ELECTRICAL SERVICES SPECIFICATION FOR

NEW SPORTS PAVILION SAWTRY

Ref :	AX 1937	**Client:** Sawtry Parish Council
Prepared by :	N Ross	
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Approved By :	AW	

Axis Mechanical & Electrical Consulting Engineers

No.8 Poplars Court, Lenton Lane, Nottingham, NG7 2RR

tel: +44 (0)115 979 1875 **fax:** +44 (0)115 924 9179 **email:** mail@axisconsult.co.uk

Axis M&E Consulting Engineers Ltd Company Registration : 6186328

REVISIONS

Revision	Clause	Amendment
A		Tender Issue
B		Updated Lighting Schedules

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STANDARD M&E CONTRACTUAL CLAUSES

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STANDARD M&E CONTRACTUAL CLAUSES
FOR
DOMESTIC SUB-CONTRACT PROJECTS
TRADITIONAL (NON-DESIGN & BUILD) PROCUREMENT METHODS

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1.1 PROJECT PARTICULARS

Particulars of the project as a whole are given within the Main Contract Preliminaries.

The Contractor will be appointed as a Sub-Contractor to the Main Contractor. All Sub-Contract conditions shall be agreed with the Main Contractor.

The term Sub-Contractor when used within this specification and is deemed to be synonymous with the term Subtrader and the like which may be used elsewhere within the Contract Documentation.

Contractor, Electrical Contractor, or Mechanical Contractor referred to in this specification shall also be synonymous with the term Sub-Contractor

The Sub-Contractor shall include within their tender for the surveying of the building site, design, production of calculations, specification, drawings, purchase, delivery to site, off-loading, moving into position, marking out, setting up, alignment, erecting, fixing, wiring, connecting, setting to work, commissioning, testing, O & M Manuals, teaching and demonstrating the whole works as described in the Specification.

For a period of 12 months from the handover date, the Sub-Contractor shall repair and make good any defects arising in connection with the installation and / or equipment free of charge.

Details of the Pre-tender health and safety plan are included in the Main Contract Preliminaries Section.

The installation shall be carried out and in accordance with the specification / tender documentation and shall be in compliance with all current applicable standards and legislation.

Contractors are invited to submit a tender based on this document. If ultimately appointed the successful Contractor shall produce all working drawings / details etc., against this document for installation within the proposed development.

The construction programme shall be confirmed with the Main Contractor along with start and completion dates and other programme details.

The mechanical and electrical installation shall be as aesthetically pleasing, and appropriate for the building operation.

Information on the building layout, construction methods and finishes shall be obtained by consulting the Architects and Structural Engineers drawings and details, these should be obtained through the Main Contractor.

1.2 DEFINITIONS AND INTERPRETATIONS

Where used in the documentation the following definitions apply:

“ENGINEER” shall mean the person representing Axis M&E Consulting Engineers

“CLIENT” or “EMPLOYER” shall mean the Person, Persons, Company, Authority and their Representatives who have instructed that the works shall be carried out.

“CONTRACT ADMINISTRATOR” or “SUPERVISING OFFICER” shall mean the person appointed by the Client who is responsible for the administering of the Main Contract.

“SITE ENGINEER” shall mean Chief Site Supervisor or his Representative.

"CLERK OF WORKS" shall mean the person appointed to supervise the general works.

"MAIN CONTRACTOR" or "PRINCIPAL CONTRACTOR" shall mean the Person, Firm or Company undertaking the Main Contract and shall include their successors, heirs, executors and administrators named as a party to the Main Contract and the Contractor.

"SUB CONTRACT" shall mean the Contract made between the Main Contractor and the Contractor.

"CONTRACTOR", "SUB-CONTRACTOR" or "MECHANICAL SUB_CONTRACTOR", shall mean the Person, Firm or Company whose quotation for Specialist Engineering Works forming the subject of this Specification has been accepted and who has entered into a Sub-Contract with the Main Contractor and shall include his or their successors, heirs, executors and administrators.

"SPECIFICATION" shall mean the Specification on which the Tender is based.

"MATERIALS" shall mean all plant, materials and equipment for incorporation in the works.

"WORKS" shall mean and include all materials to be used and work to be done by the Contractor under the Contract and shall include supplying, fixing, testing, regulating and commissioning of the installations described in the Specification.

"PRINCIPAL CONTRACTOR" shall mean the person appointed by the Client (or others) to act as Principal Contractor in accordance with the Construction, Design & Management Regulations 2015 and any subsequent amendments to same.

"SITE" shall mean the actual place or places to which the materials shall be delivered to where work shall be done by the Contractor, together with so much of the area surrounding the said place, or places, as the Contractor shall actually use in connection with the Works as otherwise than merely for the purpose of access to the said place or places.

"SHALL" shall mean mandatory.

"SHOULD" shall mean optional.

"WILL" shall mean informative.

1.3 TENDERING

Ensure tenders include for all work necessary to meet the requirements of the Specified Work and its completion and proper integration with the Works generally.

The tender figure shall be deemed to be fully inclusive of all charges and expenses incurred.

Tenderers are advised to visit site during the tender period to satisfy themselves of the site and the access to it.

The Contractor shall be deemed to have read the whole of the Specification and the accompanying drawings and to have checked the accuracy of all schedules and diagrams and to fully understand the intent of the scheme

Any contradictions noted between the Specification, Drawings and existing site conditions/installation must be brought to the attention of the Engineer during the Tender Period when a ruling will be given.

If there are any discrepancies in, or omissions from, the Drawings, Schedules, Manufacturers Quotations or Specifications, or if the Tenderer is in any doubt as to the true meaning of any part of the Contract Documents, they shall request clarification from the Engineer.

Where reference is given to suppliers or manufacturers quotations, the Sub-Contractor shall ensure that such quotations meet the requirements of the tender scheme with regard to both Specification and quantities and that all terms and conditions forming part of the quotations are acceptable to the Sub Contractor and that such terms and conditions will enable compliance with the tender offer.

Any catalogue or model numbers specified were current at the time of writing, in the event of these numbers changing or becoming obsolete the advice of the Engineer shall be sought before tendering.

The Sub Contractor shall also allow within his tender for all liaison required with the Architect, Client, Structural Engineer, Contractors and Sub-Contractors during the design and construction period to enable designs to be fully co-ordinated and working details discussed and agreed.

The Sub-Contractor shall allow for installing all equipment in a neat, tidy, workmanlike manner. Services shall be routed in corners and follow the building to give an aesthetically acceptable installation.

The Sub-Contractor shall allow for all building deviations, beams, etc., when estimating services runs. No extras will be allowed for failure to comply with this paragraph.

Where and to the extent that quantities are not included in the specification, tenders must include for all work shown or described in the tender documents as a whole or clearly apparent as being necessary for the complete and proper execution of the Works.

It shall be the Contractor's responsibility to establish final measurements and quantities before ordering any materials, plant or equipment from any manufacturer.

All materials and equipment shall be new unless otherwise stated in this Specification or on the tender drawings.

During the Tender Period, the Architect/Engineer may advise the Tenderers, by addenda, of additions, deletions, omissions, or alterations in the Contracts. All such addenda shall become a part of the Contract Documents as if originally provided.

The Sub-Contractor shall complete and return the tender summary, failure to return or to complete fully the tender summary may jeopardise the acceptance of the tender.
The absence of any item from the tender summary shall not be taken as an omission from the contract; the Contractor shall include for such missing items and add them to the list in a like manner.

The Employer and his representatives offer no guarantee that the lowest, or any tender, will be recommended for acceptance or accepted, and will not be responsible for any cost incurred in the preparation of any tender.

1.4 INTERIM CLAIMS FOR PAYMENT

Interim claims for payment shall include a statement indicating:-

- Value of work complete for each item from the Summary of Tender.
- Priced schedule of unfixed materials on site.
- Value of work complete against each agreed variation.
- Value of unfixed materials on site for each agreed variation.

Materials stored off site will not normally be paid for unless specific agreement is reached between the Quantity Surveyor, Main Contractor and Client in accordance with the Contract.

1.5 MANUFACTURERS/SUPPLIERS

Where manufacturers, suppliers or installers of products are NOT identified by name, select products that comply in all respects with the specification and, as and when requested, demonstrate such compliance.

Where manufacturers, suppliers or installers of products ARE identified by name, or names, but reference is made to "Or approved" equivalent, the submitted tender must include the named or one of the named suppliers. Alternatives may be selected and shall be submitted to the CA for approval, separately.

Check that any proposed alternatives comply with any stated British (or other equivalent recognised International) Standards. Confirm equivalence in quality, operation and space requirements to those items which have been specified by name. If, and when requested demonstrate the proposed alternative is fully equivalent to the specified item and identify any constructional, cost, programme, maintenance or other differences.

A list of proposed manufacturers/supplies of products, equipment and plant, including all items for which the choice of manufacturer/supplier is at the discretion of the Subcontractor, must be submitted with the Tender.

1.6 ALTERNATIVE MANUFACTURERS/SUPPLIERS

The Sub-Contractor shall base the tender on the specified items / manufacturer, however, the successful Tenderer may approach the Engineer with suggested alternatives before commencing on site.

In addition to and at the same time as his tender for the Subcontract Works as defined in the tender documents, the Subcontractor may, at his discretion, submit alternative design proposals and/or method(s) of construction/installation for consideration.

Any alternative material offered shall not form part of the Tender offer but will be considered provided there is a benefit to be gained either in cost, quality or delivery.

Such alternative(s) must be clearly priced as a cost option and include all additional costs arising from necessary changes to the details of the installation, including changes to the design and drawings, as well as any associated ancillary equipment items.
Full technical data for each such alternative must be submitted with the Tender together with details of any consequential amendments to the design and/or construction/ installation of other parts of the Works.

The design responsibility for the change will be rest with the Sub-Contractor who will be required to confirm to the Engineer via the Main Contractor, that he (the Contractor) indemnifies the Engineer for any time spent and costs incurred by the Engineer as a direct result of changing from the materials originally specified.

The Sub-Contractor must ensure that all specified materials are correctly applied and installed strictly in accordance with the manufacturers advice and requirements. Any conflict between information given in the Specification and/or tender drawings and that given by the manufacturer must be brought to the attention of the Engineer before tenders are submitted.

Any costs incurred by the Sub-Contractor through not installing materials in accordance with the manufacturers requirements will not be reimbursed through the Main Contract.

1.7 SCHEDULE OF RATES

A schedule of rates must be submitted with the Tender, or within 14 days of request.

It must include all items and materials included in the tender, together with their rates, extended and totaled. The rates given shall be inclusive of all on-costs. Price Preliminaries separately

Such totals shall agree with the Subcontract Sum and subtotals shall agree with the priced breakdown of the tender.

Correction of errors in the quantification will not lead to adjustment of the Subcontract Sum.

The prices given shall be the installed cost to the Client and shall be used for costing variations to the Contract and the evaluation of work for interim payments.

When used for costing variations of a like basis it is deemed that the schedule price given includes for all costs associated with contract administration overheads and profit and that no additional charges will be levied.

1.8 VARIATIONS

General additions or omissions of work shall only be carried out on receipt of written instructions in accordance with the General Conditions of Contract.

No order for such alterations, additions, or omissions will be issued until an estimate of cost has been submitted by the Contractor unless specifically instructed in writing by the Supervising Officer.

1.9 CDM REGULATIONS

The Contractor shall include in his tender for fully complying with all requirements of the current UK Health and Safety Legislation, Regulations and Codes of Practice, including the 2015 CDM Regulations and any transitional provision of the regulations and subsequent amendments.

Comply with the requirements of the CDM Regulations by:

- Adhering to the rules of the Health and Safety Plan.
- Reporting accidents, injuries or dangerous occurrences to the main contractor.
- Providing the main contractor with appropriate input to the health and safety plan, including risk assessments, and to the health and safety file.
- Providing the main contractor with information on the subcontract works which might affect the health or safety of any person.

The Contractor shall include for the continual update of documents, etc. as necessary, and for the provision of all record drawings, plans, maintenance procedures, O & M Manuals, details and locations of all materials used during the construction phase, etc., as required by the Health and Safety Executive

Provide any other documents that may be required such that a completed Health and Safety Manual can be finally produced and handed to the Client by the PD/PC or other party in order that the Client *has final documentation to satisfy the CDM Regulations and to enable the Client to operate and* maintain the "Works" in accordance with HSE Legislation.

1.10 STANDARDS AND REGULATIONS

Provide all materials and works in accordance with the appropriate British Standard or Code of Practice and where no BS or CP is applicable the Agreement Certificate for the particular item.

Comply with all statutory instruments and regulations, relating to the area of the site current at the date of tender.

Comply with the requirements of the Local Authority Building Inspector.

Comply with all Statutory Obligations arising from current relevant legislation and regulations, together with other requirements, such as the following (see also particular specification sections).

- Relevant British & European Standards
- Relevant CIBSE design guides / commissioning codes / technical memoranda etc.
- Current Building Regulations
- Institution of Gas Engineers Publications (Institute of Gas Engineers & Managers IGEM/UP/2) / CORGI standards / Gas Safe Standards
- Current IET Wiring Regulations and associated British Standards
- HVCA Guides & Good Practice Notes
- Statutory Obligations
- Health and Safety at Work etc Act 1974
- Management of Health & Safety at Work Regulations 1999
- Gas Safety (Management) Regulations 1996
- Gas Safety (Installation and Use) Regulations 1998
- Public Health Acts
- Electricity Acts
- Electricity at Work Regulations 1989
- Factories Act 1961
- The Workplace (Health, Safety and Welfare) Regulations 1992
- The Construction (Design and Management) Regulations 2015
- The Health and Safety (Display Screen Equipment) Regulations 1992
- The Control of Substances Hazardous to Health (COSHH) Regulations 2002
- The Control of Substances Hazardous to Health (Amendment) Regulations 2003
- Control of Asbestos at Work Regulations 2012
- Personal Protective Equipment at Work Regulations 1992; 2002
- The Construction (General Provisions) Regulations 1961
- The Lifting Operations and Lifting Equipment Regulations 1998
- Other relevant Safety Regulations
- Water Supply (Water Fittings) Regulations 1999
- Water Supply (Water Quality) Regulations 2010
- Relevant CIBSE design guides / commissioning codes / technical memoranda etc.
- Public Utility Company and/or Statutory Authority regulations, specifications, and requirements.
- British Standards and Codes of Practice.
- BS 7671 - Requirements for Electrical Installations (IEE Wiring Regulations).
- Insurance Company Requirements.
- LDSA Fire Safety Guides.
- IEC Standards.
- SLL Lighting Guides
- Hospital Technical Memorandums
- Building Bulletins

Ensure all equipment and systems are installed in accordance with the relevant standards and that operational compatibility exists between the systems and any other system installed at the same location.

Any installation or parts thereof installed by the Contractor deemed by the Engineer to be untidy, installed incorrectly, or not in accordance with the above will be removed and correctly installed to the satisfaction of the Engineers at the Contractors cost. Any subsequent costs caused by abortive builders' works, making good, delay or disruption to other trades will be met by the Contractor.

In laying out the works, the Contractor shall at all times give proper consideration to the future maintenance of the plant and shall include for such component parts as are available from the manufacturer of the equipment or plant to ensure ease of maintenance.

1.11 TENDER DRAWINGS

Tender drawings means drawings listed in within the appendix of this specification

The drawings provided (together with this Specification) are intended to provide sufficient information to enable tenders to provide estimates for the required work and provide the basis for working drawings. Not all items or matters referred to in the Specification are indicated on the drawings and similarly not all items detailed on the drawings are described in the Specification.

It is the responsibility of the tenderer for all materials, items of equipment, etc. necessary to provide a complete finished installation as intended and for offsetting and alteration of service runs to achieve co-ordination with the building and other services/equipment, etc.

The tenderer shall, upon request, be provided full access to all available relevant project drawings.

Claims for additional payment for alterations or additions to the works brought about by conflict between the works and building detail or other services will not be considered if the information was available to avoid such conflict prior to tender.

Unless previously advised by the Engineer the tender drawings are not intended for use as working drawings.

1.12 INSTALLATION / WORKING DRAWING

The Contractor shall provide and prepare a full set of working drawings. The drawings shall be to a scale not less than the tender drawings. The working drawings shall be used to enable installation of the works and to enable other Contractors to produce co-ordinated working details

The main features of installation drawings should be as follows:

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

The Sub-Contractor should liaise with the Main Contractor to obtain Architectural/Structural Engineering Drawings.

The Contractor shall through the Main Contractor provide duplicate copies of all drawings for the Architect, other Service Contractors, Structural Engineer and Engineer at least 15 working days before work or fabrication commences.

The Contractor shall be fully responsible for any errors in these drawings whether or not approved by the Engineer. No additional costs will be payable as a result of error or as a result of lack of co-ordination between building detail and drawings or between services, and, in addition, all costs resulting from disruption to other trades as a result of error or oversight shall be born by the Contractor.

The tender drawings are not intended for use as working drawings. However, reproducible copies of the tender drawings will be made available upon request for use by the Contractor as a basis for preparing his working drawings. The Contractor shall take full responsibility for all details shown on the final working drawings.

A full set of drawings shall be kept on site in order that a record of all service runs, and changes to the working drawings can be maintained. These drawings shall form the basis for the "As Fitted" drawings.

1.13 BUILDER'S WORK DRAWINGS

Builder's work is excluded from the Subcontract. Builder's Work excludes drilling and/or plugging walls, floors, ceilings etc., for fixings of service, such work is included in the Subcontract.

The Contractor shall provide all information with regard to builders' work in connection with the services as and when required. Provide fully dimensioned drawings showing both size and position of builder's work.

The Contractor shall be responsible for establishing at the start of the contract the nature of the information that will be required and for providing the information in whatever means that may be agreed.

Generally all items of builders work other than chases shall be detailed on drawings provided by the Contractor, the drawings shall be prepared in good time so as in no way to impair the progress of construction. Drawing to show requirements for building works necessary to facilitate the installation of the engineering services (other than where it is appropriate to mark out on site).

1.14 AS-INSTALLED DRAWINGS

The Contractor shall produce the "As Fitted" drawings which shall be based on the tender drawings and shall be equal in quality to the tender drawings.

Drawing shall show the building and services installations as installed at the date of practical completion. The main features of the record drawings should be as follows:

- Provide a record of the locations of all the systems and components installed including pumps, fans, valves, strainers, terminals, electrical switchgear, distribution and components.
- Use a scale not less than that of the installation / tender drawings.
- Have marked on the drawings the positions of access points for operating and maintenance purposes.

- The drawings should not be dimensioned unless the inclusion of a dimension is considered necessary for location.

The drawings shall include all relevant information and shall exclude any information that is relevant only during tender and construction. Each drawings shall be clearly labelled "As Fitted Drawing" and shall bear the Contractors title block.

The Contractor shall maintain on site, a record of all changes to the tender scheme as works proceed so that "As Fitted" drawings can be produced immediately after the installation has been completed.

The Contractor shall submit one set of "As Fitted" drawings to the Supervising Officer for approval. Immediately following such approval, the Contractor shall forward to the Supervising Officer one set of drawings in reproducible form and/or on disc which shall be retained by the Client for record purposes.

Late production of the "As Fitted" Drawings will delay certification of the final account and completion.

1.15 PREPARATION OF DRAWINGS

Prepare drawings to commonly recognised scales generally on A1 sheets and details and schedules on A4 sheets.

Use symbols and line conventions in accordance with BS EN ISO 3766, BS EN ISO 7518 and BS EN ISO 11091 Recommendations for symbols and other graphic conventions.

Agree with the EA the document numbering/registration system to be used before preparing any documents.

1.16 DIMENSIONS

Where installations are dependent upon site dimensions ensure that these are available before proceeding with the Works.

Do not take dimensions by scaling from the drawings. Where dimensions are indicated on drawings check these on site, as appropriate, to ensure building construction and manufacturing tolerances can be accommodated.

Do not order or manufacture equipment using dimensions indicated on the Tender drawings, specification or schedules.

Where setting out is undertaken by the Main Contractor check its accuracy and obtain his approval before proceeding with the work.

1.17 MANAGEMENT OF THE WORKS

The Contractor must, during the construction of the works, engage a competent foreman on site to supervise the work, whose identity shall not be changed without the written agreement of the Supervising Officer.

The foreman must be capable of taking decisions and receiving instructions which are binding on the Contractor.

1.18 LIASON / COOPERATION

Co-operate with the Contractor, other subcontractors, suppliers, local authorities and statutory undertakings in the execution of their work.

The Main Contractor shall be responsible for co-ordinating the works of all Sub-Contractors. Under the direction of the Main Contractor, the Contractor shall fully liaise with all other trades whilst preparing working drawings and whilst installing the works.

Before carrying out any work on, or making connections to, any plant or equipment supplied by others, the Contractor shall verify the exact position and nature of the equipment on site with the appropriate Contractor or Supplier and shall take into account and accommodate positions of services and connections installed by other trades.

The Contractor shall ascertain the exact position of all switches, socket outlets, radiators, etc. and to verify the positions of any fixed furniture, or special finishes, the swing of doors, tile layouts and any other such like factors which may affect the arrangement of the works.

1.19 COORDINATION

The Contractor shall be responsible for detailed co-ordination of their installations with the building structure, existing / proposed services (including services to be provided by other contractors), site conditions and all proposed and existing equipment.

The Contractor shall include for liaising with and maintaining a close working relationship with all other contractors on site, including any contractors employed direct by The Employer. It is important that the location of plant and routing of services is coordinated to ensure the orderly installation of plant and equipment and for the subsequent successful operation of the building.

Particular attention shall be paid to services installed within ceiling voids. Co-ordination shall be carried out by the Contractor as an integral part of the process of preparing working/installation drawings.

Services shall be fully coordinated with the positions of all furniture and other fixed equipment (including process equipment/plant). Where detailed information on the layout of the above is not provided, the Contractor shall request this information before undertaken any detailed design works or attempting to coordinate the position of the electrical services.

Ensure that in locating and routing services, the operational and maintenance access to all equipment and services is maintained, to allow for the regular removal of parts for cleaning and servicing.
The Electrical Sub-Contractor shall allow for all costs associated with the co-ordinating the services installations. Any costs arising from failure to carry out this exercise prior to works commencing on the site shall be borne by the Electrical Sub-Contractor.

1.20 PROGRAMME & PROGRESS

Provide detailed services programmes to assist the Contractor in producing a Master Programme for the Contract Works.

Due allowance is to be made in the programme(s) for the Works for, but not limited to, the following:

- Ordering and installation periods.
- The completion of drawing, etc. including the minimum working days for comment 14 working days.

- Work resulting from instructions issued in respect to the expenditure of provisional sums.
- Concurrent work by other trades.
- Any temporary works necessary for the completion of the engineering services installations.
- Pre-commissioning, commissioning and performance testing of the engineering services installations.
- Preparation and provision of Record Drawings and Operating and Maintenance Manuals.

Provide a separate and detailed commissioning programme for agreement with the EA. Make due allowance for the following:

- Commissioning, demonstration and instruction procedures.
- Provision of written notice before each (or series of) test, inspection, commissioning or demonstration procedures are to be carried out, not less than ten working days
- Demonstration to the EA that test instruments and equipment are accurate.

