit shall be high impact type. Where installed on the external face of the dwelling it shall be colour 'BLACK'; in all other locations it shall be colour 'WHITE'.

All conduit connections to wire basket shall be made using purpose made conduit gland bracket and bushes.

Metallic channel cable support systems, such as 'Unistrut' shall conform to BS 6946.

18.4 Circuit Segregation & Electromagnetic Screening

The Electrical Contractor shall install all cabling, containment and electrical equipment associated with Band I, Band II and the fire alarm system so that they are correctly segregated from each other and that no electro-magnetic interference occurs between them, in accordance with BS 7671.

Cables and containment shall be kept a minimum of 100 mm away from non-electrical services.

19. UTILITIES - ELECTRICITY

Each dwelling's new power supply shall be fed from the local Distribution Network Operator (DNO) street infrastructure. The DNO shall provide each dwelling with a 230 volt single phase and neutral, 50Hz, AC supply, with a TN-C-S earthing arrangement, terminating and connected to the incoming terminals on their cut-out/service head, located in an external meter box. The electrical cable shall be brought to the dwelling using an underground duct.

NPS have made a formal application on behalf of the Client to the Distribution Network Operator (DNO) - Northern PowerGrid, to arrange the installation of each dwelling's main electrical supply. See Enquiry number: ENQ5461873 QUO5438236. Dated: 11TH November 2020. This will be subject to a formal quote update

The Electrical Contractor shall:

Make a formal application on behalf of the Client to the Electrical supplier (meter provider) – nPower, to arrange the installation of SMART tariff metering equipment to each dwelling.

Provide all required payments, negotiations, meetings, labour, attendance, associated documentation and/or test certification as required by the DNO and the Electrical supplier (meter provider).

Notify the DNO and the Electrical Supplier (meter provider) of the time when the installations shall be ready for connection to the supply.

Prior to practical completion, arrange for both the Distribution Network Operator and the Electricity Supplier (meter provider) to attend site to provide security seals on all their equipment.

Transfer names on agreements to that of the Client when practical completion is reached.

19.1 Meter Tails

The Electrical Contractor shall supply and install 25mm² (Cu) single-core, double-insulated, non-armoured PVC/PVC meter tails, in accordance with BS6004 between the meter and the Consumer unit. The Electrical Contractor shall terminate these tails into each Consumer unit and leave sufficient spare length of cable, ready for future connection into

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the tariff meter by the meter provider. **NOTE:** The Electrical Contractor shall not use armoured cables as meter tails as the DNO/Meter provider will refuse to install SWA cables into any metering equipment.

19.2 Meter Box

The Electrical Contractor shall supply and install a glass reinforced plastic (GRP) electric meter box, located on the external face of the dwelling adjacent to the dwelling entrance. Each meter box shall comply with the BS 8567 - Specification for outdoor electricity meter cupboards and Electricity Supply Industry (ESI) Standard 12-3 and shall be acceptable and equivalent to Mitras Ltd, M01023 Domestic electrical meter box range.

Each meter box shall be semi-recessed wall mounted and fitted with a fire retardant backboard and lockable hinged door. Each meter box will have an overall size - 430mm (w) x 600mm (h) x 220mm (d) and requires a brickwork opening - 360mm (w) x 520mm (h) x 150mm (d).

Cable entry shall be brought up from ground level; in the wall cavity using a DNO approved hockey stick duct, which shall be installed by the Electrical Contractor during the dwelling's construction stage.

Provide 2 no. keys for each meter box that has been installed. Keys shall be properly labelled with the dwelling addressed and listed on a permanent record sheet to enable quick identification and given directly to the Contract Administrator. Keys shall not be left in locks on site.

19.3 Failure to Connect Supply

Where the DNO refuses to connect the supply, the Electrical Contractor shall immediately inform the Architect of this situation. The Electrical Contractor shall be responsible for paying any charges required by the DNO for subsequent re-tests, site visits etc.

20. UTILITIES – TELEPHONE

Each dwelling's new telephone/data supply shall be fed from the local British Telecom (BT) street infrastructure, terminating and connected to the incoming terminals on their cut-out/service head, located in the dwelling hall. At this point it is not known if the cable will be via underground duct or overhead

BT Openreach have been contacted and the reference for this project is BQRA22/846298/20/LB

The telephone system shall be capable of enabling internet services to be connected and installed in each house at any time after handover, subject to agreement between a telephone provider and the occupier.

The Electrical Contractor shall:

Make a formal application on behalf of the Client to British Telecom (BT) to arrange the installation of new incoming telephone installations to each dwelling.

Provide all required payments, negotiations, meetings, labour, attendance, associated documentation and/or test certification as required by BT.

Supply and install white CW1308, Round 2 Pair, 4 Core telephone cable (minimum requirement) run in 20mm dia., HGSW metal conduit concealed in the dwelling fabric, installed between the BT NTP and each house nearest secondary telephone socket.

Supply and install white CW1308, Round 2 Pair, 4 Core telephone cable (minimum requirement) run in 20mm dia., HGSW metal conduit concealed in the dwelling fabric, to all secondary telephone socket installed in the houses.

Notify BT of the time when the installations shall be ready for connection to the supply.

Transfer names on agreements to that of the Client when practical completion is reached.

20.1 Provision of Broadband Internet Services

All telecommunications equipment installed shall be capable of receiving ADSL broadband Internet service. An internet service provider (such as BT) shall supply and install a broadband Internet service subject to future agreement with the

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building occupier, The electrical contractor will install all internal data cabling (see separate clause) prior to installation by BT Openreach of broadband equipment.

21. INCOMING DUCT WORK.

The Electrical Contractor shall liaise with the Main Contractor in order to provide a network of suitably sized underground cable ducts and draw pits for use with various electrical services.

The Main Contractor shall:

Provide ground works, excavations, trenching, backfilling and making good.

Electrical Supply - Provide each dwelling with 1 x empty 125mm ID dia. 'BLACK' cable duct (with draw rope). The duct shall run from the site boundary/public footpath, terminating in an external meter box. Cable entry into the dwelling's meter box shall be brought up from ground level; in the wall cavity using a 32mm dia. DNO approved hockey stick duct, which shall be installed by the Main Contractor during the dwelling's construction stage.

Telephone - Provide each dwelling with 1 x 50mm dia. 'GREY' cable duct (with draw rope). The duct shall run from the site boundary/public footpath, terminating adjacent to the external face of the building directly use a pre-formed 90° bend, which shall terminate directly below the proposed BT equipment position. The Duct shall be covered with a Connector bend 4. The Electrical Contractor shall supply and install 1 x 25mm dia. plastic conduit (installed above the building DPC) to interconnect the duct with master NTE5A outlet located in the hall.

Cable TV - is not included within the scope of this contract. However, in order to permit the future installation of cable TV should any tenant decide to subscribe to an alternative cable TV/internet provider, outside of this contract, the Electrical Contractor shall provide each dwelling with 1 x 50mm dia. 'GREEN' cable duct (with draw rope). The duct shall run from the site boundary/public footpath, terminating adjacent to the external face of the building. The Electrical Contractor shall supply and install 1 x 25mm dia. plastic conduit (installed above the building DPC) to interconnect the duct with a surface mounted single gang box, located in the hall.

The Electrical Contractor shall:

Ensure that all ducts are constructed of unplasticised twin-walled polyvinyl chloride HDPE in accordance with the Energy Networks Association (ENA) Technical Specification 12-23. Technical Specification for Plastic Ducts for Buried Electric Cables.

Ensure that all ducts are acceptable and equivalent to Polypipe Civils Ltd, RIGIDUCT range.

Ensure that all ducts for use with British Telecom underground cabling are GREY and are specifically made and approved for use with BT services.

Liaise with Northern PowerGrid (NPG) and British Telecom (BT) to ensure that the ducting installations fully comply with their requirements.

Supply each draw pit with an access cover, conforming to BS EN 124 class/category. The access covers shall be capable of supporting the expected static weight load applicable to where the draw pit is installed.

Supply and install impact resistant warning tile tape 150mm above all ducting.

Seal each end of every duct (after all cabling has been installed) to form a barrier against gas, water, oil, fire and attack by vermin. Seals shall be fire rated where applicable.

Ensure that all ducts are colour coded and installed in accordance with National Joint Utilities Group (NJUG) requirements.

22. CONSUMER UNIT

The Electrical Contractor shall supply and install Type 'A' tested, SP&N, 'WHITE' metal case MCB consumer unit with an integral 100A (minimum rating) D.P. main switch-disconnector and populated with combined 30mA, Residual Current Operated Circuit Breakers (RCBO's) to protect each outgoing way. Fit blank plates to all spare ways.

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The preferred manufacturer is Wylex, NM all metal range, although the Electrical Contractor may select consumer unit from one of the following alternative manufacturers: Eaton MEM, Hager, MK Electric or Schneider Electric.

22.1 System Description

The installation shall meet the requirements of this specification, the applicable documents detailed in Section 04 – Regulations & Standards and all other applicable regulations and standards, with particular reference to BS EN 61439: Part 3 – Low-voltage switchgear and control gear assemblies. Particular requirements for low-voltage switchgear and assemblies intended to be installed in places where unskilled persons have access to their use.

The consumer unit shall be surface wall mounted and located as shown on the drawings, at a height detailed in Appendix B – Mounting heights.

The Consumer unit shall be installed on a non-combustible surface, or a fire rated material. Where necessary supply and install 25mm (minimum thickness) wall mounted, fire retardant processed plywood board(s) conforming to BS 476 - Class 0 and EN 13501-1 Euroclass B, onto which the consumer unit can mounted.

The Electrical Contractor shall seal and fire-stop all holes in the consumer unit casing. There shall also be no gaps between the consumer unit casing and the back surface or behind the consumer unit where a smoke or potential fire risk could ensue.

All outgoing cable ways from the consumer unit, up to first floor level shall be run in a 100 x 50mm single compartment, white plastic trunking.

22.2 Circuit Chart

The Contractor shall supply and install a laminated, typewritten circuit chart, which clearly shows what each way/breaker serves. The chart shall be stuck to the inside of the board's door using 'WHITE' very high bond double-sided acrylic foam tape.