Record progress of the Works weekly on a copy of the programme kept on site. Update or redraft programme if any circumstances arise which affect the progress of the Works.

1.21 STATUTORY AUTHORITIES / UTILITIES

Orders for the incoming services may be placed by the Subcontractor. Include within the tender for all time / resources associated with liaison / placing orders

Liaise with the Statutory Authorities and provide any test notices required to ensure final connections are made in accordance with the requirements of the testing and commissioning programme.

1.22 DELIVERY / HANDLING / STORAGE

Provide adequate and safe protection for all materials and products during transport to site.

Deliver all tubes, conduit, trunking and associated equipment with open ends effectively plugged, capped or sealed.

Offload and transport about the Works all materials and products as recommended by manufacturers.

The Contractor shall ensure that the condition of all materials and equipment is maintained during the course of the Contract and that no damage, corrosion, soiling or deterioration of any kind affects the materials or equipment

Store all materials and products as recommended by manufacturers. Provide sufficient, safe and secure storage for all materials and products. Provide racks to prevent distortion for storage of conduits, pipes and similar materials.

Store all fittings, accessories and sundry items in clean bins or bagged and stowed in racks and maintained under suitable weatherproof cover.

1.23 PROTECTION OF THE INSTALLATION

Provide adequate and safe protection for all materials and products after installation. Check regularly the protection provided after installation of equipment and inform the Main Contractor if inadequate.

Install items such as grilles, diffusers, lighting fittings, switches, accessories etc. as near to completion as practicable. Only install filter media when the plant items concerned are being commissioned and tested.

Protect during erection all easily damaged materials with hardboard covers or heavy duty polythene sheet. Such items include but are not limited to control panels, switchboards, distribution boards.

Cap all open ends of pipes, ducts, conduit and trunking etc except when being worked upon. Leave plant and equipment in a ready to paint condition where specified as part of the Works or to be carried out by others.

Leave plant and equipment in a ready to paint condition where specified as part of the Works or to be carried out by others. Paint parts liable to corrosion immediately after removal of any temporary protection.

Replace material, plant or equipment where deterioration or damage has occurred prior to handover.
The Contractor shall be responsible for ensuring that proper precautions are taken to protect the building and its contents where naked flame is used in the course of the installation, commissioning or testing.

Ensure that fire extinguishers, fire blankets or other devices required by the local Fire Officer are available in areas where such hazards exist.

1.24 COVERING UP

Ensure no section of the Works are covered, concealed, or insulated until inspected and completion of a witnessed satisfactory test.

Give notice when Works which are to be covered or concealed are ready for examination and/or measurement of not less than 7 days.

1.25 TESTING AND COMMISSIONING

The Contractor shall ensure that the whole of the works are complete, tested and commissioned before the final inspection is carried out by the Engineer.

The Engineer will not certify completion until all works under the Contract have been completed, tested and demonstrated to his complete satisfaction.

Agree a programme for pre-commissioning checks, setting to work, commissioning and performance testing, and allow for all costs incurred. Compile a detailed commissioning programme and confirm/agree with the main contractor.

Appoint an "approved engineer", to supervise the whole of the testing, commissioning, performance testing and instruction of client's staff.

Provide a written statement to the Engineer confirming that each installation has been correctly tested and commissioned and that the performance requirements can be achieved.

Demonstrate to the Engineer that all system components are operating correctly, and the completely integrated installation will function in accordance with the specified performance requirements.

Where required, provide formal method statements supported by risk assessments detailing all commissioning procedures.

Provide all necessary facilities to enable tests to be witnessed and inspections carried out either on site or at manufacturer's works.

Test all equipment, material and systems as detailed in Sections. If an inspection or test fails, repeat the procedure, until satisfactory results are obtained.

Complete all tests before any paint, cladding or similar materials are applied or before services are concealed.

Ensure all requirements such as cleanliness, protection from harmful external and internal elements
etc. are provided prior to commencement of commissioning.

Provide test equipment subject to a quality assurance procedure complying with BS EN ISO 10012.

Do not start performance testing, including system demonstration, system proving or environmental and capacity testing, until commissioning of the system is completed to the satisfaction of the Engineer.

Maintain on site full records of all commissioning and performance testing, cross referenced to system components and on completion of the Works include a copy in each Operating and Maintenance Manual.
Provide all certification documents for approval before any system is offered for final acceptance.

Where a test indicates non-compliance with the Specification submit immediately details of the non-compliance and proposals for corrective action.

Arrange access for personnel who require to be in attendance, to manufacturer's or other off site premises when any inspections and tests carried out.
Following satisfactory completion of testing and when the installations are in a safe and satisfactory condition, set to work, regulate and adjust, as necessary, to meet the specified design requirements.
Provide all necessary instruments and recorders to monitor systems during commissioning and performance testing.

1.26 PRACTICAL COMPLETION

When the Contractor is confident that the works are complete, he shall inform the Main Contractor whereupon an inspection will be carried out by the Engineer and a list of outstanding and/or remedial works prepared. The Contractor shall attend to all items noted immediately in order that the installation is completed to the Engineer's satisfaction before the handover date.

Practical Completion will not be achieved until works are complete to the satisfaction of the Engineer and all testing and commissioning is satisfactorily completed.

When the Engineer is satisfied that the Works are complete he will, through the Main Contractor notify the Supervising Officer accordingly and a Practical Completion Certificate will be issued to the Main Contractor by the Supervising Officer.

Failure by the Contractor to comply with these requirements will delay completion and may result in a claim by the Client for non-completion.

Systems may not, without the prior written approval of the EA be used before Practical Completion. Systems to be used before practical completion for the benefit of the Contractor and/or Subcontractor must have all defective consumable elements (including lamps and tubes) replaced by new not more than seven days prior to Practical Completion.

1.27 FINAL INSPECTION AND HANDOVER

Upon completion of all outstanding works and/or remedial works the Contractor shall notify the Main Contractor that all works are ready for handover.

A final inspection will then be carried out at an agreed date to suit all parties. The inspection will be carried out by the Engineer or his representative and a responsible representative of the Contractor shall be present. If the work has been completed to the satisfaction of the Engineer or his representative, a Handover Certificate will be issued.

1.28 OPERATION AND MAINTENANCE INFORMATION

To satisfy the provisions of the Health and Safety at Work Act the Employer will not accept handover of the installations until full and adequate information concerning the installations is in the possession of his operating and maintenance staff. Failure to comply with this requirement will delay handover.

O&M information shall include:

- Record Drawings and Schedules.
- Operating and Maintenance Manuals.
- Blank maintenance logs.
- Log book

Prepare manuals in draft as the Works progress and make suitable arrangements where the Works are subject to Partial Possession or Sectional Completion.

Prepare two temporary Manuals with provisional record drawings and preliminary performance data available at commencement of commissioning to enable Employer's staff to familiarise themselves with the installation. These should be of the same format as the final Manuals with temporary insertions for items which cannot be finalized until the installations are commissioned and performance tested.

Manual shall comprise the information detailed in the technical section of the Specification.

Provide attendance, at no expense to the Employer, to put into service, operate 24 hours a day and maintain the systems to the Employer's requirements, including the provision of suitable competent labour, in the event that the Record Drawings and/or Maintenance Manuals are not available when the Works would, in the opinion of the EA, otherwise qualify for Practical Completion.

In the event of the Subcontractor failing to provide this service satisfactorily the Employer shall be entitled to make his own arrangements and recover the full cost through the Contract.

1.29 TRAINING OF EMPLOYER'S STAFF

Before practical completion explain and demonstrate to the Client the purpose, function and operation of the installations including all items and procedures listed in the Operation and Maintenance Manual:

1.30 DEFECTS LIABILITY PERIOD

The defects liability period shall be 12 months unless stated otherwise in the Main Contract documents.

Prepare and submit records of failures or malfunctions of any part of the Subcontract Works during the Defects Liability Period, together with details of remedial action taken, subsequent re-testing and the results.

Notify the Main Contractor of damage, failures or malfunctions to the Subcontract Works demonstrably caused by incorrect operation of the installations, vandalism or other actions by a third party.

Inform the CA, via the Main Contractor, in writing when all defects are finally rectified so that an inspection may be carried out prior to the issue of a Final Certificate.

SECTION 2

STANDARD ELECTRICAL SERVICES SPECIFICATION

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2.1 STANDARD CLAUSES

The following clauses detail general requirements for Electrical Services and are to be read in conjunction with Section 3 of this Specification. Where details given in Section 3 conflict with those given in Section 2, Section 3 shall take preference.

The electrical works shall comply in all respects with the current edition of the IET Wiring Regulations (BS761).

1. Connection to District Network Operators (DNO) supply

Where connections are to be made to the DNO's supply equipment, the work shall be carried out by the DNO.

On no account shall the Contractor disconnect or connect the DNO's equipment without written consent from the DNO.

The Contractor shall make full allowance to enable the DNO to carry out their connection by providing suitable conductors, equipment space, notifications, etc.

2. Notification to DNO

The Contractor shall ensure that the test notice is forwarded to the DNO when all works, including testing, have been completed. A copy shall be sent to the Engineer.

Should the Contractor fail to sufficiently complete the installation to enable a permanent supply to be connected by the date agreed with the Main Contractor the Contractor shall be liable for any additional costs associated with a return visit by the supply company to complete the final connection unless it can be demonstrated that the delay was beyond the Contractor's control.

3. Application for Supply of Electricity

The Contractor shall apply for the supply of electricity where DNO charges are included within the Tender Sum or if this is separately stated as a requirement of this Specification.

The Electrical Contractor shall pay all charges involved in obtaining the supply unless stated otherwise in Section 3 of this Specification.

Details to be completed for the application form will be provided to the Contractor upon application to the Architect or Employers Agent as appropriate.

Where DNO connection charges are included in the Tender Sum, the supply company shall be considered as being a Sub-Contractor to the Electrical Contractor.

4. Equipment Locations

The Contractor shall ensure that all equipment installed by the Contractor is located such that satisfactory operation and maintenance of such equipment is provided and that full access is given to supply company equipment for inspection, maintenance and cabling.

No electrical services, cables, conduits, etc., shall be installed within 150 mm of any pipework. Where cables, conduits, etc., cross pipes they shall cross above the pipe.

Details of supply company equipment and layout will be made available to the Contractor upon request to the supply company.

5. Tails

The Contractor shall ensure that conductors intended for final connection to DNO equipment are of adequate length and do not exceed the maximum permitted length laid down by the

DNO and are provided with suitable protection against mechanical damage. The Contractor shall also ensure that the cross sectional area and number of conductors are suitable to enable direct connection to supply company equipment.

6. Link Boxes

Where new connections are to be made to DNO terminals, these shall not be made via link boxes, whether existing or otherwise unless specifically approved in writing by the Engineer.

Where link boxes are to form part of the approved installation, the Contractor shall ensure that upon completion of the works, these are effectively sealed against unauthorised or inadvertent access.

2.2 MAINS DISTRIBUTION

1. General

Distribution equipment shall mean those parts of the installation occurring between the DNO terminals and outgoing terminals to final sub-circuits. Such equipment shall comply with the requirements of the following Clauses.

On completion all distribution equipment shall be left provided with at least 20% spare outgoing ways to facilitate future expansion.

2. Main Switchboards

Where main switchboards are to be of the cubicle type, details will be given in Section 3 of this Specification or on the Tender Drawings. Unless otherwise stated all cubicle type switchboards shall conform to the standard given in a) below.

Where main switchboards are to be constructed using individual components, details will be given in Section 3 of this Specification or on the Tender Drawings. Main switchboards constructed on this manner shall conform to the standard for frame type switchboards detailed in b) below.

Cubicle Type Switchboards

The switchboard shall conform to the requirements of BSEN 61439-2 Form 4 Type 6 with all current revisions and to the requirements of the current edition of the IET Wiring Regulations (BS 7671) and shall be constructed to provide a degree of protection to IP54.

The switchboard shall be of sheet steel construction using heavy gauge electroplated steel and finished with polyester resin powder coating with a colour to be advised to BS 4800. If no colour is specified the switchboard shall be finished light grey (RAL 7055)

Inter-connections within the switchboard shall be made using copper busbars.

The Contractor shall ensure that glanding arrangements are suited to the type, number and size of cables to be connected and that adequate provision is made for glanding of future cables to any spare ways or spaces for spare ways that may be specified.

As a minimum all main switchboards shall be provided with an integrated multifunctional meter to enable voltage, current, power factor and KW readings to be instantaneously read and recorded. Where specified meters shall be compatible for remote connection to a centralised metering system. Further integral meters should be provided within the switchboard and throughout the electrical distribution network as required to satisfy the requirements of Part L of the Building Regulations and CIBSE TM39.

The switchboard shall be provided with an integral Surge Protection Unit conforming to the requirements of BSEN 62305-4.

The main switchboards shall be built to an arrangement which is suitable for the dimensions of the rooms space and ducting details, etc., such that clear working access is maintained at the switchboard and any adjacent equipment. The Contractor shall ensure that access for future cabling additions and alterations is adequate.

Labelling shall be fitted to all switches and other components which shall clearly describe the function and give reference numbers which relate to the distribution diagram.

All cable terminals which do not form part of an incoming or outgoing switch or circuit breaker shall be numbered to relate to a fully detailed manufacturers schematic diagram.

For precise details of label types refer to Clause 2.9.00

Frame Type Switchboards

Where switchboards are to be constructed using individual components, a frame type construction shall be employed.

Prior to manufacture of a frame type switchboard, the Contractor shall provide fully labelled and dimension drawings of the switchboard arrangement for the approval of the Engineer.

A galvanised Unistrut type frame with manufacturers accessories shall be provided to accommodate all equipment for the main switchboard and the supply company's meters and termination. Bright steel M10 hexagon set screws, double coil spring washers and bright flat washers shall be used for assembling the frame and fixing equipment to it. The frame shall be grouted to the floor and where not free standing shall be fixed to the wall with M10 rawl bolts.

Where trunking is provided for the DNO tails, the DNO shall be consulted at an early opportunity to ascertain their exact requirements regarding segregation, size, etc., of the trunking and/or conduits used for their cables.

The frame type switchboard shall be arranged and located to ensure adequate access for operation, maintenance and inspection.

Labelling shall be attached to individual components to clearly describe the function and give reference which shall relate to the distribution diagram.

For precise details of label type, refer to Clause 2.9.00

Main Earth Bar

At each incoming mains position, a purpose made main earth bar shall be provided for connection of all main earth conductors, main bonding conductors and supplementary bonding conductors.

All conductors shall be labelled and a schedule fitted adjacent to the main earth bar.

3. Sub-Main Switchboards

Sub-main switchboards shall mean those boards occurring in the electrical installation in-line between the main switchboard and distribution boards or switchgear feeding final sub-circuits but may incorporate such distribution boards or switchgear.

The requirement for sub-main switchboards are as those for main switchboards except that metering and provisions for DNO equipment are not required unless otherwise detailed in Section 3 of this Specification or shown on the Tender Drawings.

4. Busbar Chamber

The busbar chamber shall comprise of high conductivity copper busbars rated as shown on the distribution diagram and suitable cable terminating clamps or sockets for the connection of tails. The unit shall be complete with cover insulators, end plates and coloured phase identification discs.

5. Switchgear

The make, rating and types of switchgear to be used in this installation are indicated on the distribution diagram or detailed in Part 3 of this Specification. Switch fuses, fuse switches and isolating switches shall be complete with suitable fuses or solid copper links as applicable. All case circuit breakers shall be complete with suitable metal enclosures. All fuses shall be of the HRC type.

All types of switchgear, i.e. switch fuses, fused switches and isolators, shall be fitted with means for locking in the 'on' or 'off' positions.

6. Distribution Boards

The manufacturer, rating and make-up of distribution boards is indicated on the distribution diagram or detailed in Part 3 of the Specification. Where a miniature circuit breaker (MCB) distribution board is specified, the miniature circuit breakers shall be incorporated in an enclosure of the same manufacture, all spare ways on the board shall be fitted with blanking pieces unless specified otherwise.

In conditions where outgoing circuits of a single phase distribution board are enclosed in a conduit or trunking with wiring of different phases, the protective fuses shall be of 500 volt rating.

The neutral bar fitted in the distribution boards shall contain a number of ways equal to the number of outgoing fuses or MCB's plus one way for the incoming cable.

The wiring to fuse or MCB banks, neutral bars and earthing bars of distribution boards shall be arranged so that all connections are in correct sequence.

All distribution boards shall be fitted with an integral isolator and hinged lockable lid. Incoming clamp type connections shall be lugged. Single phase boards shall have laminated phase discs fitted for identification purposes.

Sub-Metering shall be provided to distribution boards in accordance with Part L of the Building Regulations and CIBSE TM39 unless agreed or detailed otherwise. As a minimum all distribution boards shall have 2 No integrated multifunctional meters to enable lighting and power consumption to be recorded separately, unless the distribution boards are designated as power or lighting only in which case only 1 No meter need be provided. Where specified meters shall be compatible for remote connection to a centralised metering system.

7. Cable Extension Boxes

Cable extension boxes shall be provided for mounting directly onto switch and fusegear assemblies, to provide adequate space for spreading cable cores before entering equipment, where this is necessary. The box shall be of the same manufacture as the equipment to which it is related. The extension box shall be complete with a hardwood or Paxolin fillet for fitting between the box and the assembly.

8. Mechanical Connections

Where distribution equipment is to be fitted together or to cable trunking a 4 mm Paxolin or hardwood fillet shall be fixed between the items to prevent the chafing of cables on metalwork. The slot cut in the fillet shall be 5 mm smaller all round than the slot in the associated metalwork.

Top and/or bottom end plate fixing screws shall be utilised where possible to secure the equipment to the busbar chamber fuse board or trunking.

9. Fuses

HRC cartridge fuses shall comply with BS 88 Part 1. Class Q1 fuses shall be supplied unless indicated in Part 3 of the Specification or on the distribution diagram.

10. Circuit List

A list of circuits in an approved form, typed on a sheet of cartridge paper, shall be provided in all distribution boards, indicating the type of circuit, cable size, number of points fed, their location, load and size of fuse or MCB installed. The list shall be fixed to the inside face of the distribution board cover or door and shall be contained in a plastic wallet.

A copy of each circuit list shall also be incorporated into the Operation and Maintenance Manuals.

The Electrical Contractor shall update existing circuit charts on projects which include refurbishment or upgrading.

11. Cable Connections

Cable connections between items of adjacent distribution equipment shall be neatly dressed and where appropriate shall be loomed using cable ties.

Final terminations shall be made using crimped type connection lugs or if a larger CSA, soldered types shall be used. Insulation tape of the appropriate colour shall be applied to all crimped connections covering 10 mm of both the cable and lug. Cable lugs shall be of the correct size without adaptation for the conductor and studs to which they are to be fitted.

Where cables are to be connected to screw terminals, the cables shall be of the correct size for the terminals. Where cables are of considerable length and are not connecting items of adjacent equipment and are to be connected to screw type terminals of an unsuitable size, final connection shall be made using crimped adapter lugs to increase or decrease the CSA of the cable as required.

All cables interconnecting items of distribution equipment shall be of the appropriate colour without the addition of coloured insulation tape.

12. Busbar Trunking

Busbar trunking shall be of sheet steel construction and finished to the manufacturers standard. Busbars shall be HDHC copper. All accessories shall be incorporated as appropriate and as recommended by the manufacturer including fire barriers and expansion couplers. Each section of busbar trunking shall be earth bonded to the adjacent section using manufacturer's bonding links.

All accessories including bends, tees, etc., shall be supplied by the manufacturer and not site made.

The cover plate to each section of busbar trunking shall bear a label giving adequate warning of the presence of live conductors and the voltage.

2.3 CABLE TYPES

1. General

This Section of the Specification deals with various types of wiring systems that may be specified in Section 3 or shown on the drawings relating to the installation of main, sub-main and sub-circuit cables.

All cables and flexible cords shall be manufactured in accordance with the latest relevant British Standard, as given in the following sub-sections of this Section of the Specification and shall be BASEC approved.

All cables shall be manufactured with LSZH insulation unless detailed otherwise.

All cables shall be delivered to site on drums or as normally supplied by the manufacturer.

All cables shall have copper conductors unless otherwise specified and shall have a minimum CSA of 1.5 mm^2. Where flexible cables are used for final connections, these shall have a minimum CSA of 0.75 mm^2.

No coil or cable or flexible cord manufactured more than one year prior to delivery to site shall be used on the installation. Every coil of cable and flexible cord shall bear the manufacturer's label firmly attached when delivered to site, the labels being retained for inspection by the Engineer.

To avoid risk of damage, cables shall only be installed when the temperature is above **zero degrees centigrade** and has been so for the previous 24 hours.

All armoured cables shall be complete with separate appropriate size CPC 6491B type cable with outer sheath coloured green/yellow.

No cables shall be installed in contact with any thermal insulation.

All cables shall be installed to the manufacturer's recommendations and in strict accordance with the current edition of the IET Wiring Regulations (BS7671).

2. Armoured Cables

General

Armoured cables shall have cross linked Polyethylene (XLPE) insulation of 600/1000 volt grade generally being armoured and finished with LSZH outer sheath to BS 6724 unless noted otherwise.

Where PVC cables are specified (external to the buildings) these shall have Polyvinyl Chloride insulation of 600/1000 volt grade generally being armoured and finished with PVC outer sheath to BS 6346 & BS 5467

Terminations

The ends of each cable shall terminate in a compression type gland to BS 6121 comprising cone grip clamp and outer seal. Hawke 151 or equivalent for internal use and type 153 or equivalent for external use shall be used.

The glands shall be complete with back nuts, earth 'Banjos' and PVC shrouds. Female bushes shall be fitted to the male thread of each gland. The whole of the gland shall be covered with a PVC shroud.

All cables shall be supported below the gland to ensure that the gland is relieved of the weight of the cable.

Where cables pass through walls, floors or the foundations of buildings, or where they are exposed and liable to damage near floor level or elsewhere, they shall be protected by sleeves or sheet steel guards, the ends of which shall be bushed or similarly protected to prevent abrasion with the cables.

Cores of stranded cables shall be terminated with suitable size lugs secured to the cable core either by soldering or by compressing the lug with a hydraulic compression tool in accordance with the cable manufacturer's recommendations, or a combination of both methods.

Cables shall be run at a minimum of 150mm from any other services. The distance shall be measured from the external distance of any lagging.

Jointing

Tee joints, and when specifically approved, straight through joints, shall be made within a cast iron protection box incorporating internal armour clamps, filled with hot pouring compound or a plastic protection box filled with a cold pouring compound.

Joints between paper insulated and PVC insulated cable shall be within a pressed copper box, which shall be plumbed to the sheath of the paper cable. The plastic cable shall be sealed with polyester impregnated tape. The inner box shall be filled with hot pouring compound. The complete joint shall be enclosed in a cast iron protection box and filled with hot pouring compound.

Joints shall be made using hot tinned copper jointing ferrules or crimp type ferrules.

Cables shall be jointed colour to colour throughout the installation. Where coloured cores are to be jointed to existing numbered cores, the Electrical Contractor shall ascertain from the supply company the system in use at the particular site or installation.

The bonding of the armouring shall be outside the protection box and shall be in accordance with the IET Regulations. The size of the bonding lead shall be determined from the cable manufacturer's published tables. The minimum thickness of compound between the cores of the cable and the sleeve of box shall be 16 mm.

3. LSZH/LSZH Cables

All such cables shall be 300/500 volt and conform to BS7211.

Cables shall be installed so as to be protected against mechanical damage and so as to prevent contact with any non-earthed metalwork other than cable fixing devices.

The cables shall be concealed as far as possible by being run in the ceiling spaces and in the cavities of proprietary brands of partitioning and behind the inner cladding of external walls.

Where cables are concealed within the fabric of masonry walls it shall be installed within a conduit such that the cable can be redrawn without disruption to the fabric. The conduit shall be fixed securely to the accessory box.

Single cables can be supported with proprietary plastic clips and loops where multiple cables are installed as a bunch. The maximum number of bunched cables shall not exceed five.

Where run on the surface the interval between supports shall not exceed 250mm.

Where run in ceiling spaces the clips shall be provided at changes of direction or atany point where mechanical stain is prevalent.

Clips shall be provided immediately adjacent to each ceiling box, switch or socket box, etc, and when entering boxes the cable sheath shall be protected by rubber

grommets or bushes.

Where the sheathing is cut back to reveal the insulation and bare earth continuity conductor, this conductor shall be sheathed with green and yellow PVC sleeving.

Care shall be taken to ensure that the outer sheathing is cut back to within the limit of the box or distribution board.

The amount of insulation removed for the purpose of termination shall be in accordance with the manufacturer's recommendations. In any instances where too little or too much insulation is removed then the contractor shall be instructed to remedy the situation without additional cost.

The removal of all insulation for the purpose of termination shall be carried out in a careful and professional manner using the correct tools and procedure. Conductors damaged during the removal procedure shall be replaced /re-terminated without additional cost.

The wiring to all multiple socket outlet circuits shall be carried out by looping from point to point. Junction boxes will only be allowed in exceptional circumstances and as agreed with the Consulting Engineer.

Lighting circuits shall be wired using multicore cable and interconnections shall be made only at lighting boxes with porcelain, or high-grade melamine shrouded brass screwed connector blocks.

No connectors will be acceptable at wall switch points unless required for the correct operation of neon indicators or energy conservation systems.

All lighting point and switch boxes shall be effectively earthed by means of a fixed brass earth terminal.

Junction boxes shall not be used without the express permission of the SO.

All cables shall be installed directly off drums and not loose coils.

Where conductors are to terminate into screw or clamp type terminals, solid conductors shall be bent back to form double thickness and stranded conductors shall be twisted. Where more than one conductor terminates in a single terminal, the cores of different conductors shall not be twisted together.

Where conductors are to terminate by use of crimped type cable terminations, the type and size of the crimp terminal shall be in accordance with the manufacturers recommendations and crimps shall be applied using the manufacturers recommended crimping tool.

All cable cores shall be of the correct colour coding and where twin core cable with CPC is used for combined switch feed and switch wire or where 3 core cable with CPC is used for 2 way switching, all cores are to be over-sleeved with red PVC sleeving.

Uninsulated circuit protective conductors shall be individually completely insulated with a single length of green/yellow PVC sleeving. The CPC shall terminate at the earth terminal of accessories and equipment and a separate conductor shall connect between the earth terminal of accessories and the earth terminal of metal accessory boxes.

Each circuit CPC shall be separately over sleeved at all termination points.

4. LSZH Cables

General

All such cables shall be 450/750 volt and conform to BS 7211.

Cables shall only be installed in heavy gauge conduit or trunking in all situations.
In trunking, all conductors in a circuit shall be bound together every 1200mm at the time of installation and with no other conductors from other circuits intertwined.

All cores with a cross sectional area of 1.5 mm^2 and greater shall have stranded conductors.

All cables shall be installed directly off drums and not loose coils.

Terminations

Where conductors are to terminate into screw or clamp type terminals, solid conductors shall be bent back to form double thickness and stranded conductors shall be twisted. Where more than one conductor terminates in a single terminal, the cores of different conductors shall not be twisted together.

Where conductors are to terminate by use of crimped type cable terminations, the type and size of the crimp terminal shall be in accordance with the manufacturer's recommendations and crimps shall be applied using the manufacturers recommended crimping tool. All cable cores shall be of the correct colour.

Jointing

Jointing of cables shall not be permitted unless specifically requested.

Any jointing of cables shall be carried out using manufacturer supplied terminal boxes or purpose made terminal boxes with fixed terminals.

Terminal boxes shall be fully enclosed and installed in accessible locations and shall be securely fixed.

5. Mineral Insulated Cables

General
This Clause details the requirements of mineral insulated copper cables. (CC, CCM and CCV cables.)

Cables shall be manufactured to conform, with BSEN 60702. 750 volt (heavy duty) grade cables shall be used unless otherwise stated in Section 3.

All cables shall be sheathed with PVC unless otherwise stated in Section 3.

The colour of the outer sheath shall be as follows: -

Orange	-	General Power
Red	-	Fire Alarms
White	-	Emergency or Standby Lighting

The minimum size of cable on sub-circuits shall be 1.5 mm^2.

The whole of the installation shall be carried out with tools recommended by, and in accordance with, the instruction and recommendations of the manufacturer.

Only Tradesmen skilled in the use of mineral insulated cables shall be employed on the installation.

Pre-assembled wiring units may be used but the Electrical Contractor shall be responsible for the accurate measurement of the cable runs.

Terminations

All joints shall be at main switches, distribution boards, switches, ceiling boxes, socket outlet boxes and fixed apparatus only. No through joints in boxes will be permitted.

All cable ends shall be sealed with cold screw-on pot type seals **with earth tails** fitted and cold plastic compound. 'Stud' caps may be used where available.

Heat Shrink Terminations are not permitted.

Tails shall be fitted with black Neoprene sleeving, except in hot situations where sleeving designed for operating temperatures of up to 150 degrees centigrade shall be used. Hot situations shall include termination within bulkhead and similar unvented lighting fittings, and connections to heating apparatus mechanically coupled to the heating system.

Tails shall be marked with identification sleeves or collars. The use of PVC tape for identification is not permitted. Main and sub-main cables shall carry the phase colouring, i.e. Red, Yellow and Blue for phases and Black for neutral conductors. Sub-circuit wiring shall be identified with Red for 'Live' and Black for neutral conductors.

With cables having conductors of 2.5 mm^2 or less, the tail end shall be bent back upon itself where it enters a connection, to present a 'fair face' to a pinching screw or clamp. The tail shall be further bound with copper wire and sweated solid, if required by the termination method.

Conductors of 6 mm^2 and over shall be terminated with cone grip type cable sockets, either lug, tag or stud type as necessary.

Where cables enter boxes and equipment the Universal Ring type gland shall be used other than where boxes with MICS cable clamps are specified.

Where the entry to the equipment or box is already tapped, the gland shall be screwed directly into the equipment, utilising reducing sockets, where necessary. The minimum entry permitted is 20 mm ET.

Where the entry is a clearance hole, the gland shall be fixed with a lock nut.

All spare ways in boxes shall be fitted with brass stopping plugs.

In external or other damp situations, and where glands are screwed into aluminium alloy fittings, bitumastic paint shall be applied to the junction between the gland and fitting and to any exposed threads.

All gland terminations shall be fitted with PVC gland shrouds. Before applying the shroud, bare metal shall be wrapped with PVC adhesive tape.

End of cable left unfixed due to the building construction must be coiled and secured to a temporary fixing and not be supported solely by the cable. All ends left temporarily un-terminated must be sealed with a liberal external application of sealing compound, held in position with self adhesive PVC tape. Alternatively 1000 mm shall be left for cutting back when the cable is terminated.

When terminating into equipment subject to vibration, a loop shall be introduced into the cable immediately before its entry into such equipment. A clear space of at least 12 mm shall be maintained at the point in the loop where the cable passes over itself.

Jointing

Jointing of cables will not be permitted unless specifically requested. Any jointing of cables shall be carried out using manufacturer supplied terminal boxes or purpose made terminal boxes with fixed terminals.

Terminal boxes shall be fully enclosed and installed in accessible locations and shall be securely fixed.

6. 'Soft Skin' Fire Resistant Screened LSZH Cables

General

This Clause details specific requirements for cables having robust mineral filled compound sheath bonded to coated aluminium foil and cross-linked thermosetting insulated copper conductors.

Cables shall be in accordance with BS 7629 and shall be 300 - 500 volt rated.

Cables shall be installed from cable drums, not coils and in strict accordance with the manufacturer's instruction. Particular attention shall be given to bending and shaping in order to maintain a circular cross section and minimum recommended bending RADII shall be adhered to. When dressing cables, particular regard shall be given to the vulnerability of silicone rubber insulation to compression and the aluminium foil to kinking.

Terminations

Unless specifically requested, flush cable terminations contained within the fabric of the building and not susceptible to movement shall enter accessory boxes and other enclosures via holes with rubber grommets.

All terminations shall be made via cable glands as supplied by the manufacturer and shall either be screwed into threaded entries or fitted with a locknut to clearance hole entries. Cables shall be stripped using the manufacturers stripping tool.

In all external situations and those where moisture may be present, cable glands shall be fitted with PVC shrouds. In all cases, cable ends shall be fitted with plastic ferrules as supplied by the manufacturer which shall be slid over the conductors to protect the core insulation from chafing against the aluminium foil.

At all terminations, those conductors insulated with silicone rubber shall be fitted with PVC over-sheath to provide additional mechanical protection. PVC over-sheathing shall be of the correct colour code.

The earthing conductor (CPC) shall be fully insulated with Green/Yellow PVC sleeving.

Jointing

Joints in cables shall not be permitted unless specifically approved. Joints shall be made in fully enclosed housings provided with fixed terminals.

7. LSZH Flexible Cables

General

This clause details specific requirements for flexible cables insulated and sheathed with LSZH (flexible cords).

Cables shall be in accordance with BS EN 50525-3-11 and shall be 300 - 500 volt graded.

Cables shall have conductors with 1.0 mm^2 minimum cross sectional area.

All cores shall be insulated with material of the correct colour coding.

Flexible cables shall be used for final connections to plant and equipment and shall not be used for fixed wiring.

Final connections shall be of minimum length with the outlet mounted immediately adjacent.

Terminations

All cables shall be made off into accessories, terminal boxes and equipment by means of correctly sized packing glands fixed with locknut or by means specifically provided by the manufacturer of equipment or accessory into which the cable is to terminate. The Contractor shall ensure that any such facility provided by the manufacturer is suited to the type and dimensions of the cable to be connected.

Where single conductors are to terminate into a screw or clamp type terminal, the standard cores shall be twisted and the conductor bent back double. Where more than one conductor is to terminate in a screw or clamp type terminal, conductors shall not be bent back double but the stranded cores shall be twisted. Conductors shall not be twisted together with other conductors.

Where crimp type connectors are to be fitted to conductors, these shall be the correct size and type and shall be crimped using the tool recommended by the manufacturer.

Jointing

Joints shall not be permitted in flexible cables unless forming part of a trailing lead. Joints in trailing leads shall be by means or trailing type plug and socket connections.

8. Aluminium

General

This clause details specific requirements for cables having aluminium armouring, sheath and/or conductors.

Cables with aluminium armouring, sheath or conductors shall not be used without prior approval of the Engineer in writing.

Cables containing aluminium shall comply to the latest British Standards and shall be installed by suitably experienced and qualified operatives in strict accordance with the manufacturer's recommendations.

Stranded aluminium conductors shall not be used.

Terminations

Where aluminium conductors are to terminate in tunnel type terminals, shaped conductors shall be formed circular by swaging using the appropriate dies and compression tool so that when fitted with a split brass sleeve it gives the minimum clearance within the terminal.

Where aluminium conductors are to terminate in stud and clamp type terminals using crimped cable sockets or crimped cable lugs, cable sockets, split sleeves and compression tools and dies used on the installation shall be those recommended by the cable manufacturer.

A smear of corrosion preventative jointing compound shall be applied at the interface of al bi-metallic connections to prevent interaction between the dissimilar metals.

Jointing

Where cables are to be jointed, joints shall be made either within a cast iron protection box filled with a hot pouring bituminous compound or a plastic protection box filled with a cold

pouring compound. The former shall be used where the cable is to be jointed to a paper insulated cable.

Joints may be made by a crimping method, using the equipment marketed by the cable manufacturer. All jointing shall be carried out in accordance with the recommendations of the cable manufacturer. Cables shall be jointed colour to colour throughout the installation.

9. Telephone, Data and Other Specialist Cables

The clause details requirements for non-standard specialist cables which the Contract may include.

Cables will be specified in Section 3 of the Specification.

Unless otherwise specified, the Contractor shall include for all terminations and outlet boxes required, including any specialist work that may be required.

Where multi-core cables are used the core identification system shall be agreed with the Engineer.

Full and proper segregation shall be maintained where required with any other cables.

10. Abbreviations

The following is a list of cable types with associated abbreviations in common use which may be referred to in Section 3 of this Specification or detailed on Tender Drawings.:-

Abbreviation	Description
PVC Insulated	Plain annealed copper conductor with PVC insulation and no sheath, to BS 6004, 6346
PVC/PVC	Plain annealed copper conductor(s) with PVC insulation with PVC sheath to BS 6004, 6346
PVC/SWA/ PVC	Plain annealed copper conductor(s) with PVC insulation, lapped PVC tape or extruded PVC bedding, single layer galvanised steel wire armouring and extruding PVC outer sheath (serving) to BS 6346
XLPE/SWA/L SZH	Armoured cables shall have cross linked Polyethylene (XLPE) insulation of 600/1000 volt grade generally being armoured and finished with LSZH outer sheath to BS 6724.

continued.....

Abbreviation	Description
XLPE	Plain annealed copper conductor(s) with cross linked polyethylene (XLPE) insulation, extruded PVC bedding, single layer galvanised steel wire armouring and extruding PVC sheath to BS 5467)
PILC	Plain annealed copper conductor(s) with impregnated paper belt lead or lead alloy sheath, bedding, steel tape armour and serving BS 6480.
CCV	Plain annealed copper conductor(s) with magnesium oxide insulation and copper sheath with PVC serving
FP200	Tinned annealed copper conductor with silicone rubber insulated plain annealed conductors, PVC coated aluminium foil strip and hard grade extruded PVC sheath.

FP400	Tinned annealed copper conductors with composite mica/glass tape and ethylene propylene rubber insulation LSOH* bedding, wire armouring and LSOH sheathing.
PX	Tinned annealed copper conductor with low toxicity PVC insulated plain annealed copper conductors, PVC coated aluminium foil strip and low toxicity PVC extruded sheath.
LSF	Low smoke and Fume
LSZH	Low smoke zero halogen

*** LSOH - Low smoke zero halogen (registered trademark of Pirelli General plc)**

2.4 INSTALLATION OF CABLES

1. General

The following Clauses detail specific requirements for the most common methods of cable installation. Where other methods of cable installation are specified these shall be carried out in strict accordance with the current edition of the IET Wiring Regulations, all relevant British Standards and good working practice.

All parts of the installation shall be carried out to the highest standard of workmanship. Particular attention shall be given to ensure that routes are chosen to effect the most discrete installation which shall co-ordinate with building detail.

The Contractor shall carry out the installation with full regard to accessibility, maintainability, protection against mechanical damage, corrosive environments and damp conditions. The Contractor shall comply with the requirements for fixing centres and bending Radii given in the Specification.

2. Cables Buried in Trenches

All cables buried direct in trenches shall be armoured unless specifically instructed otherwise.

Non armoured cables in trenches shall be drawn into continuous circular ducts or conduit as appropriate.

The Contractor shall ensure that trenches excavated by the Contractor or by another party are of the required depth and enable minimum bending Radii to be maintained and are free from sharp objects, corrosive substances, etc., that may cause damage to cables, ducts or conduits.

Trenches shall be excavated to a depth of 600 mm except under garden or cultivated areas where they shall be 750 mm deep.

Turf and top soil shall be removed carefully and preserved for reinstatement in their original positions.

Broken land drains and damage to other services shall be reported immediately to the Engineer and indicated.

The excavations shall be kept free of water and properly shored up, other services uncovered shall be adequately supported by slings or other means and protected.

Before cables are laid the bottom of the trench shall be evenly graded, cleared of loose stone and then covered with a 75 mm layer of sand. When cables have been laid they shall be covered with a further 75 mm layer of sand.

In straight run trenches cable crossings are not permitted except where cables branch from the main run.

At each draw point, joint or junction box the cable shall be left slack.

Cables shall not be pulled taut to straighten them after laying.

Cable stockings shall be used for cable hauling, and in order to ensure that the strain is taken on the cores as well as the sheath and/or armouring a solid plumbed hauling end shall be made.

When more than one cable is installed in a duct or trench they shall be spaced apart in conformity with the IET Regulations.

Cable marker tape shall be laid directly over the cables and also a second layer 100 mm below ground level. Where cables are buried side by side, additional marker tape may be required to ensure full cover of marker tape horizontally above cables.

Where cables are buried one above the other, the depth of the trench shall be increased to maintain the minimum specified depth for the uppermost cable.

Cable route markers shall be provided at all changes of direction, and every 20 metres on straight runs.

Directly above the point of entry of a cable into a building an engraved label shall be fixed to the wall detailing the voltage, purpose and type of cable under.

3. Cables fixed to Catenary Wires

Catenary wires shall be stated by the manufacturer to be suitable for this purpose.

Catenary wires shall be stranded flexible galvanised steel construction and of suitable diameter for the applied load including snow, ice and wind. All catenaries shall be fitted with secure hook and eye attachments at both ends and shall incorporate a strainer.

Wires shall be terminated using bulldog clamps. Hooks, eyes, strainers and bulldog clamps shall be of galvanised steel.

Cables shall be fixed to catenary wires using Nylon cable ties. At the ends of cable catenaries, cables shall form a loop to take up expansion and contraction.

A downward cable loop will be present at the end of catenaries where these enter building in order to prevent ingress of moisture.

Catenaries shall be sited with due regard to the headroom that may be required.

Every catenary shall be fitted with a warning label depicting the presence of an electric cable and for long catenaries, these shall be repeated at 6 metre intervals.

4. Cables in Circular Ducts

The Contractor shall ensure that circular cable ducts are suitably constructed and installed prior to the installation of cables. Circular cable ducts shall be free from obstruction, shall be free from abrasive points, shall be of adequate size and bends shall enable minimum recommended bending radii to be achieved.

The Contractor shall install a draw rope for future use in all circular cable ducts.

When installing more than one cable in a circular cable duct, the cable shall not be attached together.

Cables shall be installed in circular cable ducts at entry or exit points from buildings if this is to occur below ground level and spanning all vehicular access points.

The ends of circular ducts shall be sealed to prevent ingress of foreign matter and vermin.

Areas around cables shall be caulked and the ends of ducts then sealed with cold pour Bitumous compound. Spare ducts shall be sealed with tapered hardwood plugs and cold pour Bitumous compound.

5. Cables in Walls and Floors

Cables installed flush in walls shall be protected by galvanised steel sheathing or shall be of armoured construction.

Flush cable runs shall be installed in the vertical and horizontal plane, sloped or angled runs will not be permitted.

Where cables are installed in walls or partitions at a depth of less than 50 mm from the surface, they shall be located within 150 mm from the top of the wall or corner formed by the wall unless running directly to an outlet.

Galvanised sheathing shall be one complete length or a number of complete lengths where long runs are installed. The use of short pieces will not be permitted. Sheathing shall fully cover cables but shall not extend into ceiling voids, etc.

Sheathing shall be fixed with hardened masonry pins.

Sheathing shall be connected to earth at outlet boxes by means of a short length of 2.5 mm^2 6491B cable, crimp lug and pop rivet through the sheathing, the cable shall be connected to the outlet box terminal.

The surface behind the sheathing shall be made smooth and the cables shall be withdrawable. In certain instances it will be permissible for vertical cable runs to be installed in wall cavities but only where the cable drop does not exceed 5 metres in length.
When installing cables, conduits and other flush systems, the Contractor shall ensure that sufficient depth of cover can be obtained in the finishing material to avoid weakness which may be liable to cracking. Flush systems shall be installed such that when finishes are applied, a totally flat finish can be achieved.

Where the Contractor is responsible for making good, chases in walls and floor shall be refinished by suitably experienced Tradesmen employed by the Contractor to achieve a finish which is suitable for final decoration.

6. Cables Laid Direct

Cables shall not be laid direct and unfixed unless this is specifically requested. Where cables are to be laid direct and unfixed they shall be neatly installed and shall not cross any adjacent cable except for the purpose of changing direction.

Where cables are to lay direct on a surface, the Contractor shall ensure that the surface is made clean, free from foreign objects and material and has no sharp projections.

At each point or junction, cables shall be left slack.

Cables shall be installed using adequately spaced cable rollers.

Cable stockings shall be used for cable hauling and in order to ensure that the strain is taken on the cores as well as the sheath and/or armouring, a solid plumbed hauling end shall be made.

When more than one cable is laid in close proximity, the Contractor shall ensure conformity with the current edition of the IET Wiring Regulations by ensuring correct spacing.

7. Cables in Structures

Single insulated cables shall not be installed in structures. Where cables are installed in structures such as partition work, etc., these shall be adequately supported.

Where cables are passed through holes within a structure, the holes shall be of adequate size to avoid damage to cables both before and after installation. Holes in metalwork shall be fully bushed or grommeted. Cables installed in stub partition work shall be clear of the distance that nails or screws may travel when the outer skin of the partition is fixed.

Cables shall be installed in a manner agreed by the Partition Contractor and Architect.

Cable installations shall be carried out with due regard to movement that may occur from vibration, expansion and shrinkage.

Where risk of mechanical damage is present, cable shall be protected with steel conduit or metal sheathing as appropriate.

Cables within floors of wood joist and board construction shall be passed through holes drilled at the neutral axis of joists and in no instance shall such holes be less than 50 mm from centre to the top or bottom of the joists. Notching of joists will not be permitted. When existing buildings are re-wired, cables may be laid unfixed between floor joists. In new buildings cables shall be clipped to the side of the floor and ceiling joists and shall be not less than 50 mm from the top or bottom of joists.

Cables installed in roof voids shall be neatly clipped to the sides of roof timbers.

Cables shall not run on top of timbers where they may be damaged.

Cables shall run parallel to or at 90° in all cases.

Multi-cable runs shall be installed on cable tray, i.e. more than 3 cables.

Cables in roof voids shall run above the level of the roof insulation. Where cables pass through insulation they shall be encased in conduit or similar and approved.

8. Cables Fixed with Clips or Cleats

Cable clips, cleats and saddles shall be those recommended by the cable manufacturer and shall be of the correct size. All cable fixings shall be secure.

Cables shall be installed neatly and unlinked and shall maintain horizontal and vertical lines.

Cables shall be installed in a discrete manner with full regard to building features and architectural detail.

Where a number of cables follow a common route and are individually fixed, fixings shall be at the same centres and in-line for all adjacent cables.