Each Consumer unit shall contain the following outgoing ways:

Way	Circuit Type/ Description	Cable	Rating (A)	RCBO
1	Fixed Equip Radial – Air Source Heat Pump	1 x 2c, 10mm ² XLPE/LSZH (T&E)	B25	30mA
2	Fixed Equip Radial - Cooker	1 x 2c, 10mm ² XLPE/LSZH (T&E)	B32	30mA
3	E.V Charger Socket	1 x 2c, 10mm ² XLPE/LSZH (T&E)	B40	30mA
4	Fixed Equip Radial – Air Source Control Board	1 x 2c, 4.0mm ² XLPE/LSZH (T&E)	B16	30mA
5	13A Sockets Ring -	1 x 2c, 2.5mm ² XLPE/LSZH (T&E)	B32	30mA
6	Fixed Equip Radial – Shower	1 x 2c, 10mm ² XLPE/LSZH (T&E)	B40	30mA
7	13A Sockets Ring - Kitchen	1 x 2c, 2.5mm ² XLPE/LSZH (T&E)	B32	30mA
8	Lighting - and Doorbell	1 x 2c, 1.5mm ² XLPE/LSZH (T&E)	B10	30mA
9	Fixed Equip Radial – Smoke/heat/CO detectors	See Clause 32	B6	-
10	PV Battery Unit	1 x 2c, 4mm ² XLPE/LSZH (T&E)	B25	30mA

Fit blank plates to all spare ways.

The Electrical Contractor shall provide the consumer with a laminated, typewritten circuit chart, which clearly shows what each way/breaker serves. The chart shall be stuck to the inside of the board's door using 'WHITE' very high bond double-sided acrylic foam tape.

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23. ACCESSORIES

The Electrical Contractor shall supply and install all electrical accessories, including mounting boxes and their component parts.

The preferred manufacturer of lighting and small power accessories is MK Electric, although the Electrical Contractor may select accessories from one of the following alternative manufacturers: Ashley Hager, Eaton MEM, Scolmore or Volex.

Item	Location	Mounting Details	Range/Finish
Lighting, small power & telephone accessories.	All areas	Flush wall mounted.	Logic Plus - 'WHITE' plastic.

The Electrical Contractor shall ensure that accessories (such as light switches, socket outlets, fused connection units, data outlet plates etc.) are selected from the same manufacturer and are of a similar type/range/style/finish to ensure uniformity throughout the building.

The Electrical Contractor shall not locate flush mounted accessories (such as light switches, socket outlets, fused connection units etc.) on:

Chimney breast.

Back to back in walls or partitions.

Party walls.

23.1 Accessory Boxes/Rubber Grommets

Accessory boxes shall be of the following minimum depths:

	Surface Box (Moulded) Minimum Depth	Flush Box (Steel) Minimum Depth
Lighting switch boxes	16mm	25mm
Socket outlet, fused connection unit boxes	30mm	25mm
20A DP Switch	30mm	35mm
Cooker control switch boxes	40mm	47mm
Cooker connector boxes	-	46mm

Only entry 'knock out' or purpose made access holes into these boxes shall be used to pass cables into these boxes. All cable access holes shall be free from burrs and suitably protected with rubber grommets.

All accessory boxes shall be bonded to the earthing system. Where accessories do not have an earth terminal such as lighting switches, the earth bonding lead within the supply cable shall be covered in green/yellow PVC sleeving and connected into the earthing terminal within the accessory box.

All accessory boxes shall be fully plastered in and the final plasterwork shall be in line with the existing wall surface. Accessories shall not be fitted until the new plasterwork has completely set or paintwork dry.

24. LIGHTING - INTERNAL

The Electrical Contractor shall supply and install the internal lighting installations, which shall generally consist of LED luminaires, pendant lamp holders, diffusers and/or glassware, PIR's, photocells, light switches, accessories, protective devices, cabling and containment etc. as described in this specification or deemed necessary to render the installation as a whole safe, fully functioning and in a working order.

The Electrical Contractor shall be responsible for agreeing the correct position of switches with regard to door hangs etc., on site before installation. No claims for non-compliance to this requirement will be accepted.

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24.1 Internal Luminaire Types

See 'APPENDIX No.3 – Luminaire schedule, attached to the rear of this specification.

24.2 System Description

The Electrical Contractor shall supply and install 1 x 13w White (100W equivalent) Bayonet Cap B22 GLS Style 4000K LED lamps in pendant lamp holders.

Diffusers and/or glassware shall be fitted at the conclusion of the electrical installation works.

Lighting circuits shall be wired as single-phase and neutral radial circuits (looped-in principle) and all 'live' conductors including switch wires shall be coloured 'BROWN'. Where a T&E cable is used as a live and switch wire this cable shall have both the conductors coloured brown. Coloured sleeving for identification purposes shall not be allowed.

The supply for the first floor staircase light shall be derived from the ground floor lighting circuit.

The Electrical Contractor shall make provision for independently supporting each luminaire mounted 'ON' or 'IN' a suspended ceiling, so that in the event of the suspended ceiling failure the luminaires do not drop significantly below their current position. Also lighting outlets shall be securely fixed to timber joists or cross timbers that have a minimum dimension of 75mm (w) x 20mm (d).

24.3 Light Switches

Light switches shall comply with BS EN 60669 Part 1 – 'Switches for household and similar fixed-electrical installations'.

Surface wall mounted switches shall be mounted on 38mm (minimum depth) accessory box. Flush wall mounted switches shall be mounted on 16mm (minimum depth) accessory box, which shall finish square, level and flush with the finished plaster surface. Any accessory box which protrude beyond the finished plasterwork shall be rejected by the Client and replaced at the Electrical Contractor own expense.

In areas where insufficient space is available, to insert a standard lighting switch, flush mounted architrave switches shall be used

The Electrical Contractor shall ensure that lighting switch and cover plates etc. are selected from the same manufacturer and are of a similar type/range/style/finish to ensure uniformity throughout the building.

24.4 Pendant Sets

Pendant sets shall be surface mounted and consist of a WHITE ceiling rose, lamp holder and the necessary length of WHITE sheath, 1 x 3 Core (2c + E) 0.75mm² heat resistant butyl flexible cable (3183TQ). Ceiling roses shall be constructed of insulating material complying with BS 476, Part 12 - Fire tests on building Materials/Plant/Equipment and structures. Method of test for ignitability.

Ceiling roses shall be provided with an enclosed integral pattress incorporating knock-outs and a screw-on cover which shall conceal the fixing screws. The base shall be suitable for direct mounting onto a conduit box. Bayonet lamp holders shall comply with BS EN 61184, with a T2 heat resistant to category suitable for conditions up to a lamp cap temperature of 210°C. All pendants shall be of the same length and shall be supported by wooden bridges between joists so avoiding damage to the joists.

24.5 Pull cord ceiling switches

Ceiling mounted pull cord type light switches shall be 6A minimum rated white insulated pattern, complying with BS EN 60669: Part 1. Switches shall be suitable for mounting on a circular conduit box or purpose made pattress. Cords shall be 1000mm in length and capable of being replaced without removal of the cover.

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24.6 Roof Void Lighting

The Electrical Contractor shall supply and install a batten lamp holder, complete with 1 x 13w Warm White (100W equivalent) Bayonet Cap B22 non-dimmable GLS Style 2700K LED lamp in the roof void to allow this area to be safely accessed.

The loft lighting shall be controlled by a grid switch located in the store cupboard in close proximity to the loft hatch access. The switch shall be fitted with 10A WHITE switch module and AMBER neon indicator unit to show when the loft lights are ON. The switch shall also be engraved with the words 'LOFT LTG'.

25. EXTERNAL LIGHTING

The Electrical Contractor shall supply and install the external lighting installation, which shall generally consist

1 x IP65 surface wall mounted decorative LED porch light, located at the front of the building by the main entrance, which shall be PIR control with manual override.

1 x IP65 surface wall mounted LED luminaire, located at the rear of the building by the garden door, which shall be photocell control with manual override.

2 x IP65 surface wall mounted LED luminaire, located at the side elevation of the building which shall be photocell control with manual override.

The external lighting installation shall include all required light switches, accessories, protective devices, cabling and containment etc. as described in this specification or deemed necessary to render the installation as a whole safe, fully functioning and in a working order.

25.1 External Luminaire Types

See 'APPENDIX No.3 – Luminaire schedule, attached to the rear of this specification.

26. SMALL POWER

The Electrical Contractor shall supply and install a new small power installation, which shall distribute 230V power supplies to fixed and portable items of equipment (via ring or radial final circuits) throughout the building. The small power installation shall generally comprising of socket outlets, fused connection units and associated small power accessories, mounting boxes, protective devices, cabling and containment etc. as described in this specification, indicated on the drawings or deemed necessary to render the installation as a whole safe, fully functioning and in a working order.

The Electrical Contractor shall ensure that small power accessories (such as socket outlets, fused connection units, data outlet plates etc.) are selected from the same manufacturer and are of a similar type/range/style/finish to ensure uniformity throughout the building.

Surface wall mounted small power accessories (such as socket outlets, fused connection units etc.) shall be mounted on 38mm (minimum depth) accessory box. Flush wall mounted small power accessories shall be mounted on 25mm (minimum depth) accessory box, which shall finish square, level and flush with the finished plaster surface. Any accessory box which protrude beyond the finished plasterwork shall be rejected by the Client and replaced at the Electrical Contractor own expense.

26.1 13A Socket Outlets

Unless detailed otherwise, socket outlets shall be 13A rated (one or two gang as applicable) DP switched, three pin shuttered, without an indicator lamp, complying with BS 1363 -13 A plugs, socket-outlets, adaptors and connection units.

Unless detailed otherwise, 13A socket outlets shall be wired as ring circuits, protected by board mounted RCBO's, conform to BS EN 61009, with 30mA trip rating. All other small power circuits shall be wired as either a ring or radial circuit, as applicable.

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Where detailed in this specification, socket outlets shall be engraved with the name of the equipment they serves.

26.2 Fused Connection Units

Unless detailed otherwise, fused connection units shall be 13A rated, switched or non-switched, with integral cartridge fuse holder (c/w fuses rated to suit the item being supplied) concealed type flex outlet with flex clamp, without an indicator lamp. Where detailed in this specification, fuse connection units shall be engraved with the name of the equipment they serves, e.g. 'BOILER' etc.

26.3 Flex Outlet Plates

Unless detailed otherwise, flex outlet plates shall be 20A rated non-fused, non-switched, with an outgoing cable clamp and fitted with three pairs of terminals, each capable of accepting 2 no. 2.5 mm² conductors.

26.4 Fridge/freezer, Washing machine & Cooker Hood

Others shall supply and install the white goods.