Cable fixings shall be spaced at not more than the distances listed in this Specification and may be required at lesser distances at changes in cable direction, etc.

Cables shall be fixed to surfaces that are clear of sharp projections. Cables shall be fixed in locations where risk of mechanical damage is minimal. Where risk of mechanical damage is present, additional protection will be required which shall take the form of steel conduit or channel.

Cables shall not be installed less than 50 mm from hot water pipes or other heat sources and this distance shall be increased as appropriate.

Where damp or corrosive conditions are present, the Contractor shall secure cable fixings using plate steel bolts or brass screws. Fixing holes shall be plugged with plastic rawl plugs, wood screws shall be brass. Fixing holes, plugs and screws shall be of compatible size.

Where exceptionally uneven surfaces occur or where fixing is not reasonably obtainable, for example on exceptionally hard or soft surfaces, the Contractor shall install cable tray which shall be fixed to and shall span the surface, cable shall then be fixed to the cable tray.

The Contractor shall use the cable clips, cleats and saddles listed below or shall use equal and approved alternatives.

a) *Circular Cables up to 10 mm diameter and Flat Cables:-*

Tower clips or on multi cable runs either PVC covered copper or aluminium strip or cable tray.

b) *Circular Cables in excess of 10 mm and up to 50 mm diameter:-*

One piece, single hole polythene cable cleats shall be used and shall be fixed using suitably sized brass round head screws and flat brass washers.

c) *Circular Cables in excess of 50 mm diameter:-*

Two piece, two hole cable cleats shall be used and shall be fixed with rawl bolts.

d) *Mineral Insulated Cables:-*

Cables shall be fixed with PVC coated copper 'P' clips of the correct size and secured with brass round head screws.

Multi-cable runs may be fixed using multi-way one piece PVC coated copper saddles. Cable tray may also be used.

Where unsheathed mineral insulated cable is used, fixings shall be bare copper.

Maximum fixing centres for cables fixed with clips, cleats or saddles shall be in accordance with the following tables.

Cables fixed or supported by other means shall also comply with the maximum fixing centres given in the following tables but may also be subject to additional restrictions to ensure compliance with the current edition of the IET Regulations and manufacturers' recommendations.

In exceptional circumstances or where sanctioned by the Engineer, orange or white PVC tower type clips may be used. These will generally be allowed only where cables are concealed and
fixed to timber. These clips shall not be used without prior approval of the Engineer.

TABLE 1
Accessible Surface Runs
XLPE or PVC SWA PVC Copper Conductors

Conductor Size mm²	Maximum Spacings of Fixings and Supports					
	Horizontal Runs			Vertical Runs		
	2 Core	3 Core	4 Core	2 Core	3 Core	4 Core
1.5	350	350	350	450	450	450
2.5	350	350	350	450	450	450
4.0	400	400	400	550	550	550
6.0	400	400	400	550	550	550
10.0	450	450	450	600	600	600
16.0	450	450	450	600	600	600
25.0	450	450	450	600	600	600
35.0	450	450	450	600	600	600
50.0	450	450	450	600	600	600
70.0	450	450	450	600	600	600
95.0	450	450	700	600	600	600
120.0	450	700	700	600	600	600
150.0	700	700	700	900	900	900
185.0	700	700	700	900	900	900
240.0	700	700	1100	900	900	900
300.0	700	1100	1100	900	1300	1300
400.0	1100	1100	1100	1300	1300	1300

TABLE 1A

The spacing shown above may be applied to XLPE SWA PVC cables with stranded copper conductors with the following exception:-

	Horizontal	Vertical
150 mm ² 2 Core	450	600

If XLPE SWA PVC cables with stranded copper conductors are to be used of CSA greater than 300 mm² or smaller than 16 mm² then manufacturers information must be consulted.

TABLE 2
Inaccessible Surface Runs
XLPE PVC SWA PVC Copper Conductors

Conductor Size mm²	Maximum Spacing of Fixings and Supports Horizontal Runs		
	2 Core	3 Core	4 Core
1.5	350	350	350
2.5	350	350	350
4.0	600	600	600
6.0	600	600	600
10.0	675	675	675
16.0	675	675	675
25.0	675	675	675
35.0	675	675	675
50.0	675	675	675
70.0	675	675	675
95.0	675	675	1050
120.0	675	1050	1050
185.0	1050	1050	1050
240.0	1050	1050	1650
300.0	1050	1650	1650
400.0	1650	1650	1650

Maximum Spacing for Vertical Runs as per Table 1.

TABLE 2A

The spacings shown above may be applied to XLPE PVC SWA Cables with stranded copper conductors with the following exception:-

		Horizontal
150 mm²	2 core	675

If XLPE SWA PVC cables with stranded copper conductors are to be used of CSA greater than 300 mm² or less than 16 mm² then manufacturers' information must be consulted.

TABLE 3
Accessible and Inaccessible Surface Runs
XLPE or PVC insulating SWA PVC Sheathed
Solid Aluminium Conductors

Conductor Size mm²	Maximum Spacing for Fixing and Supports					
	Horizontal Runs			Vertical Runs		
	2 Core	3 Core	4 Core	2 Core	3 Core	4 Core
16	2000	2000	2000	600	600	600
25	2000	2000	2000	600	600	600
35	2000	2000	2000	600	600	600
50	2000	2000	2000	600	600	600
70	2000	2000	2000	600	600	600
95	2000	2000	3000	600	600	900
120	-	2000	3000	-	600	900
150	-	3000	3000	-	900	900
185	-	3000	3000	-	900	900
240	-	3000	4000	-	900	1300
300	-	3000	4000	-	900	1300

Table 3A

The above spacing should be used with PVC Aluminium strip armoured PVC cables with solid aluminium conductors with the following exceptions:-

		Horizontal	Vertical
16 mm²	2 core	1200	550
25 mm²	2 core	1200	500
95 mm²	4 core	2000	600
240 mm²	4 core	3000	900

TABLE 4
Accessible Surface Runs
Light Duty Mineral Insulated Cables
Copper Sheath Copper Conductors with or without PVC Sheathing

Conductor Size mm²	Maximum Spacing of Fixings and Supports							
	Horizontal Runs				Vertical Runs			
	2 Core	3 Core	4 Core	7 Core	2 Core	3 Core	4 Core	7 Core
1.0	600	600	600	600	800	800	800	800
1.5	600	600	600	600	800	800	800	800
2.5	600	600	600	900	600	600	600	1200
4.0	600	-	-	-	600	-	-	-

Table 4A
Inaccessible Surface Runs
Light Duty Mineral Insulated Cables

Copper Sheath Copper Conductors with or without PVC Sheathing

Conductor	Maximum Spacing of Fixings and Supports - Horizontal Runs			
Size mm²	2 Core	3 Core	4 Core	7 Core
1.0	510	580	630	760
1.5	570	640	700	840
2.5	660	730	810	970
4.0	770	-	-	-

For vertical runs all spacings are doubled.

TABLE 5
Accessible Surface Runs
Heavy Duty Mineral Insulated Cables
Copper Sheath Copper Conductors with or without PVC Sheathing

Conductor	Maximum Spacing of Fixings and Supports - Horizontal Runs						
Size mm²	1 core	2 core	3 core	4 core	7 core	12 core	19 core
1.5	-	600	600	900	900	1500	1500
2.5	-	600	900	900	900		
4.0	-	900	900	900			
6.0	600	900	900	900			
10.0	600	900	900	900			
16.0	600	900	1500	1500			
25.0	900	1500					
35.0	900						
50.0	900						
70.0	900						
95.0	1500						
120.0	1500						
150.0	1500						
185.0	1500						
240.0	1500						

TABLE 5A
Accessible Surface Runs
Heavy Duty Mineral Insulated Cables
Copper Sheath Copper Conductors with or without PVC Sheathing

Conductor	Maximum Spacing of Fixings and Supports - Vertical Runs						
Size mm²	1 core	2 core	3 core	4 core	7 core	12 core	19 core
1.5	-	800	800	1200	1200	1200	2000
2.5	-	800	1200	1200	1200		
4.0	-	1200	1200	1200			
6.0	800	1200	1200	1200			
10.0	800	1200	1200	1200			
16.0	800	1200	2000	2000			
25.0	1200	2000	2000	2000			
35.0	1200						
50.0	1200						
70.0	1200						
95.0	2000						
120.0	2000						
150.0	2000						
185.0	2000						
240.0	2000						

TABLE 5B
Inaccessible Surface Runs
Heavy Duty Mineral Insulated Cables

Copper Sheath Copper Conductors with or without PVC Sheathing

Conductor	Maximum Spacing of Fixings and Supports - Horizontal Runs						
Size mm²	1 core	2 core	3 core	4 core	7 core	12 core	19 core
1.5	-	790	830	910	1080	1560	1660
2.5	-	870	930	1010	1210		
4.0	-	980	1040	1140			
6.0	640	1090	1150	1270			
10.0	730	1270	1360	1480			
16.0	830	1470	1560	1730			
25.0	960	1710	1820	2010			
35.0	1070	-					
50.0	1210	-					
70.0	1370	-					
95.0	1540	-					
120.0	1680						
150.0	1840						
185.0	2040						
240.0	2330						

For Vertical Runs all Spacings are Double

TABLE 6
Accessible Cable Runs
PVC/PVC Cable - Copper Conductors

Conductor	Maximum Spacings of Fixings and Supports			
Size mm²	Horizontal Runs		Vertical Runs	
	2C + CPC	3C + CPC	2C + CPC	3C + CPC
1.0	250	300	400	400
1.5	250	300	400	400
2.5	300	300	400	400
4.0	300	300	400	400
6.0	300	350	400	450
10.0	350	350	450	450
16.0	350	350	450	450

TABLE 6A
Inaccessible Cable Runs
PVC/PVC Cable - Copper Conductors

Conductor	Maximum Spacings for Fixings and Supports			
Size mm²	Horizontal Runs		Vertical Runs	
1.0	375	450	400	400
1.5	375	450	400	400
2.5	450	450	400	400
4.0	450	450	400	400
6.0	450	525	400	450
10.0	525	525	450	450
16.0	525	525	450	450

TABLE 7
PILC Cables
All Types of Installation

Conductor	Maximum Spacings for Fixings and Supports - Metres

Size mm²	1 core	2 core	3 core	4 core
10		1.02		
16		1.12	1.12	1.12
25		1.14	1.12	1.17
35		1.17	1.17	1.19
50	1.57	1.22	1.22	1.27
70	1.65	1.32	1.30	1.27
95	1.73	1.35	1.27	1.37
120	1.70	1.37	1.37	1.45
150	1.75	1.50	1.50	1.55
185	1.83	1.55	1.52	1.57
240	1.83	1.57	1.55	1.63
300	1.93	1.67	1.60	1.68
400	2.03	1.68	1.68	1.70
500	2.16			
530	2.16			
630	2.06			
800	2.16			
1000	2.29			

TABLE 8
PILC CABLES
Aluminium Conductors
All Types of Installation

Conductor Size mm	Maximum Spacing of Fixings and Supports - Metres 1 Core	2 Core	3 Core	4 Core
10		1.02	1.04	-
16		1.17	1.17	1.22
25		1.22	1.22	1.32
35		1.24	1.30	1.37
50	1.78	1.32	1.37	1.47
70	1.91	1.47	1.47	1.52
95	2.06	1.52	1.52	1.63
120	2.06	1.57	1.60	1.73
150	2.13	1.70	1.73	1.80
185	2.26	1.78	1.83	1.91
240	2.29	1.83	1.88	1.98
300	2.44	1.99	1.96	2.08
400	2.59	2.03	2.06	2.13

1. Cables in Conduit

General

All conduit and conduit accessories shall be new.

Steel conduit shall be black enamel or galvanised as specified and shall be heavy gauge welded and screwed and shall comply with the requirements of BS 4568 Part 1.

PVC conduit shall be high impact PVC and shall comply with the requirements of BS4607 Part 1.

Flexible steel conduit shall be helically coiled galvanised steel with outer sheathing consisting of clear PVC and shall conform to the requirements of BSEN 61386-1.

Flexible PVC conduit shall be corrugated reinforced PVC and shall be of the type stated by the manufacturer to be suitable for moving machines.

All lengths of conduit shall bear a label stating that they comply to the standards specified above.

Conduit systems shall be installed to manufacturers' recommendations, shall be installed with fittings and accessories as recommended by the manufacturer of the conduit, shall be installed using the special purpose tools recommended by the manufacturer and shall be subject to the specific requirements detailed below.

All conduit systems shall be complete before installation of cables. Conduits shall be securely fixed and free from sharp edges, burs and foreign objects. Bends in conduits shall be made without damage to conduit and without altering the conduit section.

The use of solid or inspection elbows or equivalent sets shall not be permitted. No more than 2 No. 90° bends shall be allowed between inspection points.

Inspection points shall be installed at 4 metre centres maximum and all inspection points shall be installed in accessible locations. Lids shall be fitted to inspection boxes and adaptable boxes using brass pan head screws. In all external or damp locations lids shall be fitted with neoprene gaskets.

All conduits shall contain a separate circuit protective conductor. Each circuit shall be provided with a separate circuit protective conductor. Circuit protective conductors shall be 1.5 mm^2 copper minimum or half the size in cross sectional area as the associated phase conductor, but not less than 1.5 mm^2.

The cable capacities of conduits shall not be exceeded. The number of cables drawn into conduits shall not exceed the manufacturer's recommendations or the maximum number calculated in accordance with the Regulations.

Conduits installed in screeds shall have slow bends formed where necessary with large radius bends used and not standard bender radii.

Conduits installed in floor screeds shall be black enamel finish.

Adaptable boxes shall be used where a number of conduits meet, cross or intersect. Boxes shall be black enamel or galvanised as necessary and where installed in damp or external locations the lids shall be fitted with neoprene gaskets and fixing holes with neoprene washers to provide a water tight compartment.

Adaptable Boxes with 'Knock-Outs' are Prohibited

Flanged couplings with washers and brass male bushes shall be used to connect steel conduit to trunking, adaptable boxes, distribution boards and the like, where the conduit connects to a small box as in the case of a flush switch box a standard coupling and bush shall be used.

PVC conduit connections shall be by means of solvent welded couplings with male PVC bushes.

Male brass bushes shall be tightened using spanners or purpose made tools, the use of pliers or teethed wrenches which damage the bush is prohibited.

All free ends of steel conduit not connected to items of equipment, trunking, etc., shall be fitted with female brass bushes.

Steel conduits crossing expansion joints in the concrete floor shall be joined by means of an expansion coupler. The coupler shall be wrapped with Denso tape for a distance of 300 mm

on either side. An inspection box shall be fitted as close as possible on each side of the expansion coupler and a copper circuit protective conductor complying with the IEE CPC shall terminate at each box by means of a M4 brass RH screw tapped into the bottom of the box and 2 No. flat brass washers.

PVC conduits shall be fitted with expansion couplers on runs exceeding 6 metre in length and all PVC conduits must be free to slide within saddles.

Where PVC conduit is used PVC boxes shall not be used for suspending lighting fittings. Only cast iron boxes shall be used for this purpose.

Where conduit boxes are installed flush with ceiling or wall surfaces, approved white break joint rings shall be fitted where necessary to hide the joint.

Conduits shall be fixed using 2 hole fixing saddles spaced at not more than 1000 mm apart. Sheradised or galvanised screws shall be used for galvanised conduit saddles.

Conduits installed in concealed positions may be fixed using spacer bar saddles. Conduit laid in floor screeds or in wall chases shall be fixed by means of 'crampets' or similar approved.

The minimum cover to rewired conduits shall be 40 mm for screed and 6 mm for walls.

Extreme care shall be taken to prevent the ingress of foreign matters into conduits during the course of building construction. All ends shall be plugged and sealed by the Contractor who will remain responsible for any additional costs resulting from blockage of conduits due to neglect or lack of attendance.

Conduits terminating into distribution boards installed flush shall terminate into a flush adaptable box mounted behind the distribution board. A hole shall be cut in the back of the board edged with grommet strip for the cables to enter. An earth link not smaller than 10 mm^2 shall be connected between the distribution board and adaptable box.

For surface mounted distribution boards the conduits shall terminate directly into the board with flanged couplings, washers and brass bushes.

All conduits shall be installed to the neatest possible standards square and plumb with the building structure. Upon completion of the conduit installation each day any damaged steel conduits, running joints, etc., shall be painted either with black paint or Galvafroid paint in the case of galvanised conduit.

2. Cables in Trunking

All trunking and accessories shall be new.

Steel trunking shall be grey painted or galvanised and shall be heavy gauge and comply with the requirements of BSEN 50085-2-1.

PVC trunking shall be white unless otherwise specified in Section 3 of this Specification.

Trunking systems shall be installed to manufacturers recommendations using the manufacturer's pre-made fittings wherever possible. All bends, elbows, 'T' joints, flanges, etc., shall be supplied by the same manufacturer as the trunking.

All connections and junctions shall be made to maintain the full cable capacity equal to that of the trunking main body.

Where special fittings or sections of trunking are fabricated they shall be prepared and finished to the same standard as the manufacturer's equipment. All joints in such fabrications shall be constructed using M6 nuts and bolts with the nuts on the outside.

All cut ends shall be painted to match the original finish.

For PVC trunking all bends, junctions with accessory boxes, etc., shall be made using the manufacturer's fittings. Site made mitred corners, junctions, etc., without the correct fittings, etc., shall not be allowed.

Earth continuity shall be maintained throughout the length of steel trunking systems by using earthing straps at all junction fittings, etc.

Earth continuity conductors shall be installed for all circuits. The trunking systems shall not be used as a circuit protective conductor. Circuit protective conductors shall be 1.5 mm^2 minimum and shall be half the size of the associated phase conductor.

All trunking shall be fitted with a lid, upon completion. Cut lengths of steel trunking shall be arranged so that lid fixings are provided for all sections of lid including all ends.

Where trunking sizes are not specified the trunking shall be sized in accordance with the manufacturer's recommendations to accommodate all necessary cables with sufficient spare capacity to accommodate 20% more cables.

Fixings for steel trunking direct to surfaces shall not exceed 1000 mm on horizontal or vertical runs. Fixings for PVC trunkings shall not exceed 500 mm on horizontal or vertical runs and a fixing shall be provided within 100 mm of each end of the trunking. Roundhead screws shall be used.

Where multi-compartment trunking is used, the Contractor shall allow to install all necessary crossover pieces and all other segregation accessories and mounting boxes.

Cable supports shall be installed at 900 mm intervals in vertical trunking. Where a trunking passes through a floor or fire barrier the trunking shall be filled with fire resistant material to maintain the fire barrier. The trunking lid shall be cut 50 mm to either side of the floor or wall to enable removal of the lid at a later date.

Where cables of different voltages are run in the same trunking the cable insulation shall be to the same standard as the higher voltage. The cable for each system shall be identified by the use of non-standard cable insulation colour for the low voltage cable, i.e. pink, grey, etc.

Manufacturers cable retainers shall be used as required to adequately support all cables.

As an alternative the Contractor may elect to use a segregated trunking system with low voltage cable insulation rating if desired but approval must first be obtained from the Engineer.

3. Cables on Cable Tray and Ladder Rack

All cable tray and support systems shall be new.

Wherever a number of cables run together not enclosed in trunking or clipped individually they shall be fixed on cable tray.

Cable tray shall be hot dip galvanised, heavy duty with a return flange. All bends, tee sections, etc., shall be made using the proprietary manufacturer's fittings. No site made fittings shall be allowed.

Cable tray shall be supported at regular intervals in accordance with the manufacturer's recommendations and the spacing of supports shall be such that no 'sag' is apparent when the tray is fully loaded.

Earth continuity shall be maintained throughout runs of tray by means of copper earth continuity links and the traywork shall be bonded to earth at all distribution boards, switches, etc.

Ladder rack systems shall be manufactured using proprietary systems strictly in accordance with the manufacturer's instructions and recommendations.

Systems shall be designed and arranged to provide support for cables in accordance with this Specification and structural calculations shall be provided when required by the Engineer to verify that the system is correctly designed for specific applications.

Under no circumstances shall the manufacturer's recommendations be varied or components from 2 or more manufacturers be mixed.

Where components of a cable support system are built into the structure of a building or duct the Electrical Contractor shall take full responsibility for providing all information required by others and for ensuring that any components are correctly positioned.

Cables shall be fixed to cable tray using nylon ties. For ladder rack a proprietary cable clamp by the manufacturer of the ladder rack system shall be used. All cut ends of cable tray shall be painted with Galvafroid paint.

2.5 SUPPORTING STEELWORK AND BRACKETARY

1. General

This clause details the support systems required for all trunking, tray, ladder rack, switchgear, etc., supplied and/or installed under the Contract.

All brackets and supporting steelwork associated with the electrical installation shall be supplied and installed by the Contractor. All components shall be new and adequate in terms of strength and finish for the purpose.

Unless otherwise specified brackets and supporting steelwork shall be assembled from Unistrut or similar proprietary systems utilising galvanised steel fixing rails, sprung bolts and nuts and other miscellaneous brackets, clamps, etc., as required. Visible brackets shall have plastic end caps fitted.

The manufacturer's recommendations shall be strictly followed during design and assembly of support systems and the Engineer shall upon request, be given copies of calculations to verify that supports and brackets have been correctly designed.

Where brackets or support systems are fixed to, hung or supported from elements of the building structure it is the responsibility if the Contractor to check and ensure that the building structure elements are capable of withstanding the imposed loadings.

The Contractor shall be responsible for ensuring that any brackets, supporting systems, etc., do not obstruct or clash with other services, and for co-ordinating the run of Electrical Services with other trades.

The fixings for brackets and support systems shall be suitable for the purpose and comply with any local Building Regulations. The Contractor shall, if required by the Engineer, prove the effectiveness of fixings.

Any manufactured brackets shall be painted properly to suit the environmental conditions. Unistrut brackets shall have all cut ends painted with galvafroid paint.

2.6 LUMINAIRES AND INSTALLATION

1. General

This Section details the methods of providing lighting outlets for the various wiring methods.

2. Luminaires

All luminaire fittings shall be supplied and installed complete with all glassware, diffusers, fuses, lamps, etc. All fittings shall be of the type specified in Section 3 or shown on the drawings. No alterations on site shall be carried out which may invalidate the CE marking.

Any luminaries which show signs of damage or deterioration in finish or performance at the date of final inspection, will not be accepted. Lighting switches shall be rated 15/20 amp for all fluorescent lighting.

3. Lighting Points in Surface Conduit

Small circular conduit boxes shall be provided at lighting fitting positions to dimensions suitable for utilising the pre-formed holes in the fittings.

Generally, for linear fittings 2 conduit boxes shall be provided interlinked by conduit. For small fittings , a single box only may be necessary.

Where no suspensions are required the fittings shall be mounted directly onto the conduit boxes, the 6491B wiring shall enter the fittings via a male brass bush and lock ring and shall be enclosed in heat resistant sleeving. The CPC shall terminate in the conduit box with a crimp lug and brass M4 set screw and the final connections made to the fitting with a short length of 6491B cable with a similar crimp lug on the conduit box end.

Every conduit box shall have 2 fixings at equidistant centres.

Where PVC conduit is specified the conduit boxes above lighting fittings and used for fixings shall be steel. On no account shall PVC conduit boxes be used for supporting fittings.

4. Lighting Points in Concealed Conduit

Conduit and boxes shall be installed as described in Clause 2.6.02 above the ceiling.

From the conduit boxes conduit suspensions shall be installed finishing in a conduit box flush with the ceiling onto which shall be fitted the fitting.

For ceilings with a small void or where the whole conduit system is suspended with a small difference in height between the conduit system and surface of the ceiling the conduit boxes shall be extended through the ceiling with extension rings.

5. Lighting Points on Trunking

Lighting fittings shall be fixed directly to the trunking with trunking manufacturer's fitting attachments. Cables shall be taken directly into the fitting enclosed in heat resisting sleeving via a bush and locknut.

Where the trunking is to finish flush with a suspended ceiling, adjustable suspensions shall be used to provide final height adjustment to suit the ceiling.

Trunking lid shall be fitted before erection of the fittings and shall be continuous between fitting suspensions. However it shall be cut to enable it's removal between fittings.

The suspension points for the trunking system shall be co-ordinated with the fitting positions such that at least one suspension is provided above each lighting fitting position.

6. Lighting Points in Mineral Insulated Cables

Small circular conduit boxes shall be provided at each fitting position as described in Clause 2.6.02 for surface fixed installation. The mineral insulated cable shall be terminated directly into the conduit box and the cores extended by means of porcelain connectors and heat resisting flexible cable into the lighting fitting.

For flush installations the cable shall terminate into boxes with special mineral insulated cable type cable clamps, the cable shall be extended as previously described and the suspension extended if required as detailed in Clause 2.6.03.

7. Lighting Points in PVC/PVC, FP or PX Cable

Small circular conduit boxes shall be provided as detailed in Clause 2.6.02 unless otherwise specified in Section 3 of the Specification.

The boxes shall be fitted with cable glands suitable for the cable and the cable extended into the fitting with porcelain connectors and heat resisting flexible cable.

For flush installations the suspension shall be extended as described in Clause 2.6.03.

8. Lighting Points for Fittings Fixed to and Recessed in Suspended Ceilings

Where luminaires are not suspended from the structural ceiling but fixed to the suspended ceiling the method of attachment and fixing will be given in Section 3 of the Specification.

Wiring to the luminaires shall terminate into a plug in ceiling rose mounted on a conduit box fixed and adjacent to the fitting, Final connections shall be made using 3 core heat resisting 1.00 mm^2 flexible cable of minimum length. Where the flex enters the luminaire a cable gland shall be fitted.

9. Luminaire Suspensions

Where luminaires are detailed as being suspended the suspensions shall be either chain or conduit as detailed in Section 3 of the Specification.

Chain suspensions shall be black for general areas and galvanised for industrial areas or areas where the general trunking and/or conduit is galvanised.

The conduit boxes above the luminaire shall be fitted with hook plates and the wiring connected to 3 core 1.00 mm^2 heat resisting flexible cable with porcelain connectors within the conduit box. The flexible cable shall be fixed to the chain with PVC cable ties and enter the fitting through a conduit hook. Conduit hooks shall be fixed to luminaires by means of 2 lock nuts, one fitted above the luminaire and one below.

Conduit suspensions shall comprise a ball and socket, conduit and flanged coupling with brass bush and scraper washer.

Conduit shall be either black enamel or galvanised to match the general conduit installation.

10. Erection of Luminaires

Luminaires shall be erected complete with all necessary diffusers, louvres and lamps.

Before erection each diffuser shall be cleaned with an anti-static cleaning solution. All louvres shall be carefully erected using gloves where necessary to prevent finger marks on polished surfaces.

11. Break Rings

Where narrow fluorescent luminaires are fixed to recessed conduit boxes, break rings shall be installed between the ceiling and fitting to cover the edges of the conduit box aperture.

12. Connections to Luminaires

Within all luminaires where the wiring enters directly, high temperature rated sleeving shall be applied to the cables within the luminaire, which shall be coloured correctly for phase, neutral and earth connections.

2.7 INSTALLATION OF ACCESSORIES

1. General

This Clause details the general requirements for the selection, fixing and wiring of all accessories.

2. Selection

The type of accessory is generally shown on the Contract drawings and the specific manufacturer and finish will generally be detailed in Section 3 of the Specification.

3. Mounting

Unless otherwise specified it shall be assumed that accessories are to be mounted flush on deep galvanised steel boxes fixed to the building structure with 2 No. 1¼" black japanned screws into wall plugs.

Where PVC/PVC cables are used the entry holes to boxes shall be suitably bushed and green/yellow sleeving applied to the CPC.

4. Earth Links and Wiring

For all accessories except lighting plateswitches without an earth terminal, install a 6491B earth link between the box and accessory.

Where an accessory is connecting a fixed appliance, i.e. water heater, the final connection shall be made using suitably sized heat resisting flexible multi-core cable with a minimum size to 1.0 mm^2.

5. Positions

All accessories shall be correctly positioned in relation to fixed appliances, cupboards, doors and the like. The Architect's detail drawing shall be consulted before first fix stage and any other Contractors consulted to establish the correctness of positions.

6. Fuses

Where accessories contain fuses the correct fuse shall be fitted for the application.

7. Engraving

Certain accessories shall be engraved, see Clause 2.9.00 for details.

8. Outside Lighting

All outside lighting luminaires shall be provided with a local means of isolation adjacent to each fitting.

9. Photocell Control

Where photocell control of lighting is provided, a key switch shall be installed to override the device for test purposes. It's function shall be clearly identified by an engraved trefolite label.

2.8 PLANT AND EQUIPMENT

1 General

This clause details the requirements in respect of miscellaneous plant and equipment supplied by or connected by the Electrical Contractor.

2. Wiring and Connecting

Unless specified otherwise the Contractor shall supply, wire and connect all items of plant and equipment as shown on the drawings and/or detailed on the Specification.

3. Wiring in Areas of High Ambient Temperature

Wiring in plantrooms, boilerhouses and any other areas where higher than normal temperatures are likely, shall be carried out using 105°C rated cables in conduit unless mineral insulated cables are used.

4. Final Connections

Final connections generally shall be made using flexible conduit not exceeding 600 mm in length. A conduit box shall be installed at the final point of the main wiring system and the flexible conduit connected to the box.

In the case of small items of plant without a conduit entry, i.e. valves, small pumps, etc., the conduit box shall be fitted with a brass packing gland and the final connection made using heat resisting multi-core flexible cable.

Generally all final connections shall be neat, as short as possible, but with sufficient slack to allow for movement and vibration of plant during normal operation.

Where the final connection is specified as mineral insulated cable, the cable shall be formed into a vibration loop before connection.

5. Local Isolation

Local isolators shall be provided and installed adjacent to all items of plant or equipment.

The Electrical Contractor shall supply, install and connect all isolation equipment unless specifically noted otherwise.

Where isolators are required adjacent to free standing equipment or plant and where a suitable wall or surface does not exist for mounting the isolator, a suitable floor mounted bracket shall be constructed adjacent to the plant or equipment for mounting the isolator (see Clause 2.5.00).

6. Wiring Diagrams

Unless otherwise specified the equipment manufacturer's wiring diagrams shall be followed.

Plant wiring requirements given in the Electrical Specification and Drawings are for Tender Purposes Only, unless detailed otherwise in Section 3.

Where discrepancies occur between such information the Engineer will give the necessary instructions on request.

2.9 LABELS, ENGRAVING AND NUMBERING

1. General

The following equipment and accessories shall be provided with a laminated white-black-white or white-red-white (as applicable) label, engraved to show black or red lettering on a white ground. Labels shall be fixed by at least 2 No. M3 round head brass screws, nuts and flat washers. The heads of the screws shall be on the exterior of the equipment. All wording for labels, plates, etc., shall be submitted to the Engineer for approval before any engraving takes place.

Self Adhesive Labels are not permissible

Switch and Distribution Equipment

5 mm black letter adequately describing the function of the unit, i.e. as indicated on the distribution diagram. The labels shall also indicate the phase or phases of the supply to which the item is connected.

Isolators on distribution systems shall have a label fitted indicating the size and type of supply cable and the locations of origin of the circuit. (e.g. **50 mm^2 A1. from SW-BW Library Store**.) It shall clearly indicate the equipment it controls.

All multiphase distribution boards and busbar chambers shall be labelled **"DANGER 415 VOLTS"** (or line to line voltage applicable) in 10 mm red lettering.

Cables runs in accessible ducts shall be provided with identification labels at 20 metre spacing showing the cable size and main switch designation (e.g. **25 mm^2 4C PLSWS - SCIENCE BLOCK**) in 3 mm red lettering.

Remote Isolator

Where these are specified they shall be labelled to identify the equipment controlled using 3 mm black lettering. Equipment controlled by remote isolator shall have 6 mm red lettering on a white background to a label clearly visible prior to gaining access to live parts. The label shall state that the equipment is to be isolated elsewhere and shall give the location of the isolator.

Accessories and other Equipment (Specified to be labelled)

3 mm black lettering as described.

2. Engraving

The following equipment shall have their own cover plates engraved as described and filled with black cellulose paint.

a) *Lighting Sub-Switches*

(Out of sight of the lights they control) 2.5 mm lettering indicating the position of, or otherwise describing such light or lights.

b) *Emergency Lighting Key Switches:*

Plates to be engraved **E/L Test**, 2.5 mm lettering

c) *Accessories of the 'Grid-Switch' Pattern*

(Controlling equipment other than lighting). 2.5 mm lettering

d) *All other Equipment*

Each item for control or isolation shall be engraved to describe it's use. - 2.5 mm lettering

3. Numbering Systems

Numbered cable ferrules shall be fitted to the ends of all cables which form part of a control system or wiring system which follow a numbered wiring diagram. Cable markers shall be of continuous sleeve type.

All cable core not identified during manufacture shall be numbered.

All distribution cables shall be labelled using flexible 'wrap-around' labels resistant to moisture. The labels shall be fixed at all floor inspection and termination positions and shall indicate cable size, type, source and purpose, i.e. **"50 mm" SWA 4 core feed to panel P27**.

4. Periodic Inspection Notice

A white plastic label of not less than 125 mm x 60 mm shall be fixed at every mains position in accordance with the Regulations.

The dates of the last inspection and recommended date of the next inspection shall be completed.

5. Residual Current Devices

Where an installation incorporates a residual current device a notice of not less than 125 mm x 45 mm shall be fixed in a prominent position adjacent to the device, in accordance with the Regulations.

6. Electric Shock Notice

In all rooms containing main switchboards, an electric shock treatment notice of an approved type shall be fixed with screws.

2.10 EARTHING AND BONDING

1. General

To comply with the IET Regulations, the whole of the installation covered by this Sub-Contract shall be effectively earthed and bonded including extraneous metal work.

Where the installation is to be connected to a combined neutral earth and protective multiple earthed system, this will be indicated in Section 3 of the Specification and the requirements of the supply company for this system of earthing shall be adhered to. A main equipotential bond shall be installed to the following:-

1. Main Water Service Pipe
2. Main Gas Service Pipe
3. Exposed Metallic Part of Building Structure
4. Central Heating System

5. Air Conditioning System
6. Ventilation System
7. Sprinkler Pipework
8. Miscellaneous Services i.e. Oil Pipework, Compressed Air Pipework, etc.
9. Cast Iron Drainage Pipes
10. Lightning Protection System

Note: All connections shall be fitted with lugs and shall be labelled.

All main equipotential bonding cables shall be fitted with the prescribed notices and shall be of the size detailed in Section 3. Where no size is given in Section 3 these cables shall be sized in accordance with Regulation 543-01-04 Table 54G and the size of the main tails.

Circuit protective conductors shall be installed in all trunking, conduit, etc. The size shall be selected in accordance with Regulation 543-01-04 Table 54G or calculated as per Regulation 543-01-03 unless specified in Section 3 of this Specification. The conduit or trunking shall not be regarded as the circuit protective conductors unless specifically stated in Section 3.

Every steel wire armoured cable shall be provided with a separate circuit protected conductor, as shown on the distribution drawing, or shall be in accordance with Regulation 543-01-04 Table 54G, unless otherwise specified in Section 3.
Supplementary bonding conductors shall be provided for the following:-

- Hot, Cold and Waste (if metal) pipes at every Sink, Bath and Urinal position.
- Metal Sinks, Baths, Bedpan Washers, Showers, etc.
- Waste Pipes (if metal) to Air Conditioning or other plant.
- Heating Pipes (in the position shown on the drawings)

All cross bonding connections shall be continuous, i.e. uncut to each connection point or both ends in same crimp lug.

Earthing clamp (with warning label), manufactured to BS 951 shall be used for securing bonding conductors to cast iron or mild steel pipework, the bonding being in accordance with the manufacturer's instructions. When bonding tape is used this shall be fixed under the cover nuts. Cables of equivalent sections shall be used to bind the 'U' bolt of the pipework.
Where the pipework is galvanised, the joint shall be over-wrapped with high density waterproof tape to prevent corrosion.

2.11 TESTING

1. General

The Contractor shall carry out all tests during and upon completion of the installation. The following shall be carried out:-

1. Completion and Inspection Certificate

2. Completion of Particulars of Installation Form

3. Completion of Form of Inspection

4. Visual Inspection

5. Continuity of Protective Conductors

6. Continuity of Main and Supplementary Bonding Conductors

7. Continuity of Ring Final Circuit Conductors

8. Insulation Resistance of Circuits.

9. Insulation Resistance of Switch Boards, etc.

10. Polarity

11. Earth Fault Loop Impedance

12. Operation of Residual Current Operated Devices

13. Verification of Prospective Short Circuit Currents

14. Measurement of Earth Potential between Simultaneously Accessible Parts

15. Operation and Commissioning of Emergency Lighting System

16. Operation and Commissioning of Fire Alarm System

Note: Items 15 and 16 shall be commissioned by the manufacturer of the equipment.

All Test Certificates, Test Results shall be available on site at final inspection.

The Test results shall be clearly recorded using copies of the form provided in the Appendix.

On completion the Contractor shall complete 3 copies of Completion and Test Certificates to hand to the Architect and/or Main Contractor.

Each and every Test and Commissioning Certificate shall be signed by the Engineer carrying out the test and the Engineer's name shall also be printed in capital letters. Each Test Certificate shall bear the issuing Company's stamp.

Copies of all Test Results and Test Completion and Commissioning Certificates shall be supplied to the Engineer prior to handover and all Test Certificates, etc., shall be available on site when the Completion Inspection is carried out.

Copies of Calibration Certificates are required for all instruments used to carry out the tests.

The Client's Engineer may carry out random check testing to satisfy himself that the results shown on the Test Result Sheets are accurate. If any results are at deviance with the previously recorded values or are shown to be inaccurate, the Engineer will arrange for others to re-test the whole installation and the costs involved to the Engineer will be contra-charged to the Main Contractor and Contractor by the Client.

In addition to the tests detailed above the Contractor will be required to demonstrate the operation of all systems installed under the Contract including any specialist works such as Intruder Alarms, telephones, etc.

2.12 O & M MANUALS

At Practical Completion the Contractor shall hand over two copies of the Operating and Maintenance Manual comprising the following:-

- Index
- Description of Installation
- Schedule of Materials and Equipment used, together with Manufacturers' names, references, etc.
- Copies of Manufacturers' Data Sheets and Catalogues
- Detailed Operating Instructions for all Equipment.
- Copies of Test Certificates and Schedules

- Schedule of “As Fitted” drawings
- Emergency Procedures
- Fire Alarm Log Book
- Emergency Lighting Log Book
- Recommended Testing Regime with dates
- Details of any unusual maintenance required

SECTION 3

PARTICULAR ELECTRICAL SPECIFICATION

INDEX

3.1 GENERAL DESCRIPTION

This specification and associated drawings detail the requirements for the Electrical Services associated with the proposed extension of the existing Sports Pavilion at Green Field Sports Field, Sawtry.

The existing building is to be stripped back to its external shell and heavily extended to form a new larger Sports Pavilion with changing/shower facilities, a domestic Kitchen and Club Room.

Particulars of the project and details of the phasing are given within the Main Contract Preliminaries.

Contractors are invited to produce fixed priced tender based on this specification and the associated drawings. If ultimately appointed the successful Contractor shall produce the final detailed working drawings etc., against the tender documents for installation within the development.

Particulars of the project are given in Main Contract Preliminaries.

Specification Section 1, 2 and 3 clauses are applicable to all areas.

These requirements have been compiled based on the clients brief, design team meetings and the current scheme as defined on the latest drawings. The main objective for the Electrical Engineering Services is to provide a practical and comfortable environment for occupants which complement the facilities of the building and which maximize the opportunities available for reducing energy consumption.

This specification defines the standards of workmanship and materials to be used.

Information on the building layout, construction methods and finishes shall be obtained by consulting the Architects and Structural Engineers drawings and details these should be obtained through the Main Contractor.

Electrical Contractors are strongly advised to visit site during the tender period to satisfy themselves of the site, existing building arrangement and the access to it.

3.2 STANDARDS

The Electrical Contractor shall be responsible for the complete and satisfactory installation of the electrical services. The installation shall comply with all current statutory and legal requirements, best practices, standards, manufacturers' recommendations for a building of this nature.

The Electrical Installation shall be designed, installed, tested and commissioned in accordance with all current relevant standards and guidelines, and in particular the following: -

- Relevant British & European Standards
- Relevant CIBSE design guides / commissioning codes / technical memoranda etc.
- Current Building Regulations
- The Health and Safety at Work Act
- Current IET Wiring Regulations (BS 7671)
- CDM Regulations
- The Electricity at Work Act 1974
- The Electricity Supply Regulations 1998 As Amended
- Local Authorities Policies
- CIBSE/SLL Lighting Guide
- The Electricity Supply Regulations

- BS 5839 Part 1
- BS 5266 Part 1

3.3 SCOPE OF WORKS

The general scope of works shall include but not be limited to the supply, installation test and commissioning of the following:

- Relocation of existing Incoming Electricity Supply
- Stripping out of Existing Electrical Services
- New Incoming Electricity Supply
- New Incoming BT Openreach Services
- Distribution
- Containment Systems
- Lighting and Emergency Lighting
- External Lighting
- General Wiring
- General Power Installation
- Attendances to Mechanical Services
- Disabled Toilet Alarm
- Fire Alarms
- Induction Loop
- Structured Cabling
- CCTV
- TV System
- Intruder Alarms
- Photovoltaic Installation
- Lighting Protection
- Earthing & Bonding
- Supports & Brackets
- Testing, Inspection and Commissioning
- As Installed drawings
- Operation & Maintenance Manuals

The Electrical Contractor shall include within their tender for the surveying of the building, working drawings, purchase, delivery to site, off-loading, moving into position, marking out, setting up, alignment, erecting, fixing, wiring, connecting, setting to work, commissioning, testing, O & M Manuals, teaching and demonstrating the whole works as described in the Specification.

For a period of 12 months from the handover date, the Electrical Contractor **repair and make good any defects arising in connection with the installation and / or equipment free of charge.**

The Electrical Contractor shall be fully responsible for the proper co-ordination of all works within his charge with other trades on the project and for the production of any details required to achieve such co-ordination. Any cost incurred in this respect shall be deemed to be included within the tender offer.

Where there is a discrepancy, the information provided in the Particular Section of the Specification shall supersede Standard Clauses.

The Electrical Contractor shall include for visiting the site prior to submission of their tender to fully identify the scope of works and the requirements for new services connections. In submitting a tender this will be deemed to have been carried out.

3.4 CONDITIONS OF CONTRACT

Refer to main contract documentation.

3.5 PROGRAM

Refer to main contract documentation.

3.6 DRAWINGS AND SPECIFICATION

All work shall be carried out to conform to the requirements of the standard Specification Sections 1 and 2 in addition to the particular requirements of Section 3.

Information on the building layout, construction methods and finishes etc. can be obtained by consulting the Architects drawings and details, these should be obtained through the Main Contractor.

The Electrical Contractor shall produce all necessary installation and working details to achieve the successful completion of the project.

3.7 COMMISSIONING

The Electrical Contractor shall set to work and commission the new Electrical Services Systems installed under this contract. The Electrical Contractor should also refer to section 2 of this specification for further requirements.

The Electrical Contractor shall include to provide a fully detailed commissioning program at the outset of their works to the Main Contractor for incorporation into the Main Contractors main program. The Electrical Contractor shall note that Axis will require the commissioning information as part of the documentation prior to any practical complete of the overall project.

3.8 REMOVAL OF EXISTING ELECTRICITY SERVICES

The Electrical Contractor shall employ UKPN to isolate, disconnect and relocate the existing incoming electricity supply and metering from the existing Sport Pavilion to the carpark area housed within a GRP enclosure for use by the contractor during the construction phase of the project. The existing supply is located within a flush meter box enclosure as shown on the drawings.

Refer to the appendices of this specification for a copy of the UKPN quotation including specification details for the GRP enclosure, enclosure base, cable trenches and ducting requirements.

The supply relocation works shall be completed as enabling works in preparation for the stripping out/demotion works and to enable the Main Contractor to set up their site compound.

The Electrical Contractor shall include for all necessary liaison with the Clients Electricity Supplier and Meter Operator concerning the disconnection and relocation of the existing incoming electricity supply and meters.

The following electrical services (including all wiring and containment systems) are to be removed: -

- Incoming electricity
- Distribution equipment
- Lighting and emergency lighting
- External lighting
- General Power

- Fire Alarms
- Intruder Alarms
- CCTV
- General Wiring
- Wiring to Mechanical Services
- Wiring to Irrigation System

The Electrical Contractor shall be responsible for the safe isolation, decommissioning, removal and disposal of the electrical services.

The Electrical Contractor shall be responsible for visiting site to carry out a pre-tender survey to determine the extent of the removal work and ascertain the conditions under which the works is to be carried out.

Isolation of supplies shall be fully coordinated in accordance with the demolition works and agreed in advance with the main contractor'.

The Electrical Contractor shall allow for disposing of all existing services removed and any debris/ packaging from site caused by their works

The Electrical Contractor shall dispose of all redundant fluorescent lamps and electrical equipment via a licensed waste management company in accordance with the Hazardous Waste Regulations (England & Wales) 2005 and the WEEE Directive.

3.9 UNDERGROUND SERVICES

It shall be the Main Contractor's responsibility to confirm the exact location of all existing underground services prior to excavation works. Care shall be taken when working in these areas to ensure underground services are not damaged.

The Main Contractor shall undertake an underground radio/radar survey of the areas to be excavated for the new cable trenches. The survey shall be undertaken prior to the Contractor starting work on site as enabling works.

On completion of the survey if necessary the route of the proposed cable trenches should be adjusted accordingly to avoid existing underground services.

Where excavation works are required near live existing services, excavation shall be carried out by hand.

The HSE booklet "Avoiding danger from underground services" gives guidance on how to manage the risks of digging near underground cables.

If existing underground services are damaged during the works, the Contractor must notify the Client and/or the appropriate service authority without delay. Make arrangements for the work to be made good without delay to the satisfaction of the client/or the service authority or other owner as appropriate. Any measures taken by the Client to deal with an emergency will not affect the extent of the Contractor's liability.