The Electrical Contractor shall:

Supply and install a flush mounted multi gang grid switch/fuse unit to allow central control of appliances socket outlets. Each switch will have a corresponding fuse unit and an engraved label indicating its duty. Such as FRIDGE FREEZER, WASHING MACHINE, COOKER HOOD as applicable.

Locate the connection unit above the worktop either directly above or in close proximity to the low level socket it controls. However, where a tall upright fridge/freezer is to be installed then the connection unit shall be located to one side to suite site conditions. NO connection unit shall be installed in the area occupied by a tall upright fridge/freezer.

Final connection to Cooker Hood to be by a single unswitched socket outlet

Supply and install a flush mounted one gang non-switched 13A socket outlet, located at 600mm AFFL to U/S and central to the Fridge/freezer, Washing machine position. The socket shall be wired in series with the fused grid unit.

Wire the Fridge/freezer, Washing machine and Cooker socket as part of the kitchen ring circuit.

26.5 Doorbell

The Electrical Contractor shall:

Supply and install a surface wall mounted, mains operated doorbell consisting of 'WHITE' plastic 2 Note chime unit with built in transformer and bell push, which is acceptable and equivalent to Friedland Ltd. Festival range.

Locate the chime unit at 2100mm AFFL to U/S, in the main entrance hallway.

Supply and install a flush wall mounted non-switched fused connection unit, (fitted with a 3A fuse) located at 2100mm AFFL U/S, adjacent to the chime unit. The fused connection unit shall be engraved with the words 'BELL'.

Wire the chime unit as a single phase and neutral fused spur, fed from a local lighting circuit.

Carry out the final connection wiring between the fused connection unit and the chime unit, which shall be concealed entering through the back of the chime unit.

26.6 Future Intruder Alarm

The intruder alarm may be provided outside of this contract by the building occupier.

The Electrical Contractor shall:

Supply and install a flush mounted non-switch fused connection unit (fitted with 3A fuse) engraved with the words 'ALARM'.

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Locate the fused connection unit at 1200mm AFFL to U/S, adjacent to the consumer unit.

Wire the intruder alarm as a dedicated single-phase and neutral radial circuit using 2.5mm² XLPE/LSZH (T&E) fed from building's Consumer unit, protected by a 6A type B, RCBO with 30mA trip setting.

27. COOKER

Others shall supply and install the cooker.

The Electrical Contractor shall:

Supply and install a flush mounted 45A/50A cooker control unit (with integral 13A socket) located above worktop, located on the right hand side of the cooker position (as you face the cooker) where practically possible.

Supply and install a flush mounted cooker connection unit, located at 450mm AFFL and central to the cooker position.

Wire the cooker as a dedicated single-phase and neutral radial circuit using 6mm² XLPE/LSZH (T&E) fed from building's Consumer unit, protected by a 32A type B, RCBO with 30mA trip setting.

Carry out the interconnecting cabling between the cooker control unit and cooker connection unit; and the final connection wiring between cooker connection unit and the cooker.

28. MECHANICAL SERVICES

The Electrical Contractor shall supply and install the electrical works associated with each mechanical services installation and shall agree the position of all accessories associated with the mechanical services installation with the Mechanical Contractor, prior to installation.

The Mechanical Sub-Contractor shall supply and install the mechanical services installations. The Electrical Contractor shall ascertain for themselves the full extent of the electrical works associated with the mechanical services work, as detailed in the mechanical services specification and drawings.

The Electrical Contractor shall supply and install all protective devices, accessories, PIRs, power cabling and containment etc. as shown on the drawings, detailed in this specification or as deemed necessary to render each installation as a whole safe, fully functioning and in a working order. The Electrical Contractor shall also terminate and connect all power cabling to mechanical services, such as control panels, control equipment, pumps, motorised valves, fans etc. The fixing of all wall mounted control equipment (such as thermostats, speed controllers and similar) etc. and control cabling shall be supplied and installed by the Mechanical Sub-Contractor.

The Mechanical Contractor shall supply and install each relevant dwelling an air source heat pump installation. The Electrical Contractor shall provide the electrical works associated with each External unit, Cylinder immersion and cylinder control board, which shall generally consist of isolators, accessories, protective devices, cables and containment, etc., as shown on the drawings and/or deemed necessary to render all sections of the installation operative.

28.1 Air Source Heat Pump Installation

The Mechanical Engineer has chosen to use the following equipment for this project:

Equipment	2/3 Bed Dwelling
EXTERNAL UNIT	Make: Mitsubishi Electric Range: ECODAN. RANGE

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CYLINDER	Make: Mitsubishi Electric Range: SLIMLINE
CYLINDER CONTROL BOARD	Make: Mitsubishi Electric

EXTERNAL UNIT - Supply and install surface mounted 32/40A IP65 SPSN rotary isolating switch located at the rear of the property, in close proximity to the external unit. The switch shall be cable of being locked in the 'OFF' position and housed in an IP65 (minimum rating) 'GREY' moulded enclosure, which shall be permanently labelled 'HEAT PUMP'. Each switch shall be acceptable and equivalent to Craig and Derricott Ltd, i-switch, switch-disconnector range. Wire each external unit as a dedicated single-phase and neutral radial circuit using 1 x 2c, 4.0mm² XLPE/LSZH (T&E) cable, fed from building's Consumer unit, using 25A type C, RCBO with 30mA trip setting. Carry out the final connection wiring between each switch and external unit using BLACK sheath, 1 x 3 Core (2c + E) 4.0mm² heat resistant butyl flexible cable (3183TQ).

CYLINDER IMMERSION - Supply and install flush wall mounted switched 13A switch fused unit with flex outlet, neon indicator, located in an easily accessible position adjacent to the cylinder and engraved with the word 'WATER HEATER'. Wire each Immersion heater as a dedicated single-phase and neutral radial circuit using 1 x 2c, 2.5mm² XLPE/LSZH (T&E) cable, fed from building's Consumer unit, using 16A type B, RCBO with 30mA trip setting. Carry out the final connection wiring between each switch and Immersion heater using WHITE sheath, 1 x 3 Core (2c + E) 2.5mm² heat resistant butyl flexible cable (3183TQ).

CYLINDER CONTROL BOARD - Supply and install a flush wall mounted switched 13A fused connection unit with flex outlet (fitted with a 13A fuse) located in an easily accessible position adjacent to the control board. Wire the control board as a dedicated single-phase and neutral radial circuit using 1 x 2c, 2.5mm² XLPE/LSZH (T&E) cable, fed from building's Consumer unit, using 16A type B, RCBO with 30mA trip setting. Carry out the final connection wiring between each fuse connection unit and control board using WHITE sheath, 1 x 3 Core (2c + E) 1.5mm² heat resistant butyl flexible cable (3183TQ).

28.2 Cooker Hood - Kitchen

The Mechanical Contractor shall supply and install the kitchen cooker hood extract fans.

Each cooker hood shall be manually activated by the grid/ fused unit.

The Electrical Contractor shall wire each cooker hood as a single phase and neutral fused spur, fed from the Kitchen ring circuit. The Electrical Contractor shall supply and install a flush wall mounted 13A non-switched socket outlet, located at high level in the cooker hood space. The socket shall be wired in series within the flush wall mounted grid/fused unit (fitted with a 3A fuse) located above the worktop. The grid unit shall be engraved with the words 'COOKER HOOD'.

28.3 SELV Fans - Bathrooms

The Mechanical Contractor shall supply and install the bathroom extract fans, including the separate SELV fan transformer.

Each bathroom fan shall be manually activated by the bathroom light switch or automatically using the fans integral humidistat.

The Electrical Contractor shall wire each SELV fan transformer as a single phase and neutral non-fused spur, fed from a local lighting circuit. The SELV fan transformer shall be wired in series with a three pole fan isolator and light switch. The SELV fan transformer and three pole fan isolator shall be flush wall mounted, located at high level outside the bathroom. The fan isolator shall be engraved with the words 'FAN ISOLATOR'.

The Electrical Contractor shall supply and install a flush wall mounted flex outlet plate (adjacent to the fan) which shall be wired in series with SELV fan transformer. 12V wiring between the SELV fan transformer and flex outlet plate shall

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be carried out using 1 x 2 Core, 1.5mm² XLPE/LSZH flat (Twin & Earth) cable. The Electrical Contractor shall carry out the final connection wiring between each flex outlet plate and fan using WHITE sheath, 1 x 3 Core (2C + E) 1.5mm² heat resistant butyl flexible cable (3183TQ).

28.4 Extract Fan - Toilet

The Mechanical Contractor shall supply and install the toilet extract fan

Each fan shall be manually activated by the toilet light switch or automatically using the fans integral humidistat.

The Electrical Contractor shall wire the fan from the local lighting circuit. The fan shall be wired in series with a three pole fan isolator and light switch.

The fan isolator shall be engraved with the words 'FAN ISOLATOR'. And mounted adjacent to the fan

28.5 Shower Installation

The Mechanical Contractor shall supply and install the electrical shower as detailed, in positions as shown on the M&E drawings.

The Electrical Contractor shall:

Supply and install a flush wall mounted 50A double pole switch with integral neon lamp and marked 'SHOWER', located external to the bathroom.

Wire the shower as a dedicated single-phase and neutral radial circuit using 1 x 2c, 10mm² XLPE/LSZH (T&E) cable, fed from the building's Consumer unit, protected by a B40A, RCBO with 30mA trip setting.

Carry out the final connection wiring between each switch and shower, which shall be concealed entering through the back of the shower unit.

29. TELEPHONE SYSTEM

The Electrical Contractor shall supply and install a telephone installation in each building, comprising of master NTE5A outlet (located in the Hall Store) and 2 x secondary telephone socket outlets (one in the lounge, one in the main bedroom) which shall be ready for future connection by BT to enable telephone and internet services to be connected and installed in each building at any time after handover (subject to agreement between a telephone provider and the occupier, outside of this contract) without causing disturbance to the fabric of the building.

The NTE5A shall act as the master telephone socket and shall be the demarcation point for BT external network and the Occupier's telephone system.

29.1 Standards

The installation shall meet the requirements of this specification, the applicable documents detailed in Section 04 – Regulations & Standards and all other applicable regulations and standards, with particular reference to:

BS 6701 - Telecommunications equipment and telecommunications cabling. Specification for installation, operation and maintenance.

BS EN 50310. Application of equipotential bonding and earthing in building with information technology equipment.

In addition to the above the Electrical Contractor shall ensure that all apparatus and equipment provided for the telecommunications system complies with the Communications Act 2003, which came into force on 25 July 2003 and superseded the Telecommunications Act 1984.

29.2 Secondary extension sockets

In each building the Electrical Contractor shall supply and install a number of additional flush, wall mounted, one gang, RJ11 secondary telephone socket outlets (complete with mounting boxes) as shown on the drawings. Each secondary

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telephone socket shall form part of the private system, even when connected to a master socket, which does not contain any additional components.

Cabling between the building's NTE5A and each secondary telephone socket shall be carried out using white CW1308, Round 2 Pair, 4 Core telephone cable run in 20mm dia., HGSW metal conduit concealed in the building fabric and wired in series with one another.

30. INTERNAL DATA CABLING

The Electrical Contractor shall:

Supply and install Horizontal data cables and shall be wired as a structured wiring system, using Category 6A/Class D 500MHz, UTP screened cable. The cabling will emanate from adjacent the master telephone/hub location and wired radially to a single outlet with locations shown on the electrical services layouts.

30.1 Data Outlets

Data outlets shall be two gang, two-module type, complete with suitably sized mounting box, front plate and fitted with RJ45 Cat 6A outlets (1 x data, 1 x blank plate, for future modification). Data outlets shall be wall mounted, Euro Modular frontplate range. See also 'APPENDIX A - Schedule of Equipment & Accessories' for details of the data outlets installation method and finish.

30.2 Cable Terminations, Testing and Certification

All telephone/data cables shall be terminated and tested in strict accordance with the relevant cabling system standard, manufacturer's recommendations and best industry practice.

Each cable shall be clearly labelled on the respective outlet to allow for ease of patching

All cables shall be tested and certification provided in accordance with the ANSI/TIA/EIA standards and prove the link performance characteristics defined in BS EN 50173-1 Information technology. Generic cabling systems. General requirements and shall be compliant with the current relevant testing standard. The name of the person conducting the test, date of the test and the type and manufacture of all cable being tested shall be recorded on all test forms.

All test instruments for the purpose of testing shall be provided by The Electrical Contractor.

On completion of the tests, The Electrical Contractor shall issue to the Contract Administrator all test certificates in both printed and electronic format.

30.3 Standards

The installation shall meet the requirements of this specification, the applicable documents detailed in Section 04 – Regulations & Standards and all other applicable regulations and standards, with particular reference to:

BS 6701 - Telecommunications equipment and telecommunications cabling. Specification for installation, operation and maintenance.

BS EN 50310. Application of equipotential bonding and earthing in building with information technology equipment.

In addition to the above the Electrical Contractor shall ensure that all apparatus and equipment provided for the telecommunications system complies with the Communications Act 2003, which came into force on 25 July 2003 and superseded the Telecommunications Act 1984.

31. TV INSTALLATION

The Electrical Contractor shall supply and install a television installation in each building, comprising of digital aerial, aerial sockets, (located in the living room and main bedroom) coaxial cable (suitable for digital television) run in 1 x 25mm dia. metallic conduit concealed in the building fabric, connected to a TV aerial position located in the roof space.

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The Electrical Contractor shall include in their tender submission for employing a specialist Installer (See also 17 – Specialist Installer) who is a member of the Confederation of Aerial Industries and has the relevant qualifications for Television Distribution Systems. The specialist Installer shall develop the design of the TV system and carry out the installation, testing, commissioning and setting to work the system on behalf of the Electrical Contractor. The specialist Installer may be the Electrical Contractor's choice.

NOTE: The Electrical Contractor shall not activate any Satellite service in any building. This shall be subject to an agreement between the occupier and Sky or other television provider, or in the case of say NOW TV or FreeSAT etc. the occupier purchasing the necessary set top box, any time after handover.

31.1 Standards

The installation shall meet the requirements of this specification, the applicable documents detailed in Section 04 – Regulations & Standards and all other applicable regulations and standards, with particular reference to:

BS 6513 - (All relevant parts). Wideband cabled distribution systems.

BS EN 50083 - (All relevant parts). Cable networks for television signals, sound signals and interactive services.

BS EN 50117 - (All relevant parts). Coaxial cables.

Code of Practice for the Installation of Terrestrial and Satellite TV Reception Systems, published by the Confederation of Aerial Industries Ltd (CAI).

Digital TV Group (DTG) Publications.

31.2 Services

The completed Television system shall provide the following services to each building - BBC1, BBC2, ITV, Channel 4, Channel 5, FreeView, whether or not there is a subscription to Sky or other television provider.

31.3 Signal levels

The signal strength of the site shall be checked to ensure that adequate TV reception is available to all buildings. If reception is not adequate then suitable boosting arrangements shall be installed to all affected buildings. A certificate giving details of the signal strength shall be provided to the Contract Administrator/ Client.

All Equipment must be able to cope with the minimum and maximum signal levels, as detailed in the CAI Code of Practice for the given frequencies in use.

31.4 Aerials

Digital TV aerials shall be from an approved supplier and comply with the Confederation of Aerial Industries Ltd (CAI) Code of Practice. **NOTE:** The Electrical Contractor must obtain the required planning permission, prior to the installation of any aerials as required.

The specialist Installer shall make an appraisal of the quality of signal available and shall select and locate the aerial accordingly. The location is to be agreed with the Architect and Contract Administrator prior to installation, but is assumed to be at roof level.

Each aerial and their support structure, fixings etc. mounted on the external face of the building shall be capable of withstanding winds of up to 100mph/160kph. The Materials/Plant/Equipment shall be resistant to corrosion. All exposed ferrous surfaces shall be painted after the system has been commissioned. Each UHF antennas must incorporate a Balun to ensure the matching of the dipole to the feeder cables. Each satellite dish, aerial and their support structure must be earthed.

31.5 Co-axial Signal Cables

Provide the following co-axial signal cabling which shall be sourced from a Sky Homes partnering supplier.

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From the TV aerial array: The appropriate number of CT125 double screened low loss coaxial cables to the head end equipment.

To TV outlets: CT100 Double screened low loss coaxial cable from the distribution equipment.

Within the head-end and network, the connection of the co-axial cable shall be by 'F' type and IEC connectors only. 'F' type connectors must be crimped and IEC connectors should be of a professional design and correctly made off. Connectors shall be the correct size for the cable used.

Fly leads shall be 'Double Screened' and comply with the relevant parts of BS EN 60966 - Radio frequency and coaxial cable assemblies. Fly leads shall be of a length to achieve a neat and tidy installation.

31.6 Testing and commissioning

Before practical completion and the hand-over the whole system shall be tested by the Specialist Installer to ensure that the system complies fully with the Specification. Tests shall be carried out to ensure that each satellite dish installed is able to produce a 15dB carrier to noise level at the installations site, for the given transponders being received. The tests shall include the maximum and minimum signals for each of the services, measured at the socket outlets as specified by the Contract Administrator.

The Electrical Contractor shall demonstrate to the Contract Administrator that the picture quality on all the services stated is to CCIR grade 4 on the analogue television channels and error free on the Digital channels.

Test equipment must be accurate to within +/- 3dB and suitable for all the services indicated. The minimum requirement is a Spectrum Analyser, a simple signal strength indicator is not sufficient.

32. FIRE ALARM

The Contractor supply and install a fire detection system which complies with the following:

Grade D - System incorporating one or more inter-linked mains powered smoke alarms (and heat alarms if required) each with an integral stand-by supply. The inter-link shall be hardwired.

Type LD2 - A system incorporating detectors in all circulation spaces that form part of the escape routes from the building, and in all rooms or areas that present a high risk of fire.

Each fire alarm system shall consist of mains powered smoke, heat and Carbon Monoxide (CO) detectors which shall automatically detect and alert building occupants of the presence of fire/smoke/carbon monoxide via electronic detection/sounders units, which shall be acceptable and equivalent to AICO Ltd, 160e Series.

The installation shall meet the requirements of the following:

BS 5588-1, Fire precautions in the design, construction and use of building. Code of practice for residential building.

BS 5839-6, Fire Detection and Alarm Systems for Building. Code of Practice for the Design and Installation of Fire Detection and Alarm Systems in Buildings.

BS EN 14604, Smoke Alarm Devices.

BS EN 50291, Electrical apparatus for the detection of carbon monoxide in domestic premises. Test methods and performance requirements.

BS EN 50292, Electrical apparatus for the detection of carbon monoxide in domestic premises. Guide on the selection, installation, use and maintenance.

Building Regulations - Part B.

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32.1 System Description

Each building fire alarm system shall consist of stand-alone, mains operated smoke, heat and CO alarm system consist of surface ceiling mounted, 'WHITE' plastic smoke, heat and CO detectors with integral sounders, 10 year rechargeable lithium back-up battery, hush button, control switch, accessories, protective devices, cabling and containment etc. as described in this specification, or deemed necessary to render the installation as a whole safe, fully functioning and in a working order.

Optical Smoke Alarm shall be installed in the Living Room, Hallway

Heat Alarm shall be installed in the Kitchen.

Control switch shall be installed in the Hallway cupboard, at the same height AFFL as the light switches. The control switch shall be used to remotely test, locate triggered alarms and silence the alarm system.

The smoke and heat detectors MUST be inter-linked with each other so if one alarm sounds, all alarms shall sound. The inter-link shall be hardwired.

The smoke and heat detectors shall be located at least 300mm away from any walls, light pendant or any form of obstruction which may impede the flow of smoke/heat or CO gas to the alarm.

Heat detectors shall be located at a horizontal distance of between 1.5m and 2m from cooker where practically possible.

32.2 Occupant's User Card

The Contractor shall provide the Contract Administrator with 1 No. 'Occupants User Card' for every building in which the smoke, heat and CO detectors have been installed. The 'User Card' shall give simplified information on how the system works, how to test it, how to silence nuisance alarms and explain the need to cover the alarms when re-decoration work takes place.

32.3 Testing and Commissioning

When the installation is complete the Contractor shall remove the dust cover from each detector and fully test the smoke, heat and CO detectors, both on the mains and stand-by power supplies as detailed in the instructions supplied with the alarms.

The Contractor shall test the smoke, heat and CO detectors alarm's circuitry, sensor and horn assembly from the test button. The Contractor shall supply a duly completed and signed installation certificate for every building in which the fire alarm detectors have been installed, detailing any variations from the requirements of Clause 23.3 of BS 5839: Pt.6.