3.10 INCOMING ELECTRICITY SUPPLY

The Electrical Contractor shall employ and pay all monies to UKPN Ltd to relocate the temporary builders electricity supply back to the building towards the end of the construction period to serve the remodeled/extended building. The supply and metering shall be housed within a flush three phase meter box generally as the arrangement shown on the drawings.

The relocated supply shall be rated at 70 kVA TP&N.

As UKPN are unable to provide a quotation for the required relocation works at this stage (due to the works being required in over 6 month in the future). Include the Provisional Sum included within the tender summary section of the specification for all chargeable works by UKPN. Also include for applying to UKPN to relocate the supply once on site including all liaison, coordination, meter box and builders works. Costs for these items shall be included within the tender and shall not form part of the provisional sum.

The Electrical Contractor shall be responsible for the complete coordination and management of all works by UKPN.

From the UKPN supply provide meter tails terminating within a MEM 125 Amps rated fused isolator within the plantroom as shown on the drawings. From the fused isolator provide a XLPE/SWA/LSZH sub-main cable to the distribution board located within the Store as shown on the drawings.

The Electrical Contractor shall be responsible for the necessary coordination and liaison with the client's electricity supplier and meter operator concerning the installation of the new meters. All costs for these works should be included within the tender.

The Electrical Contractor shall liaise with UKPN to determine all builders work requirements associated with the installation of the supply and removal of the existing supply so these can be passed onto the Main Contactor for his action. The majority of this information is included within the appendices of this specification.

Final entry into the meter box shall be via UKPN hockey stick arrangement.

All cost associated with the management and coordination of the works by UKPN including all overheads and profits shall be deemed to be included within the Contractors tender.

3.11 INCOMING TELECOM SERVICES

The Electrical Contractor shall employ and pay all monies to BT Openreach to provide new incoming Fibre to the Premises (FTTP) telecom services to the building.

The incoming telecom services shall terminate on the external elevation of the building within a Openreach external termination box. From the external box, the contractor shall install the free issue Openreach pre-terminated fibre optic cable routed at low level through the Changing Area into the plantroom enclosed within galvanized steel conduit for protection. Within the plantroom provide a suitable back box for the cable to terminate within and for fixing the Openreach (ONT) unit to. Provide a twin 13 Amp switched socket outlet next to the ONT for the ONT power supply. Also provide a dedicated Cat 6A copper UTP link between the ONT and the Comms cabinet within the store for the required link to the services providers router which shall be provided by others.

The Electrical Contractor shall be responsible for the complete coordination and management of all works by BT Openreach.

The Electrical Contractor shall liaise with BT Openreach to determine all builders work requirements associated with the installation of the incoming telecom services, so these can be passed onto the Main Contactor for his action. The arrangements shown on the drawings are indicative to express design intent.

All cost associated with the management and coordination of the works by BT Openreach including all overheads and profits shall be deemed to be included within the Electrical Contractors tender.

The Electrical Contractor shall provide a continuous containment system to the Comms cabinet indicated on the drawings from the incoming telecoms services within the Plantroom for Cat 6A link detailed above.

Axis have registered the site with BT Openreach as a new site. Refer to the appendices of this specification for correspondence from BT confirming registration of the site. Allow to contact BT Openreach prior to starting on site to agree a program of works with BT Openreach.

It is anticipated that there won't be any charges associated with the works by BT Openreach, however the Provisional Sum within the Tender Summary section of the specification should be included for any unforeseen charges.

3.12 DISTRIBUTION

The Electrical Contractor shall supply, install, test and commission a three phase and neutral distribution board within the building as shown on the drawings. The distribution board shall be feed from the incoming electricity supply via double insulated single core meter tails enclosed within metal cable trunking.

The distribution board shall be a MEM Memshield 200 Amp type B 24 way TP&N split metered lighting and power distribution board with integral meters. The distribution board shall be configured tometer lighting and power consumption separately accordance with the requirements of Part L of the Building Regulations.

The distribution board shall be suitably sized to accommodate the proposed design and shall allow an additional 25% spare capacity.

The distribution board shall be fitted with Surge Protection – Class 1 & 2 surge arrester.

The distribution board shall be provided with an integral switch dissconnector, barrel lock, keys, fully labelled and complete with typed circuit schedules housed in the inside door. The distribution board circuit reference chart shall be typed and contained within a plastic protective wallet. The Electrical Contractor shall allow for securely fixing these charts either by adhesive on the inside of the hinged lockable front cover to the distribution board or alternatively, securely to the wall adjacent to the distribution board, contained in a framed enclosure.

A traffolyte label is to be fitted to the distribution board giving the distribution board reference, the earth loop impedance reading and short circuit fault current rating.

All outgoing ways shall be protected with a B, C or D Type RCBOs sized to suit the load supplied. All spare ways shall be fitted with blanks.

All cables to be sized in accordance with the 17th Edition IET Wiring Regulations and other clauses of this document.

All necessary cable support systems (cable tray/basket) shall be supplied and installed such that cables are supported continuously over their entire run lengths.

When terminating onto distribution boards, gland plates or trunkings, bond from an earthing stud to the cable gland earthing ring to the distribution board casing/gland plate/trunking and also, cross bond onto the distribution board/panel earth bar using LSZH/Copper conductors of at least half the cross-sectional area of the cable phase conductor. All cables shall be terminated using cable glands of the correct type and size.

All cable cores shall be ferruled before connection. The ferrule legend shall be identical with that of the core termination stud. Identification markers shall be Z type (Messrs. Critchley). All cables shall be marked at each end using universal carrier strip (12 digit) with K type

markers as manufactured by Messrs. Critchley. The cable marker description shall be agreed in schedule form with the Employer's Agent prior to installation.

The Electrical Contractor shall provide warning signs and treatment for shock notices at all distribution equipment positions.

3.13 INSTALLATION METHOD

A flush electrical installation is required to the following areas: -

- At ceiling level with wiring routed within the accessible roof void.
- Within the Club Room (within wall chases)
- Within the Kitchen (within wall chases)
- Within corridors (within wall chases)

All other areas shall be provided with a surface electrical installation fixed to the fare faced blockwork walls contained within **high impact** white PVC conduit.

Cabling must note be run within thermal insulation due to the derating factor. Therefore cabling shall be run within the dedicated cabling void/zone. Refer to the drawings for typical section.

Wiring shall be installed using BASEC approved LSZH cable as follows: -

WIRING INSTALLATION	CABLE TYPE	CONTAINMENT
External lighting and power	PVC/SWA/PVC	Underground contained within PVC Ducting with cable chambers provided at all changes of direction.
General Lighting & Power	6242B LSF (Twin & Earth)	**Within Roof Void** Metal wire cable basket/clipped direct to the ceiling joists. **Below Ceilings** Contained within high impact white PVC conduit.
Fire Alarm	Soft skin fire resistant cabling (or equal and approved) with red outer sheath in accordance with BS 5839 Part 1	**Within Roof Void** Metal wire cable basket/clipped direct to the ceiling joists. **Below Ceilings** Contained within galvanised metal conduit.
Intruder Alarms, CCTV, and TV System	In accordance with nominated Specialist Installer requirements (All cabling to be LSZH)	**Within Roof Void** Metal wire cable basket/clipped direct to the

		ceiling joists. **Below Ceilings** Contained within high impact white PVC conduit **External** Underground contained within PVC Ducting with cable chambers.
Voice / Data	Category 6A LSZH cable to BS EN 50173-1: and BS6701:2004.	**Within Roof Void** Metal wire cable basket/clipped direct to the ceiling joists. **Below Ceilings** Contained within high impact white PVC conduit

Cables shall be suitably segregated. Fire alarm cables shall be installed within separate containment to the general lighting and power. IT, telephone and other ancillary services shall also be installed on separate containment systems.

Vertical drops shall be installed in zones in accordance with BS7671.

The Electrical Contractor shall provide containment for all ancillary services provided by the specialist (i.e. I.T., telephones, etc.), in accordance with the containment specified for general lighting and power identified in the table above.

All containment systems shall be installed with continuous runs giving installation access to all areas of the building.

The Electrical Contractor shall co-ordinate his services fully with other trades when defining his service routes.

Allowance shall be made for fitting fire barriers to containment system where they pass through fire compartment walls and floors.

3.14 CONTAINMENT SYSTEMS

The Electrical Contractor shall design and install a cable support system throughout the building to support and contain all cabling (Generally as the arrangement shown on the drawings).

All cabling shall be supported along its entire length.

Containment systems shall generally be as detailed within section 3.13 (Installation Method)

All containment shall be suitably sized to ensure a minimum of 25% spare capacity is provided post completion.

The Electrical Contractor shall fully coordinate the installation with all other trades to ensure clashes between services, building structure, fitted furniture etc. do not result.

All containment networks shall be electrically continuous including all manufacturers cross bonds linking containment sections etc. as required. Manufacturers installation guidelines shall be adhered to.

3.15 ELECTRICAL ACCESSORIES

The Electrical Contractor shall supply, install and test all necessary wiring accessories throughout the building.

Wiring accessories shall generally be Graphite grey as manufactured by MK Ltd as their Logic Plus range to ensure they contrast visually with their back grounds in accordance with Part M of the Building Regulations.

All data outlet plates shall match standard accessories for local area. This shall be achieved by mounting the RJ45 data outlets into MK Grey Logic plus Euro type plates.

The Industrial socket outlet (16Amps) for the Comms cabinet shall be manufactured to BSEN 60309-2 and shall be as manufactured by MK as their Commando range or alternatively by Mennekes. All industrial socket outlets shall be switched.

All electrical accessories within the Plantroom and within the roof void shall be as manufactured by MK Ltd as their Metalclad range.

External wiring accessories shall be IP65 rated as manufactured by MK Electrics as their Masterseal range.

The Electrical Contractor shall allow for fitting dyno tape labels to all accessories to give identification of their circuit reference.

All fused and non-fused connection units shall be engraved to indicate the item of equipment they are supplying.

All switched fused connection units shall have indicator lights.

Cleaner's sockets shall be engraved "Cleaners" thus distinguishable from general sockets. In the case of smaller cellular areas sockets will be located adjacent to the door.

3.16 LABELING AND CABLE IDENTIFICATION

General

The Electrical Contractor shall provide and install a comprehensive system of labeling for the electrical installations.

All format/wording on the labels shall be agreed with the Engineer prior to obtaining/printing the labels.

Main Equipment

- Labels on main items of equipment, switchboards, contactors, distribution boards, isolators, control switches etc., shall be engraved Traffolyte and secured by means of screw fixings not self-adhesive.

- Information to be given on the labels shall include the equipment numbers as shown on the drawings, designation of outgoing cables and origin of incoming cables, source of supply, cable size, capacity of switch and rating of fuse in switch.

- Provide warning labels where voltages of more than 230V are present. These labels shall be securely fixed laminated plastic black text on yellow background.

Distribution Boards

- All switchgear and distribution boards shall have circuit and descriptive notice labels on the front cover. These shall be engraved Traffolyte and secured by means of screw fixings not self-adhesive. The descriptive label shall also reference the source of the feed, the capacity of the switch and the rating of the protective device and the cable size / type supplying the switchgear/distribution board.

- Outgoing final circuit information shall be in the form of a typed circuit chart securely fixed inside the distribution board to the door in a suitable plastic wallet.

- All cables in distribution boards shall have slip on type cable markers identifying the circuit reference. This includes all neutral and earth cables.

- All sub-circuits/final accessories shall be labeled with the name of the distribution from which it is fed including the phase and way number, an example for this would be:- DB2 / 6L1

Cables and Earth Bar

- Provide all mains and sub-main armoured cables with tagged ferrule markers at both ends to identify origin and destination.

- Label all earth cables at both ends. Refer to typical earth bar details given in Section 2 and on the drawings.

Lighting Switches, Sockets, Luminaires

- The front plate of all electrical accessories shall have printed adhesive tape fitted. The label shall be red text on clear background for essential circuits (where essential circuits are provided) and black text on white background for non-essential circuits. The labels shall give the circuit number as indicated on the distribution board schedules.

Fire Alarm Installation

- All fire alarm devices shall be identified with the loop number, device number and device type (B - break glass/manual call point, S – smoke detector, H – heat detector, I-Input/Output relay).

- The identification shall take the form of clear self-adhesive tape with black text.

- The Electrical Contractor shall provide sufficient self-adhesive tape for this purpose.

Hidden Services

In the case of services that are to be concealed above ceilings, circular traffolyte or plastic labels to BS colour code shall be secured by screw fixing or riveted to the adjacent false ceiling “T” bar.

The following ceiling services colour indication shall be used: -

- Yellow Concealed Power Supply Units
- Magenta Fire Alarm Detectors and Interfaces
- Black Smoke/Fire dampers
- Grey Lighting Control Modules
- Cyan Disabled Alarm systems

The Electrical Contractor shall confirm the full extent of concealed services and make due allowance in his tender for all labelling. Colour codes for services not listed above shall be confirmed with the engineer.

Prior to purchasing the above disks, the Electrical Contractor shall liaise with the client to confirm specific colour selection.

Actual distribution board references shall be as agreed with the Employer and Engineer prior to any labeling taking place.

The Electrical Contractor shall submit complete label schedules to the Services Engineer for comment prior to manufacture and fitment of the same. Schedules shall be submitted for all labelling.

3.17 GENERAL LIGHTING

The Electrical Contractor shall supply, install, test and commission a complete lighting system to all areas as shown on the Axis tender drawings and as detailed within this specification.

The lighting shall be designed to optimize the internal environment and appearance, whilst minimizing energy consumption and maintenance activities. All lighting shall be of the LED type to satisfy the schemes low energy consumption requirements.

The internal lighting installation shall be generally configured in a uniform manner in accordance with the Architect's drawings and as shown on the Axis tender drawings. However, as minor changes to the room layouts may result from design development, the Electrical Contractor shall make due allowance within the tender submission price for the reasonable relocation and reconfiguring of the internal lighting installation to suit revised architectural layouts.

Where multi-gang switches are detailed with more than 1 Phase at the switch, then suitable proprietary phase barriers and "Danger 415 Volts" labels shall be fitted to maintain segregation.

Final connection to luminaires shall be via a heat resistant flex.

Manufacturer's requirements for fixing, mounting and wiring shall be adhered to in all cases. The Electrical Contractor shall establish the various types of ceiling systems being used and shall allow for installing the luminaries accordingly, including the correct type of finishing seals/gaskets/flanges are provided.

The Electrical Contractor shall ensure that no luminaires, or switches, sensors etc. are damaged/spoiled by decoration, finishes or other trades etc. Any damage to the units shall be replaced at no cost to the employer such that the installation is new at the day of handover. The Electrical Contractor is thus advised not to install luminaires prior to decoration. The installation shall not be used for temporary/site lighting.

Lighting Controls

Lighting control shall be provided as shown on the drawings and detailed within this specification to comply with the requirements of Part L2A of the Building Regulations.

Generally, luminaires shall be controlled automatically via ceiling mounted PIR presence detectors as the arrangement shown on the tender drawings. Presence detectors to be manufactured by CP Electronic. Where presence detectors are not shown luminaires with integral presence detectors are to be provided as shown on the drawings and as detailed within the luminaire schedule included within the appendices of this specification.

Within the Club Room lighting shall be controlled by ceiling mounted microwave absence detectors.

The Electrical Contractor shall fully commission and set up the lighting control systems.

The Electrical Contractor shall allow to return to site after the building has been in use to re-adjust the lighting control settings to suit the user's requirements.

On completion of the project 2 No of each type of hand held Electronic programmer (to program absence/presence detectors) shall be issued to the Client to allow the setting of the detectors to be adjusted in the future.

All detectors shall be positioned to ensure their optimum performance is achieved.

Upon completion of the lighting control system the Contractor shall allow to demonstrate/instruct to the Clients engineer on the operation and reprogramming of the lighting control system.

3.18 EMERGENCY LIGHTING

The Electrical Contractor shall supply, install, test and commission a complete emergency lighting installation.

The emergency lighting system shall be installed and commissioned to comply with the following standards and legal requirements. All recommendations shall be taken as a requirement.

- BS 55266 Part 1
- BSEN 1838
- Building Regulation Part B
- Fire Precautions Act
- Health and Safety at Work Act
- Local Authority requirements
- Building Control Requirements

All luminaires shall comply with all British Standards and IET regulations.

The emergency lighting system shall consist of self-contained luminaires incorporated in to the general lighting scheme as far as practicably possible and separate emergency units where this is unachievable or detailed on the drawings seprate self-contained emergency lights shall be provided. In addition, illuminated exit signs shall be provided above all final exits and within circulation areas.

The system shall be a non-maintained system with the exception of illuminated exits signs which shall be maintained.

The emergency lighting system shall have three hours capacity; this shall be generally described as an X/0/180 system. Emergency lighting shall be provided to all defined and undefined escape routes throughout the new building. In additional emergency luminaires shall be provided in the following areas:

- External areas in the immediate vicinity of escape exits, including disabled access ramps
- Directly outside building entrances.
- All toilets
- Plantrooms
- Areas of high risk

Escape routes from the building to the assembly point will be provided with adequate emergency lighting to illuminate a safe escape route from the building.

Testing of the emergency luminaires shall be via local emergency lighting key switches. Where there is more than one key switch they shall be provided in a multi-gang format. Above each key switch on the switch shall be engraved "EMERGENCY LIGHTING TEST SWITCH". Each key switch shall have indication of the circuit and area served.

Emergency lighting key switches shall incorporate a red neon indicator light that shall illuminate when in test mode.

The 230V supply to the emergency luminaires shall be taken from the same switched circuits as the normal lighting. In addition to the normal switched live, neutral, and earth, emergency luminaires shall have an unswitched live (monitor live); this live shall originate from the final circuit protection device and the means of normal light switch.

All emergency luminaires shall be supplied complete with visible LED indicators.

The emergency lighting installation shall be tested and commissioned to the requirements of BS 5266 Part 1. Illumination level tests shall be carried out by the Electrical Contractor and the results recorded on a CAD drawing. All exit signs shall be of the illuminated maintained type.

All emergency lighting shall be so placed to achieve the level of illumination required by the above clauses and shall in general be placed at the following positions.

(a) Near each intersection of corridors.
(b) At each exit door.
(c) Near each change of direction.
(d) Near each staircase so that each flight of stairs receives direct light.
(e) Near any change of floor level.
(f) Outside each final exit door.
(g) Near each fire alarm call point.
(h) Near all the lighting equipment.
(I) Toilets and Lobbies.
(j) All plant rooms, switch rooms and sub stations alike.
(k) To maintain lighting levels to all general area
(l) Additional Luminaires required by Building Control
(m) At all electrical distribution equipment
(n) At all firefighting equipment
(o) Within Classrooms

Emergency lighting shall be provided in accordance with BS 5266 and to meet the requirements and recommendations of the local Building Control and other enforcing bodies to the complete development.

Where diffusers are installed on emergency escape routes (i.e. corridors, stairwells and final exits) all luminaires shall be fitted with TPA rated or polycarbonate diffusers in accordance with Building Regulations.

Sufficient signage is to be provided to allow quick identification of escape routes. These shall be provided by internally illuminated units with “running man” legends and directional arrows as required.

At a date to be agreed the Electrical Contractor shall carry out a full test on the emergency lighting installation in the presence of the Employer and the Engineer.

The 'as fitted' documentation shall include a test sheet for each luminaire, together with appropriate log book and maintenance sheets for routine testing and maintenance over the next 5 years for completion by the Client. Each test sheet shall have a unique number which shall correlate to a matching number added to the record drawings.

On completion Illumination level tests shall be carried out by the Electrical Contractor and the results recorded on a CAD drawing.

The Electrical Contractor shall ensure the emergency lighting system is compatible with the CP Electronics lighting control modules (LCM's).

3.19 EXTERNAL LIGHTING

The Electrical Contractor shall supply, install test and commission the external lighting and controls to the building as the arrangement detailed on the Axis tender drawings.

The Electrical Contractors shall develop these proposals further in accordance with the latest architectural/external landscaping scheme drawings.

The scheme shall be installed and commissioned in accordance with the following legislation:

- ILP Guidance notes for the reduction of obtrusive light.
- CIBSE SLL Lighting Guides
- BS7671 17th Edition IET wiring regulations
- BS5266 Emergency Lighting

The external lighting shall be controlled via a time-switches, photocells and contactors with an override switch provided adjacent the main distribution board (override switch on/off/auto) neon. Time switches shall be of the 7-day digital type. Separate time switches shall be provided for the building mounted external lights and the carpark lighting columns.

Mounted heights of wall mounted luminaires shall be agreed with the architect at prior to installation. Mounting heights and positioning to be coordinated on site, by liaison with the Architect, Engineer and Main Contractor, this coordination and liaison will be deemed to have been included with the tender return costs.

The Electrical Contractor shall take note of any landscape planting throughout the development.

Care shall be taken with conduits to wall mounted external luminaires to ensure that no back-entry conduit boxes and box lids are seen inside on plastered or block work walls.

All cable penetrations through the building fabric shall be suitably carried out and sealed to prevent ingress of moisture and to maintain the integrity of the construction.

External lighting shall be as manufactured by Kingfisher lighting, generally as their quotation included within the appendices of this specification.

External column mounted lanterns shall be fixed to 6m octagonal rooted, hot dip galvanised finish. Columns to be manufactured by Kingfisher lighting as detailed within their quotation.

Provide fused cut out units with 6 Amp fuse within the base of each lighting column. Cut-out units to be as manufactured by Kingfisher lighting.

Refer to the Kingfisher Lighting quotation included within the appendices of this specification for further information.

3.20 GENERAL POWER

The Electrical Contractor shall supply, install, test and commission the complete small power installation in order to comply with the objectives of the electrical services specification.

Refer to Axis tender drawings for number of outlets to be included for tender purposes.

The Electrical Contractor shall make due allowance within the tender submission for coordinating all power, voice and data outlets and power to specialist equipment in order to provide a fully coordinated installation. This shall involve producing working installation drawings which are submitted to the Client for comment/approval. The whole process shall be carried out in an iterative manner and at an early stage within the design development stage of the programme.

All general-purpose socket outlets shall be provided with 30mA RCD protection by RCBOs integrated within the local distribution board.

All socket outlets shall be positioned as far away as possible from sinks to reduce the risk of electrically powered equipment being placed in water.

Where noted on the drawings sockets shall incorporate USB charging outlets.

Circuits serving socket outlets which will potentially be used for connecting computers shall incorporate a high integrity dual earth and shall be wired in accordance with BS 7671.

As a maximum, sockets for no more than 8No. Computer workstations should be connected to a single MCB/RCD if likely to be used to serve ICT equipment, to prevent nuisance tripping. Circuits serving socket outlets which will potentially be used for connecting computers shall incorporate a high integrity dual earth and shall be wired in accordance with BS 7671 17th Edition IET Wiring Regulations.

Local supplies from fused connection units will also be included for all items requiring connection e.g. electric water heaters, hand driers, security systems, etc. Except for the fire alarm and intruder alarm these will be wired from local utility power circuits.