32.4 Wiring Installation

The smoke, heat and CO detectors shall be wired as a single-phase and neutral radial circuit, fed from a dedicated MCB way on the Consumer unit. The protective device that supplies the fire alarm system circuit shall be clearly labelled with the words "SMOKE & CO - DO NOT SWITCH OFF". Cables from the Consumer unit to the first detector unit shall be wired using 1 x 2c, 1.5mm² Thermosetting XLPE/LSZH (T&E) Interconnecting cables between subsequent detectors shall be 1 x 3c, 1.5mm², Thermosetting XLPE/LSZH (T&E).

Cables shall be run in the ceiling void and any cable entry holes must be sealed with mastic, or similar, to prevent dust and draughts affecting the performance of the smoke, heat and CO detectors. In situations where recess wiring is not possible (e.g. concrete ceilings) suitably sized surface mounted, white plastic mini-trunking shall be used.

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33. PV INSTALLATION

The Electrical Contractor shall supply and install a UK/European built, grid-connected with battery back up (photovoltaic (PV) system on the roof of each dwelling, which is capable of operating in parallel with the DNO network.

Each dwelling's PV system shall generally consist of following:

9 x 340 watt (15m²) black frame high efficiency monocrystalline solar panels to give 3.06 kWp solar power system.

Typed tested hybrid solar inverter in the roof void.

25 amp circuit run between mains unit and roof void local isolation points and kWh meter located close to the consumer unit.

4.5kwh battery module, linked to the solar inverter.

non-penetrative tile fixing system, comprising of roof anchors, brackets, mounting rails, frames, solar panels, mid and end clamps (Provided by the Electrical Contractor and installed by the Main Contractor) onto the roofing structure, under the supervision of the PV Specialist.

33.1 Specialist Installer

The Electrical Contractor shall include in their tender submission for employing a specialist installer (See also E.06 – Specialist Installer) who is registered on the Microgeneration Certification Scheme (MCS) website. The specialist PV installer shall develop the design of the PV system and carry out the installation, testing, commissioning and setting to work the system on behalf of The Electrical Contractor. The specialist installer shall also ensure that the PV installation meets all of the requirements of MCS accreditation; using MCS listed equipment and shall register the final installation to ensure the Client obtains Feed in Tariff payments. The specialist installer may be The Electrical Contractor's choice or selected from the following list of preferred specialist installers:

Ecogise Group Ltd. Unit 51 Cannon Way Claycliffe Business Park Claycliffe Road Barugh Green Barnsley South Yorkshire. S75 1JU.	Telephone: 01226 38000E. Email: paul@ecogisegroup.co.uk
Green Yorkshire Solar Ltd. Unit 8 Headway Business Park Denby Dale Road Thornes Wakefield. WF2 7AZ.	Telephone: 01924 434390. Email: nick@greenyorkshiresolar.com
Northcroft Energy Ltd. Mustard Hill House Barnsley Road Hoylandswaine South Yorkshire. S36 7JA.	Telephone: 01226 763127. Email:

33.2 Standards

The installation shall meet the requirements of this specification, the applicable documents detailed in Section 04 – Regulations & Standards and all other applicable regulations and standards, with particular reference to:

BS EN 62446 - Grid connected photovoltaic systems. Minimum requirements for system documentation, commissioning tests and inspection.

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BS EN 61173 - Overvoltage protection for photovoltaic (PV) power generating systems. Guide.

G59/1 – Electricity Association engineering recommendations for the connection of embedded generating plant to the District Network Organisers (DNO) distribution systems. Covers generation from 16 Amps, 3 Phase up to 5MW.

G83/1 – Electricity Association engineering recommendations for the connection of embedded generating plant to the District Network Organisers (DNO) distribution systems. Covers small scale generation up to 16 Amps per phase.

33.3 System Description

The PV system shall generally consist of photovoltaic modules with high module efficiency, non-penetrative tile fixing system, comprising of roof anchors, brackets, mounting rails, frames, mid and end clamps, DC junction box, DC switch-disconnector, DC/AC inverter, AC switch-disconnector, AC switch-fuse, feed in/feed out tariff meter, energy meter, protective devices, surge protective device, AC and DC cabling and containment etc. as described in this specification, indicated on the drawings or deemed necessary to render the installation as a whole safe, fully functioning and in a working order.

The Main Contractor shall:

Provide access to the works via a fixed scaffold, together with edge protection installed around the erected scaffold and along the roof ridge, all with the necessary kick boards.

Install PV system fixing system and solar panel (Provided by The Electrical Contractor) onto the roofing structure, under the supervision of the PV Specialist.

The Electrical Contractor shall:

Before carrying out any work, obtain written permission from the DNO to connect the PV system to the building's main utility power supply. Where necessary, the Electrical Contractor shall be responsible for implementing a 'Parallel Connection Agreement' with the DNO and agree the technical basis for connecting to the DNO electrical network.

Fully co-operate with the DNO and the Electrical Supplier (meter provider) and provide any appropriate documentation and/or test certification, labour and/or assistance etc. as required by the DNO and the Electricity Supplier to enable the building's PV system and associated tariff metering equipment to be installed.

Notify the DNO of the time when the installation is ready for connection to the supply, as the DNO may wish to witness the final commissioning of the protection relay and the connection of the PV system in parallel with the building's normal electricity supply.

Before carrying out any work, obtain written permission from the Structural Electrical Consultant that the roof structure is capable of accepting the weight loads (static & wind) that shall be imposed by the roof mounted PV installation as a whole.

Ensure that all PV arrays are located within 45° of South, at an inclination close to 30° degrees from horizontal for maximum solar energy exposure. Wherever possible, arrays should be located to prevent self-shading, shading from trees, poles or other structures at any time between 9.00am and 3.00pm solar time, any day of the year.

Ensure that all PV panels and their associated roof mounting system are capable of withstanding winds of up to 100mph/160kph.

Supply and install OFGEM approved feed in/feed out tariff meter and an energy meter to record the full kWh ('units' of electricity) generated by the building's PV system. The meters shall be located in an accessible location as they need to be read periodically throughout the year.

Supply and install a protection relay, which shall be located in close proximity to the PV system inverter. The relay shall protect the DNO mains network from any potentially damaging effects of asynchronous PV generator output, such as a Vector shift or Rate of Change of Frequency (R.O.C.O.F) and shall disconnect the PV generator from the network by automatically tripping the PV generator's circuit breaker.

Determine the size and number of PV panels required.

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Ensure that the inverter(s) have an efficiency of at least 95% and closely match the output of the PV panels.

Supply and install batteries and battery enclosure.

Be responsible for ensuring that the inverter and battery enclosure are adequately ventilated by either natural or mechanical means.

Supply and install separate cable connections from each string to marshalling boxes. Connect DC string to array and provide local isolation point in the roof void next to the inverter. The cabling shall be labelled at regular intervals along their route advising that they are live during all daylight hours.

Supply and install the AC wiring, under the supervision of the PV Specialist. Provide containment for both AC and DC wiring, under the supervision of the PV Specialist.

Supply and install AC switch-disconnectors, fuse-switches and protective devices. Provide a main isolator, installed adjacent to the Landlord's distribution board.

Supply and install surge protection on the inverter DC and AC electrical supplies, using Type 2 SPDs.

Supply and install a warning notice adjacent to the mcb board, with the words 'WARNING - FED BY TWO SEPARATE (NORMAL & PV) SUPPLIES. ISOLATE BOTH SUPPLIES BEFORE UNDERTAKING ANY WORK. PHOTOVOLTAIC ISOLATOR LOCATED IN ROOF'.

Complete hand over paper work, MCS and electrical installation certificate on completion.

Notify local building control and local DNO of work completed.

33.4 PV Batteries

The batteries shall be capable of providing at least a five (5) year service life, while maintaining at least 50 percent of their initial rated capacity.

Only sealed, valve- regulated lead-acid (VRLA) types may be used in dwellings. Flooded lead-acid batteries will not be permitted.

Maximum allowable depth of discharge acid should be no more than 80 percent of the nominal battery capacity for the given discharge rates. The specification of the inverter low battery transfer voltage should be consistent with this maximum allowable Depth of Discharge (DOD) for the battery.

Battery enclosures should be designed to minimize large temperature variations of the battery, and to protect the batteries from creating a hazardous condition and located to minimize the risk of electrolyte spills, corrosion, fire, vandalism, theft and personal injury, and be accessible to maintenance and service personnel.

33.5 PV Replacement and Spare Parts

All system components must be clearly specified as to the type, manufacturer, and model number for later needs for replacement and service as required, and documented in the System Manual. Sources for this equipment should also be identified.

33.6 PV System Manual

The Electrical Contractor shall prepare and issue a PV system manual, which shall cover the following items, as a minimum:

Overview of major system components, principles of operation and safety considerations.

Complete parts lists and specifications for the overall system and individual components, including all electrical components, mechanical hardware and other equipment required for installing the systems

Diagram indicating overall layout of entire system, including PV array, and location of BOS hardware and inverter and battery sub-systems with respect to the array and building facilities,

Electrical schematics and diagrams showing all major components and devices, including conductor types and sizes, connections of individual modules and array source circuits, inverters, batteries, terminations at junction boxes, and connections to the customer's electric service and utility grid.

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Mechanical drawings showing details of module/array mechanical support structure and instructions for assembling/disassembling and installing arrays on rooftops or the ground as required.

Complete assembly and installation instructions for mounting array, junction boxes and enclosures, routing conduit, wiring arrays, and terminating conductors at array, combiner boxes and inverter/battery system

Procedures for operating, disconnecting, servicing and maintaining complete system and individual components

Warranty information on individual components as required in this bid document

All equipment manufacturers' specifications and operations manuals, including those for PV modules, inverter/chargers, charge controllers and BOS equipment.

33.7 PV System Warranties and Maintenance

The Electrical Contractor must provide warranties on both the complete system and individual components.

The methods for implementing a warranty provision must be clearly established, and handled by the specialist installer as the single point-of-contact for warranty service with the end-user.

As a minimum, the following warranties are required:

Two-year, complete system-level warranty for the no-cost replacement of any defective component required for safe and as-specified system operation.

PV modules must have a minimum ten-year limited manufacturer's warranty to maintain at least 80 percent of their initial rated output.

Inverter/chargers and charge controllers must have a minimum 2-year warranty. Batteries must be warranted for a minimum of five (5) years to deliver at least 50 percent of initial rated capacity.

Supplier/installer may provide extended warranty or service contract beyond baseline warranties as requested.

33.8 PV Performance Monitoring

Performance monitoring will be verified by the metering installed on the system, recorded by the customer on a monthly basis. This information will be provided to the BMBC Energy Office, and based on these data and the size of systems installed, determinations can be made as to whether the systems are functioning properly, or whether any problems exist that require attention by the owner or service visit by the installer at a later date.

33.9 Receiving Payments for Exported Electricity

N/A

34. ELECTRIC VEHICLE CAR CHARGING POINTS

The Electrical Contractor shall supply and install an electric vehicle (EV) charging point installation, located at the front of each dwelling, which is equivalent and acceptable to Wallpod: HOMESMART EV range Type 2 Mode 3 7.2kw (list No. EVHS2020) as manufactured by Rolec Services Ltd.

NOTE: The Charging point shall be a socketed unit, therefore the tenant will have to provide their own charging cable outside of this contract.

34.1 Standards

The installation shall meet the requirements of this specification, the applicable documents detailed in Section 04 – Regulations & Standards and all other applicable regulations and standards, with particular reference to:

IET Standard for electric vehicle charging points.

IEC 62196 - international standard for set of electrical connectors and charging modes for electric vehicles

BS EN 60335-1 - Household and similar electrical appliances. Safety. General requirements

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EMC Compliance - EN 61000-6-3, EN 61000-6-2

Safety Compliance - EN 60950-1, EN 60950-22.

Low Voltage Directive (LVD) 2014/35/EU

34.2 System Description

The electric vehicle charging point installation shall generally consist of EV charging socket unit, protective devices, cables and cable containment, etc., as shown on the drawings and/or deemed necessary to render all sections of the installation operative.

The Electrical Contractor shall:

Supply and install surface wall mounted IP65, 32amp (7.2kW) single-phase electric vehicle (EV) charging point with an integral Type 2 (IEC 62196) Mennekes vehicle connector with shutter.

Install each (EV) charging point at 1100mm AFFL to U/S.

Ensure that each EV charging point has an integral IEC 61851-1 Mode 3 fast charging communication module (IEC 62196). The communication system shall be capable of immobilising the vehicle when connected and monitoring the delivery of power, so that charging stops automatically when it detects that the battery is full.

Ensure that each EV charging point is mobile phone interactive, to enable the EV driver to control the charging activity using their mobile phone, as well as allowing them to monitor/record all their charging activity, data and history.

Wire each EV charging point as a dedicated single-phase and neutral radial circuit using 1 x 2c, 10mm² XLPE/LSZH (T&E) cable, fed from building's Consumer unit, using 40A type B, RCBO with 30mA trip setting.

Carry out the final connection wiring to the (EV) charging point, entering through the back of the (EV) charging point.

35. EARTHING AND BONDING

35.1 Scope

The Electrical Contractor shall supply and install a complete earthing and bonding system for each electrical installation throughout the building. The earthing system shall be capable of transferring electrical current safely to earth, to protect personnel, building structure and Materials/Plant/Equipment in the case of an electrical fault within the supply system and from interference from electro-magnetic fields and electro-static forces.

The earthing and bonding system shall generally consist of main earth terminal (MET), main earthing conductor to interconnect the DNO's main earthing point with the Client's MET, including earth clamps, main bonding conductors, supplementary bonding conductors and circuit protective conductors etc. as shown on the drawings, detailed in this specification or deemed necessary to render the installation as a whole safe, fully functioning and in a working order.

35.2 Standards

The installation shall meet the requirements of this specification, the applicable documents detailed in Section 04 – Regulations & Standards and all other applicable regulations and standards, with particular reference to:

BS 7430 - Code of practice for protective earthing of electrical installations.

BS 7671 - Requirements for Electrical Installation as issued by The Institution of Engineering and Technology (IET).

Distribution Network Operator (DNO) requirement for protected multiple earthing (PME).

IET Guidance Note 8 – Earthing and bonding.

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35.3 Earthing - General

In order to prevent any delay to the electrical works being completed and the main earthing conductor being connected into the MET, the Electrical Contractor shall inform the DNO of their earthing requirements (prior to commencement of the works) and either obtain permission to gain access into the earthing point or ensure that the DNO's representative is available on site to affect any connections before the electrical works are handed over to the building holder

If the Electrical Contractor has any difficulties in obtaining suitable earthing facilities in any building they shall immediately contact the respective DNO and inform the Architect before the electrical installation within the building is handed over to the tenant.

Metal back box (Surface/Flush) – All mounting boxes (metallic and non-metallic) shall incorporate an earthing terminal. CPC's shall be wired directly into the accessory earthing terminal. The earthing terminal of each accessory shall be connected to the mounting box earthing terminal using a separate earthing tail.

Main bonding & Supplementary equipotential bonding conductors - Shall be carried out using single core (Cu) LSF cable with Green/Yellow sheath to BS 6491B.

Circuit Protective Conductor (CPC) - Shall be carried out using single core (Cu) LSF cable with Green/Yellow sheath to BS 6491B. Provide each circuit with its own CPC, which shall be connected to the accessory or equipment it serves and to the dwelling's earthing system to form a continuous earth fault return path of negligible impedance. Extraneous conductive parts shall not be used as a CPC.

Containment Earthing -Metallic containment shall not be used as a protective conductor or earth path. However, the metallic containment shall be electrically and mechanically continuous throughout and be fully bonded to each building's earthing system. The Electrical Contractor shall supply and install metallic bonding strips between component parts and joints in metallic containment where the method of mechanical connection does not provide a permanent and/or reliable metal-to-metal joint of negligible impedance.

Earthing Terminals - Earthing conductor shall be connected to Materials/Plant/Equipment etc., using the earthing terminal provided. If an earthing terminal is not provided then the Electrical Contractor shall form an effective earthing terminal by drilling, tapping and installing the necessary nuts, bolts, washers and crimped lugs.

35.4 Main Protective Bonding Conductor

Dwelling main earthing terminal (MET) - Provide each dwelling with a complete main earthing terminal (MET) installation, consisting of a 8 Way double screwed earth terminal block, constructed of tinned brass, which shall be surface wall mounted, in close proximity to the dwelling's consumer unit.

Main Earthing Conductor – Provide 1 x 16 mm² earthing conductor between the DNO earth connection point and the Main Earth Terminal (MET).

Incoming services (Gas & Water) – Provide 1 x 10 mm² main protective bonding conductor between the pipework earth connection point and the MET. NOTE: If the incoming services, such as water and gas pipes are made of plastic, but the pipes within the installation are made of metal, then main bonding of the water and gas pipes shall be carried out.

Bonding to the main water and gas services shall be carried out at the point of entry into the building in an accessible position. The main protective bonding conductors shall be installed within 600mm, on the customer side of any meter, main stopcock or insulating insert and to the metal pipes of the installation.

Consumer Unit Earthing – Provide 1 x 16 mm² main protective bonding conductor between the consumer unit earth connection point and the MET. If this cable is connected to screw, bolt or threaded stud type termination at the main earthing point, then the earthing conductor shall be fixed to the terminal via a crimped annulus ring terminal.

35.5 Supplementary Bonding - General

The Electrical Contractor shall determine what constitutes an extraneous conductive part. The Electrical Contractor shall measure the insulation resistance between the item and the main earthing terminal. If the resistance value is 23,000 ohms or greater, and inspection confirms that the resistance is unlikely to deteriorate then the item shall not be considered as an extraneous-conductive-part.

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Provide supplementary equipotential bonding connections to every extraneous conductive part, such as metallic components of hot and cold water systems, heating systems, waste pipes and exposed metallic parts of the building structure etc. Supplementary equipotential bonding shall be connected to the nearest and most practicable circuit protective conductor which returns to the property's main earth terminal (MET).

Kitchen – A kitchen is not defined in BS7671 as a location of increased shock risk, hence supplementary bonding is not required. Metal sinks in kitchens do not need to be bonded.

Bathroom/Shower - A bath/shower room is defined in BS7671 as a location of increased shock risk, hence supplementary bonding is required. The protective conductors of each circuit supplying Class I and Class II equipment located in the bathroom must be supplementary bonded to all extraneous-conductive-parts within the room using 1 x 4 mm² cable connected to every metallic waste, water and central heating pipe, metal baths and metal shower basins. However, there is no need to install a Main Protective Bonding Conductor back to the MET. In addition, if the pipes are plastic and the electrical installation is fully compliant with BS7671, with particular reference to regulations 701.415.2 and 411.3.1.2 then the bonding may be omitted.

Central heating – Provide 1 x 10 mm² main protective bonding conductor between the central heating pipe pipework earth connection point and the MET. Also provide supplementary bonding, connect to every metallic water and central heating pipe using 1 x 4 mm² cable.

35.6 BS951 Earth clamps

Where earthing of the Gas/ Water service pipes work is required then the Electrical Contractor shall supply and install adjustable purpose made earthing clamps of tinned phosphor bronze, conforming to BS 951 – Electrical earthing. Clamps for earthing and bonding, which shall be acceptable and equivalent to those manufactured by Tenby Ltd.

Each clamp shall be suitable in both size and for use in the atmosphere in which it is installed (such as for use dry, non-corrosive atmospheres or corrosive or humid conditions). Earthing lead shall be fixed to the clamp by a crimped ring terminal using washers and a spin and lock nut. A metal sign stating 'SAFETY ELECTRICAL CONNECTION - DO NOT REMOVE' shall be attached to each clamp in accordance with BS7671.

The Electrical Contractor shall clean; make smooth and rub down to a bright metal a 50 mm section of the pipes, immediately prior to the installation of an earthing clamp. At the earth clamp the Electrical Contractor shall fit a crimped ring connection to the bonding conductor.

Earth Clamps shall be hidden from view, where practically possible. Earth clamps shall be accessible for inspection and if made below the floor, a trap must be provided, marked and its position recorded and included in the "AS INSTALLED" record information.

NOTE: BS 951 clamps shall not be used for connection to armouring or lead sheath cables.

35.7 TV System Earthing

The Electrical Contractor shall be responsible earthing the TV system. Incoming cables from antennas should be bonded across the outer sheath of all relevant co-axial cables prior to the input of the IF/Rf amplifiers. External Aerial Mount should also be connected to the installations earth.

35.8 PV System – Earthing

Earthing arrangements and protective conductors for use with solar photovoltaic (PV) power systems shall be carried out in accordance with regulation 712.54 of BS 7671.

36. TESTING AND COMMISSIONING

Contractor shall carry out all tests (as described in BS7671) as the works progress and upon completion of the installation and prior to the system being energised, to demonstrate that the electrical installation as a whole is safe and fully complies with the requirements of BS7671, manufacturers recommendations and all other applicable regulations/standards.