Wiring accessories shall be installed at a suitable height and in a location away from wet areas.

All outlets to be labelled indicating their circuit references.

The Electrical Contractor shall allow for close liaison with the Mechanical Contractor and Main Contractor regarding co-ordination of all outlets and shall verify against Architects wall elevations the setting out of all equipment, prior to installation.

All accessories shall be clean and grease/paint free at the time of handover.

Socket outlets shall be mounted as detailed within Part M of the Building Regulations above finished floor or 150mm above worktops.

All isolating and connection units shall be located adjacent to the cable entry position of the relevant piece of equipment as far as practicable.

Fused connection units shall be mounted at an approved height immediately adjacent to the apparatus being served and labeled accordingly.

The Electrical Contractor shall confirm all worktop and dado heights prior to first fix.

Cleaners Sockets

13A switched socket outlets protected with 30mA RCBO protection shall be provided within all rooms throughout the building, regardless of floor area size. This requirement is to discourage trailing leads being taken through doorways from one room or area and into another.

Cleaner's sockets shall be engraved "Cleaners" thus distinguishable from general sockets. In the case of smaller cellular areas sockets will be located adjacent to the door.

The Electrical Contractor will plan provisions of cleaner's sockets within open plan areas and/or larger rooms ensuring 8m radius coverage is achieved between outlets.

All Cleaner's sockets will be wired on dedicated circuits separate to other services.

Computers/IT Equipment

The Electrical Contractor shall supply and install a BSEN 60309-2 16A SP&N switched socket for the Comms cabinet. The socket shall be wired on its own dedicated 16A radial circuit from the distribution board.

Hand Dryers

The Electrical Contractor shall supply and install Hand dryers within all WC's areas (including disabled facilities). Refer to the Axis tender drawings for locations (final positions to be agreed the architect before installation). Final connections shall be via a switched fused connection unit with indicator mounted at 1800mm above the dryer with flush conduit between the SFCU and a flush mounted box mounted directly behind the hand dryer. Cabling from FCU to the hand dryer shall be 3-core 2.5mm² heat resistant flexible cable.

All hand dryers shall be manufactured by Dyson Ltd as their Airblade HU62V Nickel version.

All circuits shall be provided with 30mA RCBO protection.

Hair Dryers

The Electrical Contractor shall supply and install hair dryers within the Male and Female changing areas. Refer to the Axis tender drawings for approximate locations (final positions to be agreed at design stage). Final connections shall be via a switched fused connection unit with indicator mounted at 1800mm above the dryer with flush conduit between the SFCU and a flush mounted box mounted directly behind the hair dryer. Cabling from FCU to the hand dryer shall be 3-core 2.5mm² heat resistant flexible cable.

All hair dryers shall be manufactured by Valera at their Hotello Club range.

All circuits shall be provided with 30mA RCBO protection.

Local Power Supplies

Various supplies via switched/unswitched fuse connection units/isolators are required for individual items of equipment.

The Electrical Contractor is deemed to have included for all necessary supplies for specialist systems being supplied and installed by himself and accounting for any variation in requirements between the different specialists named. This process must take place during the tender period.

The Electrical Contractor will provide local power supplies to all equipment identified on the drawings and make all final connections.

3.21 STRUCTURED CABLING SYSTEM

The Electrical Contractor shall supply, install, test and commission a complete Cat 6A structured cabling system to the building to distribute data and telecom services. Refer to Axis drawing drawings for further information and location of the Comms cabinet and data points.

The scope of works is as follows:-

- Provide new 24u floor mounted Comms cabinet within the cupboard as shown on the drawing complete with PDU, patch panels and lockable door.
- Provide the twin data outlets (wired in Cat 6A cabling) shown on the drawing located on the ceiling for WIFI access points. The access points will be provided and installed by the client at a later date.
- Provide the new data points shown on the drawings including Cat 6A cabling back to the new Comms cabinet. Data outlets shall be terminated and tested with the data outlet provided with socket number.
- Also provide a dedicated Cat 6A copper UTP link between the Openreach ONT (within the Plantroom) and the Comms cabinet within the store.

Provide a 24 way active switch.

Provide a minimum 15 year warranty on the Structured Cabling system.

Provide all containment systems for the structured cabling system, as detailed within this specification and as required.

It will be the responsibility of the Electrical Contractor to liaise with the Main Contractor to develop and agree the primary containment routes and riser positions for the Structured Cabling System, routes and riser position shown on the drawings are indicative only at this stage.

Refer to the Axis tender drawing for locations and quantities of data outlets. Allow for all necessary containment/wiring and termination/commissioning.

All data outlet plates shall match standard accessories for the local area. This shall be achieved by mounting the RJ45 data outlets into MK Grey Logic plus Euro type plates.

All cables must be properly contained or secured to provide a safe and reliable installation. Containment runs shall use vertical risers, and horizontal distribution routes and, allow separation from other services.

Cable should be installed in basket in accordance with current codes of practice and in accordance with British Standards and IET 18TH Edition Wiring regulations, and recommendations.

When terminating cables, twists must be maintained up to the point of termination as required by category 6A standards.

As far as possible, copper data cables should be run with a separation of at least 300mm from adjacent mains wiring.

Standards

All cabling must be undertaken to the most recent version of the following standards:

- BS 7671:2018 - 18th Edition Requirements for Electrical Installations. IET Wiring Regulations
- BS 6701:2016 +A1:2017 Telecommunications equipment and telecommunications cabling.
- BS 8492:2016 Telecommunications equipment and telecommunications cabling
- BS EN 50173-1:2018 Information technology. Generic cabling systems. General requirements
- BS EN 50173-2:2018 Information technology. Generic cabling systems. Office Spaces
- BS EN 50173-3:2018 Information technology. Generic cabling systems. Part 3: Industrial Spaces
- BS EN 50173-4:2018 Information technology. Generic cabling systems. Homes
- BS EN 50173-5:2018 Information technology. Generic cabling systems. Data Centre Spaces
- BS EN 50173-6:2018 Information technology. Generic cabling systems. Distributed building services
- BS EN 50174-1:2018 Information technology. Cabling installation. Installation specification and quality assurance
- BS EN 50174-2:2018 Information technology. Cabling installation. Installation planning and practices inside buildings
- BS EN 50174-3:2013 +A1:2017 Information technology. Cabling installation. Installation planning and practices outside buildings
- BS EN 50310:2016 Application of equipotential bonding and earthing in buildings with information technology equipment
- BS EN 50346:2002+A2 2009 Information technology. Cabling installation. Testing of installed cabling
- EIA/TIA 598 Optical fibre cable colour coding standard
- EIA/TIA T568B pin/pair assignments for eight-conductor 100-ohm balanced twisted pair cabling

Copper Cabling

The components installed must be part of a single manufacturer (Excel or Hellermann Tyton) system and must be installed by an approved installer of that manufacturer.

The internal copper cabling is to be a Category 6a U/FTP S-Foil construction with a low-flammability sheath (complying to current BS EN 6701 A1: 2017 Cca-S1b, d2 a2 Classification as a minimum).

All installed cabling must be supplied with a minimum warranty of 25 years covering the cable work.

The cable must be low smoke zero halogen sheathed.

The flammability performance must meet EuroClass Cca-S1b d2 a2 as a minimum.

The components to be used must be complete Excel or Hellermann Tyton end-to-end cabling systems with associated components including patch panels and keystones.

At least two installations engineers shall have successfully completed the chosen cabling system installation training course. One of these engineers shall be present on site when any works are being undertaken.

The structured cabling system provided must be based on a star-wired topology, incorporating 258A (T568B) wired, four pair, balanced twisted pair cable running from user patch panels to the work area telecommunication outlets.

All cabling installation work must be carried out by qualified and OE Vendor approved/trained installation engineers.

The framework of the system must incorporate Excel or Hellermann Tyton standard RJ45 plug and socket presentation and IDC cable terminations.

The cable should be a U/FTP 4 pair, 24AWG 100 Ohm solid copper conductor, to a minimum performance level of Category 6a, as specified in the documents created by TIA TR41.8.1 and ISO/IEC JJC 1/SC 25/WG3.

The cable, patch panels, keystone jacks, modules and associated fixtures and fittings must be supplied by and/or approved by the Cable System OE Manufacturer thus ensuring that a full system guarantee can be issued.

The length of cable from patch panel to room outlet will not exceed 90 metres.

Wireless access points should be provided with a copper double outlet.

All cables shall be continuous from the user patch panel to the work area telecommunications outlet. Where a cable becomes damaged due to broken conductors or the sheath becomes torn or cut, the entire cable shall be removed and replaced with a known good one. The practice of jointing cables will not be accepted.

A plastic cable tie will secure the cable to the termination block.

Cables will be secured together in groups of no more than 24 by velcro straps to avoid cable damage.

All cables will be labelled with appropriate cable management within the communications racks.

Room Outlets

The data outlets will be of the matching manufacturer cabling system and be unshielded RJ45 presentation and modular in design wired to 258A (T568B) presentation.

A spring-loaded shutter must cover the entrance to the RJ45 jack.

The outlet printed circuit board (PCB) and the patch panel PCB must utilise PCBs from the OE Manufacturer to ensure complete system compatibility.

Port labelling and identification should be by way of a printed slide label running under a protective polycarbonate mask.

Room outlet accessories should match the general electrical installation.

Any work that involves the modification, reinstallation or relocation of a room outlet requires retesting and recertification to be completed.

Patch Panels

The Patching Panels must be cable OE Manufacturer approved panels, managed in groups of 24 RJ45 ports in each 1U segment.

Each circuit should be individual modular PCB, wired to 258A (T568B) specification.

Label identification should be by way of a printed slide label running under a protective polycarbonate mask.

Cables should enter the patch panel from the side.

Cable Containment

Refer to section 3.10 'Installation Method' for further details.

The cable containment system will have usable space (BS EN 50174-1:2000, Section 4.8.2) that allows for a minimum 50% future expansion.

Cable protection and fire-stopping through walls

Cable installers must ensure any penetration through walls is provided with appropriate fire-resistant material, approved by the project leader.

Labelling

Data points will be labelled as follows (each part separated by a"/") [Part A]/[Part B]/[Part C]

Where:
Part A Comprises the floor (G = Ground, 1 = 1st Floor, 2 = 2nd Floor etc.);
Part B Comprises the terminating Cabinet Number (supplied by IT Services).

Part C Comprises a 3 digit reference number (001-999).

Example: 0/032/001

All data labels must comprise laser cut, black text on white background, rectangles protected by a Perspex window.

All Patch Panels must be labelled in a corresponding fashion in ascending numerical order.

Data points should be labelled in a consecutive and logical manner (e.g. data points 25-48 in Room 'B' should follow data points 1-24 in the adjacent Room 'A' etc.)

Copper Testing

All test equipment used to characterise the performance of the installation shall be approved by the cabling system manufacturer, prior to system testing.

Prior to system hand-over, a 100% test shall have been conducted on the installed cabling.

The testing shall identify any faults due to open circuits, cross or split pairs as well as a series of performance faults.

The testing must satisfy the manufacturers installation guidelines in order to carry the manufacturer backed warranty. In some cases a representative of the manufacturer may be required to witness the testing;

All test results shall be recorded and certification handed to IT Services on completion.

Any cabling failures will require resolution of the fault and retesting before completion.

A minimum warranty of 15 year shall be provided on the complete Structured Cabling system.

As far as possible, copper data cables should be run with a separation of at least 300mm from adjacent mains wiring.

3.22 MECHANICAL SERVICES

The Electrical Contractor shall design, supply and install all supplies and containment associated with general supplies to mechanical equipment including final connections of the following plant/equipment listed below and as indicated on the drawings (this list is not exhaustive)

Note: - The above details are provisional and for tender purposes only and shall be confirmed with the Mechanical Services Contractor before installation.

All isolators and fused connection units shall be labeled/engraved identifying the circuit reference and equipment it is supplying.

Typical wiring to be carried out by the Electrical Contractor to details provided by the Mechanical Contractor shall include (but not be limited to):

Extract Fans

Provide 230v supplies via switched fused connection units located within the roof void.

Heat Recovery Units (HRU)

Provide 13A switched fused connection units within the roof voids for each of the heat recovery units shown on the drawings.

Also provide a fire alarm interfaces for each of the HRU to enable them to automatically shut down in the event of the fire alarm system being activated.

Water Boiler

Provide a 230V switched fused connection unit for the electric water boiler within the Kitchen as indicated on the drawings.

Mechanical Services Control Panel

Provide a 32A SP&N IP65 rotary isolator adjacent to the mechanical services control panel located within the plantroom via type C MCB.

Also provide a fire alarm interface for the mechanical services control panel as detailed under the fire alarm section of this specification and a twin data point.

Air Source Heat Pump

Provide a 40A TP&N supply via a IP65 rotary isolator via type C MCB for the external air source heat pump as shown on the drawings. Exact position to be confirmed at installation stage.

ASHP Hydroboxes

Provide a 32A SP&N supply via a rotary isolator for each ASHP Hydrobox within the plantroom.

Water Booster Set

Provide a 230V switched fused connection unit for the water booster set within the plantroom.

Trace Heating

Provide a 230V switched fused connection unit for the trace heating system within the plantroom. Exact location to be confirmed with the mechanical contractor as installation stage.

3.23 FIRE DETECTION AND ALARM

The Electrical Contractor shall employ Marlowe Fire and Security, to supply, install, test and commission an L2 analogue addressable fire and detection alarm system to the building as shown on the drawings and as detailed within this specification as their quotation reference Ref **407040/MP.**

The system shall be installed and commissioned to a life classification Category L2 system as defined in BS 5839 Part 2017. The fire alarm shall also comply fully with the requirements as prescribed under BS 9999: 2008, Approved Building Document Part B., Clients Insurers, Clients Fire Officer and local Building Control Officer requirements.

The Fire Alarm Specialist shall undertake the duties as listed below: -

- Supply of all fire alarm equipment including control panel, detectors, break glass units, sounder bases, addressable interface units, power supply units etc.
- Zoning of the fire alarm system.
- Provision of a detailed wiring diagram showing each device (detector, sounder etc), indicative cabling routing drawings and device address reference schedule – to be provided at least four weeks prior to the installation commencing.
- Full testing and commissioning of the system upon completion.
- A separate visit to be completed built in order to instruct the Client on the use and maintenance of the installed fire alarm system.
- Provision of full maintenance information, including operation and maintenance manuals for the equipment and as fitted drawings showing locations and addresses of all devices. A complete listing showing address numbers shall be provided.
- Zone isolators for the division of each zone, a minimum of one isolator for every 20 No. devices and as defined by BS 5839.
- Isolation-test key to prevent ancillary devices/outputs operating on routine test.

The Electrical Contractor shall allow to wire and connect to all systems in order to provide a complete operational system of interfaces. Exact positioning of all devices shall be agreed on site, particularly to smoke detectors on ceiling adjacent to light fitting, ventilation diffusers, etc. to ensure they are not in direct air flows.

The extent of the fire alarm system shall be fully recorded on the as fitted drawings, including the sequence of wiring of the fire alarm equipment and their individual address numbers. All ancillary equipment necessary to make the fire alarm system a complete functioning system in full compliance with BS 5839 and EN54 shall be included by the Electrical Contractor at tender stage, including end of line resistors, zone isolators, battery packs, power supplies, etc.

System Description

The system shall contain the following devices, this list is not exhaustive.

- Main fire alarm panel
- Heat detectors
- Smoke detectors
- Combined Smoke/Heat Detectors
- Break glass units (with covers)
- Sounders/sounder bases
- Sounder/sounder bases incorporation xenon Interface relays
- Power supplies and battery backup.
- Shutdown signals to plant / equipment
- Interface Units

Note – The roof void will be above 800mm and therefore will require automatic smoke detection throughout as shown on the drawings.

Remote Communication Links
The fire alarm system shall be configured to communicate remotely from the building to an Alarm Receiving Centre (ARC) via a DualCom Digital communicator, also used for fire alarm signals.

Compliance with Relevant Standards

The equipment and materials shall comply with the most recent issue and revisions of all relevant British Standards current at the time of tender, and/or such other recognised standards.

The following are applicable standards: -

BS 5839	Fire Detection and Alarm Systems in Buildings (All Sections)
BS 5588	Fire Precautions in the Design and Construction of Buildings
BS 5445	Specification for Components of Automatic Fire Detection Systems
BS 3116	Automatic Fire Alarm Systems in Buildings
BS 800	Specification for Radio Interference Limits and Measurements for Household Appliances, Portable Tools and Other Electrical Equipment causing Interference
BSEN54	Fire detection and fire alarm systems

Electrical Supply

Provide a fused connection key switch. The key switch shall be derived from a dedicated circuit on the buildings main distribution board. Note the MCB and 13A un-switched fused connection unit should be red and labelled 'FIRE ALARM – DO NOT SWITCH OFF'. Wiring shall be FP200 Gold or equal with red outer sheath.

Fire Alarm Circuits

Circuit Design – General

Detection circuits shall be capable of providing as a minimum requirement, monitoring of open and short circuits, together with monitoring of the removal of detector heads. Circuits shall be arranged such that the removal of any detector does not impair the correct operation of any other detector or call point.

Alarm circuits shall be monitored for open and short circuit faults with 25% spare capacity from each circuit.

Circuit Design - Analogue Addressable System

Wiring of all remote devices from the fire alarm panels shall be carried out as continuous loops. Each input/output on the loop having an individual address. **Loops shall not exceed 75% of its address capacity to allow installation of modifications.**

Line isolate modules shall be installed at regular intervals on each detection loop to enable automatic isolation of sections of the loop, in the event of a short circuit condition between the modules. The modules shall be installed on zone boundaries to enable isolation of devices.

Circuit Wiring

Cabling shall not share containment with any other system.

Fire alarm cables will be supported in accordance with Clause 26.2 f) BS 5839: Part 1. In effect the use of plastic cable clips, cable ties or trunking is precluded where these methods are the sole means of cable support. As a minimum the Electrical Contractor will use metal cable clips or ties where the cabling installed vertically on cabling tray and/or drops rods

including horizontal runs where the cabling is unsupported by the tray work i.e. clipped to underside.

Where cables are installed vertically or on inverted cable support systems, steel clips/tie wraps shall be utilised.

Where cables are surface run these shall be fixed using proprietary 'P' type cable clips. Fixing centres for cables shall be a minimum of 300mm horizontally and 450mm vertically.

The use of cabling joints will be precluded within the new cabling installations. If cabling joints are unavoidable agreement shall be reached with Axis and the client. Terminals used to joint cables will be constructed of materials that will withstand a similar temperature and duration to that of the cable. All joints, other than those within system components provisions shall comply fully in accordance with 26.2 f), BS 5839: Part 1: 2002 – A2: 2008. Furthermore, all joints, other than those within proprietary system components will be enclosed within junction boxes, labelled with the words FIRE ALARM JUNCTION to avoid confusion with other services. Junction boxes will be metal to offer some integrity to fire alarm cabling complete with ceramic terminal blocks.

All cabling shall be carried out using fire resistant cabling complying with the requirement of BS5839 Part 1 2013 (FP200 Gold or equal). The fire alarm cabling shall have a red sheath to enable the cable to be distinguished from other circuits.

All cable types and number of cores shall be verified and confirmed by the Fire Alarm Specialist during tender. The Electrical Contractor shall include within their returned tender for all costs associated with providing the correct type of cabling.

Ceiling mounted detectors shall be installed directly on to galvanised cast BESA boxes flushed to the ceiling surface. The weight of smoke detectors must not be imposed onto ceiling tiles. Either the weight must be taken by drop rods, or plywood blacking sheets used.

The Electrical Contractor shall allow for self-adhesive labelling of all detectors on the base bearing an identification number as agreed with the university.

Fire Detectors, Sounders & Call Points

Manual Call Points

Manual call points shall be addressable and of the steady pressure breakglass type manufactured to BS 5839 Part 2 and installed to BS 5839 Part 1. All call points shall be provided with plastic lift-up covers.

Heat Detectors

All heat detectors shall be of the analogue addressable type compatible with the control equipment and conform to BS 5445 Part 5 or 8. The detector shall fit a common base. The common base shall be either of the patress or flush fixing type as appropriate.

Smoke Detectors

Smoke detectors shall be optical type and of the analogue addressable type compatible with the control and indicating equipment and shall conform to BS 5446 Part 1. The detector shall fit a common base. The common base shall be either of the patress or flush fixing type as appropriate.

Alarm Sounders

Alarm sounders shall be electronic sounders and shall be supplied in sufficient quantity and suitably located to achieve the audibility levels prescribed by BS 5839. A number of alarm

sounders shall also include a flashing beacon for visual indication as detailed below and generally for compliance with Building Regulations Part M.

Sounders shall have an adjustable sound output.

Sounders Bases

All sounder bases shall be loop powered electronic sounder bases and have adjustable sound output. The sounder level shall be adjusted as necessary during commissioning.

Beacons

Beacons shall be incorporated into the heads of the detectors to meet with the requirements of Part M of the Building Regulations, BS 8300 and BS EN 54.

Protection of Ceiling Voids

Ceiling voids shall be protected by smoke detectors as required. All voids greater than 800mm require a fire detection device. Smoke detectors shall be provided with remote LEDs.

Remote LEDs

All detectors sited in cupboards, voids store rooms and infrequently used rooms shall be fitted with remote Led indicators to assist in the location of a fire or fault. The remote indicators shall be sited in main corridors or circulation areas.

Control and Indicating Equipment

The new fire alarm panel shall be located in the main entrance/reception area, exact location to be agreed at detailed design stage. Allow for batteries to be remotely mounted.

Controls shall be provided to prevent signals being sent to selected equipment connected to loop interfaces during standard test. Controls to isolate plant shall be provided via a common captive key switch and be complete with an indicator LED and buzzer. Devices to be prevent from operation during testing shall be agreed at detailed design stage.

Ancillary Services

Loop driven addressable interface units shall be provided for connection to other systems. The Electrical Contractor shall make final connection to these other systems and commission links as part of overall testing.

The new fire alarm system shall be interlinked to other services, so as to override certain functions and equipment during a fire alarm condition. The Electrical Contractor shall provide all interface connections, auxiliary relays, power supplies etc. The services and associated equipment to be interlinked to and/or from the new panel are as follows: -

Item	System Description and Location	Input/ Output	Action upon Initiation of a Fire Alarm
1.	**Mechanical Control Panel**	**Output**	**Upon activation of a fire alarm all Mechanical Services Control Panels shall be notified of a fire situation.**
2.	**HRU's**	**Output**	**HRU's shut down on fire signal**
3.	**Kitchen Roller Shutter**	**Output**	**Roller Shutter Closes**

All connections and cabling shall be supplied by the Electrical Contractor.

All interfaces shall be situated as close as practically possible to the device they are to operate.

The Electrical Contractor shall supply and install a 'Plant Over-ride' key switch. This shall then operate to prevent the signal being sent to equipment connected onto either input or output interface modules (identified above) in the event of standard testing procedures being carried out. Upon operation of the switch a buzzer will sound to warn that outputs are isolated. The plant isolation test keys will be engraved in the open and closed positions accordingly.