On the satisfactory completion of the tests, the Electrical Contractor shall prepare and issue Completion Certificate and Inspection Certificate as described in BS7671, for every section of the work undertaken.

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36.1 Programme of Testing

At an early stage of the Project the Electrical Contractor shall compile a programme of testing and commissioning of all electrical services contained in this Specification. The Electrical Contractor shall provide a full schedule of the function tests undertaken and shall be prepared to subsequently demonstrate these to the Client's representative.

The Electrical Contractor shall further provide a method statement supported by risk assessments detailing the procedures for carrying out the onsite tests.

36.2 System Description

The Electrical Contractor shall:

Provide all required skilled labour, test instruments, apparatus, fuel, and expendables necessary for carrying out all tests. All instruments and apparatus shall have been recently calibrated to ensure their accuracy. NOTE: The Electrical Contractor shall be responsible for refilling all fuel tanks, lubrication systems, fully charging batteries and shall replace all expendables etc. on completion of the tests and prior to Practical Completion.

Provide a method statement supported by risk assessments detailing the procedures for carrying out the on-site tests.

Give the Contract Administrator or their appointed representative opportunity to witness all or any tests carried out either on site or at manufacturer's works and to facilitate this. The Electrical Contractor shall give not less than eight days' notice of tests to the Contract Administrator.

Ensure that all commissioning, testing procedures, results and certificates are to be collated and indexed into 'Commissioning and Testing Procedures and Records' manuals and passed to the Electrical Consultant for comment prior to be handed over to the Client. These manuals shall be appended to the O&M manuals.

Duly sign all test and completion certificates, which shall be appended to the O&M manuals.

Not conceal any section of works until they have been inspected and tested. Subsequent concealment shall only take place following written authority from the Electrical Consultant.

Upon completion of the inspection and testing fix a label at the origin of the installation stating the date of the inspection and the recommended date of the next inspection.

36.3 Test Records

The Electrical Contractor shall be responsible for recording and maintaining comprehensive records of all ongoing tests. Copies of these test results shall be given to the Electrical Engineer and the Main Contractor and shall contain the following information:

Project title

Details and date of test

Instruments used, serial numbers, calibration dates

Signatures of those witnessing test

Electrical Services Contractor's name

Specific location of the item(s) in the Works

All such documentation shall be included in the O & M manuals.

36.4 Test Failure

If any part of the installation fails during or as a result of any test, or if the results obtained are not satisfactory, then the Electrical Contractor shall at their own expense make good any defects and retest those parts of the installation that failed. The Electrical Contractor shall repeat this process until satisfactory results are obtained.

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36.5 Test Instruments Calibration

Test instruments shall be checked and/ or calibrated before use in accordance with manufacturers' recommendations. Before the start of any testing, the Electrical Contractor shall provide the Client with evidence that the test instruments that are to be used have been fully calibrated. Calibration shall only be carried out by companies accredited by the United Kingdom Accreditation Service (UKAS).

37. BUILDERS' WORK

The Main Contractor shall be responsible for providing all major items of builders' work; the Electrical Contractor shall be responsible for carrying out all builders' work associated with the electrical services installation.

The Main Contractor shall:

Provide chasing, core drilling and cutting of steelwork, brick work, block work, concrete, plasterboard and timber in ceilings, walls and floors etc. under the supervision of the Electrical Contractor.

Make good the building fabric and redecoration works, including the boxing in of cables and containment.

Supply and install ductwork, draw-pits, feeder pillars and lighting column, including all associated coordinate ground works, trenching, backfilling and making good etc. under the supervision of the Electrical Contractor.

Supply and install root barriers, where required.

The Electrical Contractor shall:

Carrying out all their own associated builders work involved with items such as, drilling and plugging the structure for the fixing of any Materials/Plant/Equipment, equipment or fittings etc. or the supply of any clips, brackets or holding-down bolts, non-drill steel clamps, galvanised floor plates and studding, spanning members, channel, angle iron, unistrut and must allow for the carrying out of this work and the supplying of the Materials/Plant/Equipment. This also applies to the supply, installation and painting of support steelwork for fuse gear, switchgear, cables, cable tray and wiring enclosure, starters, control gear and lighting fittings etc.

Prepare and issue to the Electrical Consultant, Structural Engineer and Main Contractor drawings showing the positions and dimensions of all holes, ducts, chases etc. to be precast, built or cut in floors, roof, walls, ceilings or at any other position for the installation of the works, including drawings showing the size and construction of plinths, bases, special support of foundations required for equipment.

Accurately mark out on site the exact position of holes, chases etc. to be formed by the Main Contractor. NOTE: The Electrical Contractor shall be responsible for checking all builders' work, created by the Main Contractor to ensure that they have been accurately formed and are fit for purpose.

Provide noggins or other forms of additional support for luminaires, accessories, distribution equipment and containment etc. where required.

Provide acoustic/fire stopping, as necessary.

37.1 Structural Engineers Approval

It shall be the Electrical Contractor's responsibility to ensure that the position of all chases and holes to be cut in or through walls, floors, ceilings or elsewhere have been approved in writing by the Structural Engineer before any work is carried out.

38. RECORD INFORMATION

The Electrical Contractor shall be responsible for the preparation and provision of record drawings and documents for every installation they have installed. The Electrical Contractor shall provide two sets of the documents, hard copies and on computer discs (in WORD, DWG and/or PDF format, as applicable). One set shall be deposited on site the other set shall be submitted to the Client.

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The following record information shall be provided as a minimum:

‘AS BUILT’ record drawings for each installation.

‘OPERATING & MAINTENANCE’ manuals, including description of Services & Manufacturers Information and any other relevant record documentation for each installation.

Installation, Testing and Commissioning Certification.

Circuit Charts.

Emergency lighting luminaire charts.

Planned Preventative Maintenance (PPM) Schedules.

The provision of information relating to the M&E services to enable the creation of a ‘BUILDING LOG BOOK’ in accordance with Building Regulations PART L and produced in accordance with CIBSE TM31 – ‘Building Log book Toolkit’.

Draft copies of all Operating and Maintenance 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 at the time of signing of the Certificate of Practical Completion.

Once the manuals have been amended to incorporate any comments made by the Contract Administrator, the Electrical Contractor shall print and submit to the Contract Administrator three copies thereof suitably bound within a hard backed ring binder.

During the course of the works the Electrical Contractor shall maintain on site a complete set of drawings marked up to identify all changes to the Electrical Contractors working drawings during the course of the works to facilitate easy and accurate preparation of the “as installed” drawings and to ensure that the drawings are in all respects a true record of the installations.

The draft manual shall include the Electrical Contractors proposed “as-installed” Record Drawings of the whole of the works of each installation as installed including the following:

Schedules of all equipment etc.

Schematic layouts as determined by the Contract Administrator.

The manuals shall be contained in volumes strongly bound and suitable for heavy usage over a long period to be read in conjunction with the “AS INSTALLED” drawings and shall comprise the following:

A general description of the scope, purpose and manner of working of each system and the apparatus forming the installations.

A detailed description of the scope, purpose and manner of working each system of automatic controls. Data on general design parameters and associated normal operating temperatures, pressures etc., based on the commissioning tests.

Clear and comprehensive instructions for the starting up, running and shut down of each system or apparatus.

Clear and comprehensive instructions for dealing with emergency conditions for each system or apparatus. Instructions in respect of any precautionary measure from time to time necessary (e.g. against corrosion or freezing).

Instructions in respect of the care of apparatus normally subject to seasonal disuse.

Instructions as to the nature, extent and frequency of servicing necessary to properly maintain the Works in good condition as to the Materials/Plant/Equipment to be used for this purpose. This information shall be supported by maintenance instructions provided by the suppliers of particular component apparatus.

The names and addresses of suppliers of all major components of the installations as may potentially be required to obtain spare parts or replacements.

List of recommended spares.

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Test and completion certificates.

Commissioning Reports from equipment manufacturers and commissioning specialists.

Copies of manufacturer's data shall be supplied in respect of the nature, type and method of operation of specific items of equipment. Such data, in the form of individual booklets and the like, shall be indexed and cross referenced to the Operating and Maintenance Instructions.

Where the Works include modifications to existing installations the Electrical Contractor shall include in the Operating and Maintenance Instructions all the above information for the existing installations whether included in the works or not.

The "as-installed" drawings and schedules shall be specially prepared for record purposes, and copies as finally provided shall be included within the operating and maintenance manuals consisting of one set of full size prints on heavy quality paper, one full set of photo-reduced A3 prints and on a compact disk (or DVD), per manual.

Drawing information shall be supplied electronically on disc in the latest version of AutoCAD.

A full electronic copy of the complete finalised manuals shall also be provided on the aforementioned compact disc or DVD in PDF format. After the installations are completed, tested, set to work and handed over, the Electrical Contractor shall supervise and be completely responsible for the running of all installations for a period of one week. During this period the Electrical Contractor shall instruct the maintenance and on site staff in the running, operating and maintenance of the installations, in particular any specialist installations. Subject to the satisfactory completion of the foregoing the Contract Administrator will then issue a Certificate of Practical Completion.

39. TENANT'S HANDBOOK

The Electrical Contractor shall provide the each building with a Tenants Handbook, which shall contain emergency contact numbers, together with sufficient information so that the occupier knows how each system works, how to operate the various electrical installations and test, as applicable the various electrical installations that have been installed in their building, such as:

Operation of MCB/RCD's in consumer units.

Extract fans.

IRS, Satellite television/radio system.

Smoke, Heat & Co detection system. Explain how to silence nuisance alarms and explain the need to cover the alarm units when redecorating.

White goods - as applicable.

The Electrical Contractor shall submit to the Contract Administrator, Electrical Consultant and the Main Contractor (not less than 30 working days before the Practical Completion date) one copy of their 'Tenants Handbook' in PDF format for comment.

40. EMERGENCY CALL OUT

For the duration of the contract and for the defects period an Emergency Callout Service must be available 24 hours per day at all times including week-ends and bank holidays.

The Call Out is to be covered as soon as possible and the operative attending site must be on site within 2 hours of receiving the Emergency Call Out notice. If the Electrical Contractor is unable to respond to the call out within the time specified, attendance by others operating on a representative basis for the Electrical Contractor will be acceptable but the standard and performance of the representative is entirely the responsibility of the Electrical Contractor.

In the event of failure by the Electrical Contractor to respond to the call out within the time stipulated, the Client reserves the right to employ and pay others to carry out the work involved and the costs incurred will be deducted by

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the Client from any monies due to the Electrical Contractor under this contract or will be recoverable from the Electrical Contractor by the Client as a debt. This action will in no way invalidate the guarantee inherent in the defects liability period implicit in the terms of the contract.

The cost to the Electrical Contractor of putting the equipment and associated Electrical Systems into working order will be at the Electrical Contractor's expense and at no cost to the Client unless the work involved or the fault attended to is deemed by the Client to be outside the terms of the contract.

To Contractor, upon being given an order for the contract works, shall provide the Client with a Callout telephone number or numbers where 24 hour contact will be available and the Client will give corresponding 24 hour Call Out contact numbers for the relay of information.

Included in this Emergency Callout Procedure is the attendance to any operational fault or breakdown to any temporary Materials/Plant/Equipment that may be installed as part of the contract.

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41. APPENDIX A – SCHEDULE OF EQUIPMENT & ACCESSORIES

The Electrical Contractor shall be responsible for ensuring that similar groups of equipment (such as panel boards, switchgear, distribution equipment and protective devices) are selected from one manufacturer and are of a similar type/range/style/finish to ensure uniformity throughout the building.

Item	Choice of manufacturer	Range	List No.
Meter box - White Glass reinforced plastic (GRP) box, fitted with a fire retardant backboard and lockable hinged door	Mitras Composites (UK) Ltd	Standard fire retardant range	As applicable
Building DNO 100A DP switch	Wylex	-	REC2
Consumer unit – Metal case	Eaton	Memra	As applicable
	Hager	Design 30	
	MK Electric	Sentry	
	Schneider Electric	Resi9	
	Wylex	NM All metal	
	Apex Energy UK	40A single-phase	ADVO0401
Lighting & Small power accessories - 'WHITE' plastic.	Ashley Hager	White Moulded	As applicable
	Eaton	Premera	
	MK Electric	Logic Plus	
	Scolmore	Mode	
	Volex	White Moulded	
Water heater 20A DP switch marked 'WATER HEATER' 'WHITE' plastic.	Ashley Hager	White Moulded	PDP85N
	Eaton	Premera	P403N
	MK Electric	Logic Plus	K5423WHWH I
	Scolmore	Mode	CMA042
	Volex	White Moulded	VX1060WH
Cooker Control unit with integral socket Outlet, marked 'COOKER' 'WHITE' plastic.	Ashley Hager	White Moulded	PCCU200
	Eaton	Premera	P425
	MK Electric	Logic Plus	K5061WHI
	Scolmore	Mode	CMA204
	Volex	White Moulded	VX9701
Cooker Connection unit 'WHITE' plastic.	Ashley Hager	White Moulded	CCO503
	Eaton	Premera	P345
	MK Electric	Logic Plus	K5045WHI
	Scolmore	Mode	CMA215
	Volex	White Moulded	VX9704

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Item	Choice of manufacturer	Range	List No.
Shower pull cord switch with indicator 'WHITE' plastic.	Ashley Hager	White Moulded – Ceiling switch	CS445N
	Eaton	Circa – Ceiling switch	F1340
	MK Electric	Logic Plus – Ceiling switch	3164WHI
	Scolmore	Mode – Ceiling switch	PRW211
	Volex	White Moulded – Ceiling switch	VX9706
Shower 45A/50A switch with indicator 'WHITE' plastic.	Ashley Hager	White Moulded – Sollysta switch	WMDP50VN
	Eaton	Premera – Shower switch	P422N
	MK Electric	Logic Plus – Moulded switch	K5215SHWHI
	Scolmore	Mode – Control switch	CMA203
	Volex	White Moulded – Control switch	VX9702SH
Satellite/TV/DAB/FM Quadplexer outlet with telephone secondary. Generally comprising of flush mounted 4 module grid front plate, mounting plate and Satellite/TV/DAB/FM and telephone communication modules.	Ashley Hager	White Moulded	As applicable
	Eaton	Premera mix	As applicable
	MK Electric	Logic Plus	K3566DABWHI
	Scolmore	Mode	As applicable
	Volex	White Moulded	As applicable
TV Co-axial single outlet – Isolated	Ashley Hager	White Moulded	PTVI103
	Eaton	Premera	P353
	MK Electric	Logic Plus	K3521WHI
	Scolmore	Mode	CMA158
	Volex	White Moulded	
Three pole fan isolator	Ashley Hager	White Moulded	PP53P1
	Eaton	Premera	P049
	MK Electric	Logic Plus	K4859WHI
	Scolmore	Mode	CMA020
	Volex	White Moulded	D1013NR
Doorbell - Bell unit	Friedland	Festival	D3126
Doorbell - Bell push	Friedland	Sesame	D814
Optical smoke detector, mains operated	AIOC Ltd	160e Series.	Ei166e
Heat detector, mains operated	AIOC Ltd	160e Series.	Ei164e
Remote control switch	AIOC Ltd	160e Series.	Ei1529
Carbon Monoxide detector, mains operated	AIOC Ltd	160e Series.	Ei261EN
Containment	Britmac.	Metal ladder rack	
	Cableduct Ltd.	Metal or plastic trunking	
	Marshall Tufflex.	Metal cable tray	
	Philip Grahame Int Ltd.	Plastic mini-trunking	
	Tamlex.	Metal or plastic conduit (solid or flexible)	
	Unistrut.	Wire basket	
Cables	Anixter Ltd.		
	Batt Cables plc.		
	Draka Cables Ltd.		
	Pirelli Cables Ltd.		
	Prysmian Cables Ltd.		

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42. APPENDIX NO.2 – MOUNTING HEIGHTS

Unless detailed otherwise in this specification or shown on the drawings, Materials/Plant/Equipment shall be installed at the height given in the tables below. **NOTE:** Mechanical items shall be installed at heights detailed in the mechanical services specification and/or drawings.

In wheelchair dwellings 13A socket outlets located above worktops can be mounted on pedestal boxes fixed to the worktop. Provide easily accessible remote switching for these sockets.

In wheelchair dwellings locate accessories at least 350mm from internal corners.

No accessories shall be mounted above the space allocated/occupied by a cooker/hob or tall fridge/freezer.

Items shown on the drawings with the following suffixes shall mean:

LL – Item located at low level, 450mm – 600mm FFL to underside of item.

WL – Item located above Worktop level, 75mm -150mm from worktop to underside of accessory.

HL – Item located at High level, 2100mm AFFL to U/S of item, but at least 25mm from ceiling.

All heights in the following table are in millimetres (mm).

ITEM	From FFL to U/S of item	From FFL to top of item	NOTES
Consumer unit.	-	-	Install so that circuit-protective devices (CPDs) are between 1350mm and 1450mm above finished floor level.
Light switch.	-	-	900mm - 1200mm from FFL to top of accessory, generally align with door handles.
Pull cord light switch.	1200 - 1400	-	Heights are from FFL to U/S of cord bangle. In wheelchair dwellings 600mm from FFL to U/S of cord bangle. Cord to be colour 'WHITE'.
13A socket outlet.	450	-	Locate at least 300mm away from the edge of sinks/draining board or cooker/hobs.
Fused connection unit.	450	-	Height to match 13A socket outlets, but may vary to suit equipment connection point.
SAT/ TV / Telephone outlet.	450	-	Height to match 13A socket outlets.
Flex outlet plate.	450	-	Height to match equipment connection point.
Cooker control unit.	-	-	Locate above worktop (WL) on right hand side as you face the cooker.
Cooker connection unit.	450	-	Locate connection unit central to appliance position.
Three pole fan isolator.	2100	-	Height to match equipment connection point.
Heating controls, such as boiler programmer, timer, thermostat.	-	750 - 1000	Ensure item can be easily reached/ operated.

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43. APPENDIX NO.3 – LUMINAIRE SCHEDULE

The following table is provided as a guide to the preferred type of luminaire to be installed in a particular room/area, as shown on the drawings. Where a specific room/area is not detailed on the drawings then the Electrical Contractor shall apply the general principles for a similar room/area detailed in the table below:

Ref	Luminaire Type		
A	Make:	MK ELECTRIC LTD.	
	Range:	PENDANT SET.	
	Description:	Surface ceiling mounted pendant set and 150 mm heat resistant flexible wire and shade ring, c/w 1 x 13w Warm White (100W equivalent) Bayonet Cap B22 non-dimmable GLS Style 2700K LED lamp. Luminaire body colour 'WHITE'.	
	List No:	1186WHI.	
B	Make:	MK ELECTRIC LTD.	
	Range:	BATTEN LAMP HOLDER	
	Description:	Surface ceiling mounted batten lamp holder with home office skirt, c/w 1 x 13w Warm White (100W equivalent) Bayonet Cap B22 non-dimmable GLS Style 2700K LED lamp. Luminaire body colour 'WHITE'.	
	List No:	1174WHI	
C	Make:	NVC LIGHTING LTD.	
	Range:	PORTLAND LED	
	Description:	IP54. 325mm dia. x 100 (d) mm. Surface ceiling mounted circular 15W 5000K Cool White LED luminaire with opal polycarbonate diffuser. Luminaire body colour 'WHITE'.	
	List No:	NPO15LED/WH/O/850	
D	Make:	NVC LIGHTING LTD.	
	Range:	PHEONIX LED	
	Description:	IP20. 1527 (l) x 61 (w) x 64 (d) mm. Surface mounted, linear 40W 5000K Cool White LED luminaire, fitted with opal polycarbonate diffuser. Luminaire body colour 'WHITE'.	
	List No:	Luminaire - PH40/LED/850. Diffuser - NPH/CNTR/LED/40	
E	Make:	NVC LIGHTING LTD.	
	Range:	SPARTAN LED	
	Description:	IP65. 278 (dia.) x 86 (d) mm. Surface wall mounted circular 15W LED luminaire with opal polycarbonate diffuser, integral dusk till dawn photocell. Luminaire body colour 'BLACK'.	
	List No:	NSP15/BK/840.	

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Ref	Luminaire Type	
F	Make:	ASD LIGHTING LTD.
	Range:	CLARITY - PORTRAIT
	Description:	IP65. 276 (h) x 190 (w) x 125 (d) mm. Surface wall mounted oval 7.8W LED luminaire with opal polycarbonate diffuser, eyelid cover and integral Photocell. Luminaire body colour 'BLACK'.
	List No:	C2P/BLE4LED600C.