Include 2 No additional fire alarm interfaces to be used at the engineer's discretion.

Provision of Drawings

The Fire Alarm Specialist shall be employed to provide system wiring diagrams. Two copies of each drawing shall be forwarded to Axis for approval.

Site Programming of Description Display

The Electrical Contractor shall produce schedules itemising all addressable points, listing the descriptor references which are to be displayed on the main control panel and network upon activation of such a device.

The schedules shall further identify all reported messages which shall be displayed for pre-alarm, fault conditions etc.

To enable the Client to agree and complete the schedules the Fire Alarm Specialist shall provide: -

1) Schematics.
2) Layout drawings showing location of all devices
3) Cause and Effect schedule.

These shall be submitted for comment allowing sufficient time to prevent any delay to the progress of works.

Upon receiving comments on such schedules, the Fire Alarm Specialist shall be responsible for the programming of the system to ensure that the correct text descriptor message is displayed on the panel upon actuation of the associated device. All text messages shall be checked for accuracy during witness testing and commissioning. Any faults in text messages shall be rectified and this shall be at the expense of the Electrical Contractor if found to be of the fire alarm specialist error in programming the system.

Installation, Operation and Maintenance Manuals

The Fire Alarm Specialist shall be employed to prepare three copies of installation, operation and maintenance instructions which are to be forwarded to the Engineer one month prior to handover. Standard instruction sheets may be included for components and units, but sufficient other information must be incorporated as necessary to identify and permit full understanding of the characteristics and functions of the system as used for the particular application.

Inspection & Testing

All equipment shall be tested and inspected and commissioned to demonstrate compliance with the relevant specifications and standards.

The Fire Alarm Specialist shall be employed to carry out a full functional test on site and to further demonstrate the same to the Employer, and the employer's representative, on a separate occasion.

Audibility tests shall be carried out during the testing of the system. The Fire Alarm Specialist shall carry out these tests using a suitable sound level meter. A copy of an up to date calibration certificate for the meter shall also be provided and handed to the Engineers. The Electrical Contractor shall ensure that all interfaces onto other systems and ancillary equipment is fully functional to meet stipulated requirements. Therefore, commissioning and testing needs to be co-ordinated with these systems.

The Fire Alarm Specialist shall issue an LPS1014 certificate stating that the system has been fully commissioned and is fully operational. Once the Electrical Contractor is satisfied that the system is functioning correctly, the systems shall be offered for complete witness testing by the Engineer. At least 2 weeks' notice shall be given of the intended dates for witness testing.

Witness testing shall include: -

1) Prove the operation of all devices, detectors, call points, ancillary equipment, sounders.
2) Establish correct display and descriptor comes up on main control panel and repeater for each device, fault condition etc.
3) Simulate fault conditions, mains failure and all facilities and operations listed in the specification including the operations shown on the flow charts.
4) Audibility tests in all areas.
5) All interfaces onto ancillary systems functional and report correctly.
6) Any other tests to satisfy the requirements of BS 5839, including a continuity check/test of the detection loops, sounder circuits etc.
7) Provision and completion of the initial information in a Maintenance Logbook.

All devices must be tested 'in the field' and therefore proprietary detector actuating sprays and methods of activating heat detectors shall be utilised. The Fire Alarm Specialist shall be in attendance during all witness tests. It is to be clarified to the Electrical Contractor that AUDIBILITY TESTS are to be carried out during witness testing of the system. The specialist shall carry out these tests using a suitable sound level meter. A copy of an up to date calibration certificate for the meter shall also be provided and handed to the Engineer. During witnessing the Electrical Contractor shall record DbA levels in all rooms on a set of A3 drawings, which shall be appended to the Commissioning Certificate.

Special Tools

The Electrical Contractor shall supply any special tools required for operation and testing of the system in sufficient quantity. (Minimum quantity of 3 for any item).
The Electrical Contractor shall also provide a full schedule of devices with suggested labelling to the client/engineer at an early stage for comment.

Mimic Diagram

The Electrical Sub-Contractor shall allow to mount a colour diagram of the system indicating the fire alarm zones. The diagram shall be mounted adjacent to the fire panels and shall be installed in glazed frames.

Soak Test

The Fire Alarm Specialist shall provide a soak test to BS 5839. The soak test is to be carried out once the commissioning of the building has been finished and the occupants/tenants have taken ownership of the building. Allow attendance as necessary by the Fire Alarm Specialist during the soak test period.

Allow for all necessary insurances to be in place to cover the use of the building by the Contractors and Specialist Contractors during this period. A false alarm monitoring test shall be performed by the Electrical Contractor for 7 days, complete with 24 hour monitoring of all detection equipment to establish the system does not produce unwanted false alarms. Should this test fail for any reason at any period during the 7 day test, then the soak test shall be repeated from the start again, until the systems function accurately and correctly. Practical completion shall not be awarded until the soak test has been completed successfully.

Training of the System

The fire alarm equipment supplier shall make available to the Client all necessary software, licences, equipment and instructions in simple written format to enable maintenance, testing, reprogramming and extending of the system by either the Client themselves or a trained specialist. The Fire Alarm Specialist shall allow for training 2 separate groups of staff on 2 separate occasions. The Electrical Contractor shall provide a tailored training programme for the Client's personnel responsible for the operation and management of fire alarm installations in designated areas.

3.24 ASSISTANCE NEEDED ALARM

The Electrical Contractor shall supply, installation, testing, commissioning and leaving ready for continuous service an assistance needed alarm call systems to the disabled/assisted WC.

The system shall comprise of: -

- Ceiling mounted pull cord switch. The pull cords shall extend to within 150mm affl and shall be complete with 2No grab rings.
- Wall mounted, flush, reset unit with integral reassurance lamp, stainless steel finish.
- Lamp and tone generators (combined unit), stainless steel finish (x2).
- Power supply unit and 230v supplies via un-switched fused connection unit.

Upon activation, an alarm signal shall be generated locally via the lamp and tone unit shown on the drawings.

The system shall be wired and installed in accordance with the manufactures wiring diagrams and instructions.

The system shall be as manufactured by C-TEC limited or equal and approved.

Upon completion the Electrical Contractor shall demonstrate the full working system to the Engineer and Client and train the Client in its operation. Test and completion certificates stating that the system has been correctly installed shall be issued to the Client and incorporated into the Operation and Maintenance Manuals.

3.25 CLUB ROOM INDUCTION LOOP

The Electrical Contractor shall design, supply, install, test and commission mains powered induction loop system to the Club Room. Exact requirements are still to be confirmed with the client, however for tender purpose the following should be included for:

- PDA Pro-range amplifier
- Ceiling mounted microphones (2 No)
- Input/ sockets (2 No) locations

- Induction loop
- Interconnecting cabling
- AFILS fitted stickers

The induction loop amplifier shall comply fully with the following British Standards and/or other nominated rules and regulations. The equipment manufacturer shall confirm compliance with the standards: -

- The equipment manufacturer shall be approved to BS EN ISO 9001 quality system standard for the design and manufacture of the equipment.

- The product shall be manufactured in conformance with the requirements of all applicable EU directives.

- The amplifier shall be designed to comply with BS 7594 - Code of practice for audio-frequency induction-loop systems (AFILS).

- A 400mA Induction Loop Tester, shall be used to test the AFILS in accordance with BS EN 60118-4 (Magnetic field strength in audio frequency induction loop systems for hearing aid purposes).

- Installation practices shall conform to the current edition of BS 7671 (IET Wiring Regulations).

Induction loop equipment to be as manufactured by C-Tec limited or equal and approved.

Following installation and completion of the induction loop systems, and at a time agreeable with the Client, the Electrical Contractor shall arrange for the induction loop system to be fully demonstrated to the Client and/or his designated representatives.

The appropriate signage must be provided and displayed with the induction loop system. The Electrical Contractor shall include for all electrical supplies, containment and associated wiring to form a complete installation.

For tender purposes assume the induction loop cabling will be installed within a PVC conduit system installed behind the ceiling system around the entire perimeter of the room. Exact containment system to be agreed prior to installation and accordance with the manufactures recommendations.

Following installation, the induction loop systems shall be tested and commissioned in accordance with the manufactures requirements.

Include for providing all 230-volt electricity supplies required for the systems.

3.26 INTRUDER ALARM SYSTEM

The Electrical Contractor shall employ Marlowe Fire and Security Ltd to supply, install, Test and commission an intruder an intruder alarm system to the building as shown on the drawings, as detailed in this specification and as their quotation Ref **407040/MP.**

The Electrical Contractor shall include for all charges by Marlowe for the first years Annual Maintenance and DualCom monitoring.

The Intruder Alarm shall be a Grade 2 and shall be designed and installed to comply with PD6662:2010, EN50131 and DD243:2004. The system shall be designed to transmit dual path alarm activations to a central monitoring station supplemented by external and internal audible warning devices.

In general, the intruder alarm system shall consist of (but not be limited to) the following

elements: -

- Door contacts to all external doors
- Key pad with on board proximity readers
- Proximity tags (x10)
- Dual Tech movement detectors
- 24 Hour Anti Tamper Protection
- External sounders/beacons
- Internal sounders
- Wiring and containment systems
- Intruder alarm panels and expander panels/RIOs
- DualCom Plus digital communicator
- Data point for the above
- Power supply units
- Back-up battery
- Decoy Sounders
- Document box and NSI Gold Certificate

The intruder alarm system could be configured to communicate remotely from the building to an Alarm Receiving Centre (ARC) via the DualCom Digital communicator via GSM and data network. Location of the ARC to be confirmed.

The exact locations and mounting heights of external strobe/sounder units to be agreed with the architect.

The Electrical Contractor shall provide all 230 Volt power supplies and containment systems associated with the intruder alarm works.

All wiring to be LSZH concealed and coordinated with the Electrical Contractor.

Power supplies to equipment shall be via un-switched fused connection units, located, as far as possible, in secure positions, to prevent tampering. All power supplies shall be supplied and installed by the Electrical Contractor.

On completion, an encapsulated zone chart shall be provided adjacent to the new intruder alarm panel. The chart (drawing) shall show all building zoning in colour. The chart shall be frame mounted on the wall behind a clear Perspex cover. A copy of the zone chart shall be forwarded to the Engineer for approval prior to final printing and installation.

Prior to practical completion, the whole of the intruder alarm system shall be commissioned in accordance with the recommendations of NSI and the aforementioned standards. The

Electrical Contractor shall provide the following information prior to practical completion: -

- Commissioning certificates.
- Comprehensive operating and maintenance instructions for the system.
- A detailed system log book.
- Comprehensive, detailed record drawings showing layout of all principle components, wiring routes etc.
- Details of each component utilised within the scheme including details of detectors, control panels etc.

The aforementioned information shall be included within the general electrical services operating and maintenance manuals.

Upon completion, the specialist shall allow demonstrations of the system to the Client. The system will be an addressable system, with each device comprising of an individually identifiable address, which in the case of an activation or fault, will be displayed on the keypad in text format.

This generic specification is not an installation standard and all installations must comply with BS4737, DD243:2004 and any other relevant legislation or standard at the time of installation. Every detection device on the system shall be configured as a single-zone, individually addressed.

All cabling to alarm contacts shall be fully fault monitored and individual devices shall be fully monitored for open and short circuit.

All alarms shall display within 2 seconds. The system shall continue to monitor all devices and produce alarms when any subsequent ones are initiated, although acknowledgement shall be required. The priority level of an alarm shall be displayed at all times, with higher priority alarms taking precedence.

The system shall allow for future expansion with 25% spare capacity.

All equipment shall comply with IEC standards regarding creation of, and sensitivity to, electromagnetic radiation and electrostatic fields.

Alarm input shall comply with BS 4737 to minimise false alarms.

Door contacts shall include an associated magnet, which shall be recessed into the top edge of the door leaf. Heavy-duty devices shall be of steel construction with screw fixings, suitable for surface mounting with armoured loop. These shall be fixed to the transom at appropriate places, which shall be coordinated with the conduit installer such that surface conduit terminates near the contact housing in a conduit box. The associated magnet shall be fixed to the door leaf using approved fittings.

Where cable connections are made into equipment, a numbered marker sleeve shall be fitted to each cable-core, which shall correspond to the wiring diagram.

Schedules detailing all user definable options and system configuration proposals shall be provided and forwarded to the Engineers for comment at an early stage, together with appropriate advice to enable the system to be tailored to the client's situation. Sufficient information shall be provided to enable by client to fully appreciate the options available. Care shall be taken to differentiate between items that can be re-defined by the user and those requiring attendance by the specialist.

Contact details for Marlowe Fire and Security Ltd: -

Marlowe Fire and Security Ltd
6-10 Rising Lea,
Derby Road,
Risley,
Derbyshire,
DE72 3SS
Contact: Mark Palethorpe
Tel: 07968 765944

3.27 CCTV SYSTEM

The Electrical Contractor shall employ Marlowe Fire and Security Ltd to supply, install, Test and commission an CCTV system to the building as shown on the drawings, as detailed in this specification and as their quotation as their quotation reference Ref **407040/MP.**

Refer to Axis tender drawings for number, types and locations of cameras.

The system shall comply with the following standards: -

- BS EN 62676-4

- BS EN 50132-7
- IET Wiring Regulations

The system shall be provided in accordance with the NSI codes of practice NCP104 and all relevant legislation. It shall be compliant with the installer aspects of the Data Protection Act.

The system shall generally consist of the following: -

- NVR (Network Video Recorder) housed within the Comms Cabinet with on board PoE switch
- Network Cameras
- Wiring and power supplies
- Monitoring equipment

The Electrical Contractor shall provide all attendance on the specialist, including co-ordination of the works.

The Electrical Contractor shall provide all power supplies and containment systems in association with the CCTV installation and shall include for all commission/annual monitoring costs associated with these works.

Wiring to the cameras shall from the NVR shall be Cat 6A structured cabling. Refer section 3.21 of this specification for further information.

All wiring shall be concealed.

The system shall be tested and commissioned by the specialist CCTV system supplier and certification shall be provided in accordance.

The Electrical Contractor shall provide all power supplies and containment in association with the CCTV installation and shall include for all commission/costs associated with these works.

Contact details for Marlowe Fire and Security Ltd: -

Marlowe Fire and Security Ltd
6-10 Rising Lea,
Derby Road,
Risley,
Derbyshire,
DE72 3SS
Contact: Mark Palethorpe
Tel: 07968 765944

3.28 TV SYSTEM

The Electrical Contractor shall for the design, supply, install, test and commission a complete Digital TV distribution system.

The system shall be installed to serve the TV points indicated on the drawings.

The system shall receive transmission via a digital free view antenna mounted to one of the gable ends of the building.

Cabling shall be separately identified from other cables.

Consideration shall be given to the location of the aerials, boosters and associated equipment.

The system shall be suitable for the viewing of all free view terrestrial channels.

All power supplies and containment in association shall be included within these works.

The TV system shall comply with the following:

- BSEN 50083 pt.2 (2012) cable distribution systems for television sound and interactive multi-media signals.
- The Technical Conditions of the Licensing Authorities.

All signals shall be distributed at received frequencies unless local conditions are such that the reception in the locality of the network will be interfered with, or interference will be produced on a received connection to the system. If either case exists then, distribution shall be on Channels recommended and approved by the Home Office.

The off-air signal shall be to British Standards in order to produce satisfactory operation of the system.

The system shall be suitable for the viewing of different channels (terrestrial or satellite) simultaneously through each television outlet point.

The specification of cable types shall be screen low loss LSZH satellite cable, exact type to be confirmed with the specialist supplier.

3.30 LIGHTNING PROTECTION SYSTEM

The Electrical Contractor shall employ a Lightning Protection Specialist during the tender period to undertake a Lighting Protection risk assessment for the building in accordance with BS EN 62305-1: 2011 to determine if a lighting protection system is required to the new building.

If a Lightning Protection system is not required, the Electrical Contractor shall confirm this within their tender return including a copy of the risk assessment accordingly.

If required the Electrical Contractor shall employ a Lightning Protection Specialist to design, supply and install a complete lightning protection system to the Building (LPS) including complete testing and commissioning of the system in accordance with the following clauses, details, appendices and relevant design, installation and material legislation.

The Electrical Contractor shall be responsible for providing all information required by the Lightning Protection Specialist to ensure a comprehensive tender cost shall be provided, and a full, detailed and precise design and subsequent installation shall be undertaken.

A lightning protection system will be provided in accordance with BS EN 62305-1: 2011. This will also include mains and sub-mains surge protection to protect sensitive equipment installed throughout the building.

Typically, the new installation will consist of an air termination network, where available the steel structure will be utilised as down conductors. If this cannot be used, down conductor tapes, (in a colour to be agreed with the Architect) integrated with the external cladding design will be utilised. A sufficient numbers of earth electrodes will be installed.

The lightning protection system shall be design, installed, tested and commission in accordance with the following standards/legislation.

- BS EN 62305:2011 Protection Against Lightning

- BS EN 50164 Lightning protection components Part 1: Requirements for connection components
- BS EN 61663 Lightning Protection – Telecommunication Lines and Fibre Optic Installations
- BS 7430 Code of Practice for Earthing
- BIP 2118 A UK Guide to the Practical Application of BS EN 62305
- BS 6746C Colour Chart for Insulation and Sheath of Electric Cables
- BS EN 755 Aluminium and Aluminium Alloys
- BS EN 13601 Copper and Copper Alloys, Rod and Bar
- BS EN 61643 Surge Protection Device

The Lightning Protection Specialist shall allow for following the requirements of BS EN 62305 and the client's insurer to calculate the LPS (structural and electronic) grade/level of protection required via risk assessment method

The building shall be suitably zoned (LPZ) as detailed within BS EN 62305.

The class of LPS shall fully consider the building layout, high location use, incoming services, utilities and all other loss factors as appropriate.

The Electrical Contractor shall provide class of LPS calculations undertaken by the Lightning Protection Specialist to the Engineer for comment prior to placing orders.

The Electrical Contractor shall be responsible for co-ordination of the works carried out by his Lightning Protection Specialist Sub-Contractor with all other works, and also for co-ordination of details prepared by his Specialist with Architects and Structural Engineers drawings. The Specialist Sub-Contractor shall be responsible for producing all necessary information and details of his equipment and methods of fixing for the co-ordinated installation of his equipment.

All detailed design drawings shall be forwarded to the Engineer for approval prior to commencement on site.

The Specialist Sub-Contractor shall be responsible for producing all necessary information and details of his equipment and methods of fixing for co-ordinated installation of his equipment. All detailed drawings shall be forwarded to the Engineer for approval prior to commencement on site.

On completion of the whole of the installation, test results and reports as supplied by the Specialist Sub-Contractor, shall be forwarded to the Engineer. The report shall clearly state that the installation complies with the relevant requirements of the British Standard.

The installation shall also comply with the relevant requirements of the Health and Safety at Work Act 1974, 17th Edition of the IET Regulations and British Standard 7430, Earthing.

For details of the structure refer to the Architect and Structural drawings which are available via the Main Contractor.

The Lightning Protection Specialist shall undertake a risk assessment in accordance with BS EN 62305-2 Risk Management. Separate risk assessments shall be undertaken to ascertain the implications of the risk of human life (R1), risk of loss of service to the public (R2), risk of loss of cultural heritage (R3) and risk of loss of economic value.

The risk assessment as a minimum shall include: -

- Building collection area.
- Number of dangerous events.
- Overhead services.
- Underground services.
- Connected structures.

The risk assessment shall also include, as and were applicable, the following:-

- Client insurer requirements.
- Data Specialists requirements.
- CCTV/Access control specialists.
- All other Mechanical and Electrical Sub-Contractors and Specialists Sub-Contractors with external equipment and internal or external electronic equipment.

A full list of variables and calculation methods are available within BS EN 62305-2 Risk Assessment and shall be fully adhered to.

The lightning protection system shall be terminated to ground via a number of earth electrodes, BS EN 62305 type A configuration, with 2 No. earth electrodes as a minimum.

The earth electrodes shall be housed within a LV stable high strength chemical resistant polymer inspection pit. The pit shall as a minimum withstand a 5000kg load and incorporate a lockable lid. The inspection pit shall be installed flush with the finished ground level and co-ordinated with the perimeter paving/landscaping.

Solid copper earth rods minimum 20mm diameter, plain round section, 1.2m long coupled as necessary with bonded screwed connections and complete with triangular type gunmetal head clamps, unless otherwise specified. Each rod shall be a minimum of 2.4m long.

Inspection pits and trenches shall be readily duty out by the Main Contractor to allow the Lightning Protection Specialist to install and connect the earth rod and inspection pit. The Main Contractor shall provide a trench of minimum depth of 600mm and length 1000mm perpendicular to the steel stanchion to which shall be connected to an earth electrode.

The earth electrode shall be installed at a distance of 500mm from the building structure and connected to the local down conductor via a copper tape (minimum of 25mm x 3m) with PVC sheaf buried at a depth of 600mm.

All conductor joints shall comprise of riveted or bolted clamps, rigidly securing the conductor tape ends, with recommended mating surfaces cleaned, anti-corrosion protected and the whole joint wrapped in waterproof tape or shroud, extended beyond the joint ends.

All conductor joints shall have both metal contact surfaces of the joint, or similar or dissimilar metal tapes, wire wool cleaned and tinned before any bituminous coating is applied.

Have cadmium plated steel plates and bolts as appropriate.

Where differing material conductors are utilised i.e. copper and aluminium a bi-metallic connector shall be utilised.

The use of oxide inhibiting compounds shall be applied and used as required.

Test joints shall be provided in all earth inspection pits for the disconnection of the earth rod from the termination and down conducting system for testing.

Where it is found that the resistance to earth for the system is greater than 10Ω, earth electrode lengths shall be increased until a satisfactory resistance is achieved.
The use of moisture retaining aggregates shall not be permitted.

Earth electrode connections shall be concealed within the brickwork, connecting tapes from the down conductor to earth pits shall be concealed within the cavity of the brickwork. All passes through brickwork shall be made good to maintain the thermal and structural integrity of the wall. The tape shall be laid by the Builder through a duct through the wall.
Bonding as directly as possible, preferably below ground, to all buried services (entering the structure) having exposed metal in the form of sheathing, armouring or piping shall be undertaken. The complete system shall be further bonded back to the main building earth bar.

Bonds to all exposed extraneous metalwork shall be undertaken, including access hatches, ladders, roof lights, vents, sun pipes, flues, PV panel supports etc.

All equipment that can not stand a direct lightning strike i.e. chillers, aerials, CCTV etc that are required to be constantly operational shall be protected via an air rod connected to the LPS via a conducting tape. The air rod shall be sufficiently sized and located, including adequate separator distance to fully shield the equipment from a direct strike.

All connections throughout the system shall be fully electrically continuous and in good appearance and suitably connecting using adequate connections with correct torque levels applied.

Earth loads shall be connected to a local earth box, connection loads shall not exceed 10m.

The Lightning Protection Specialist shall allow for fully liaising with all other specialists (Mechanical and Electrical) to ascertain the extent of all extraneous metal work/equipment that shall require connection to the structural LPS and all electronic items that require surge protective measures, i.e. CCTV, Fire Alarm panels etc
.
All such items raised by the specialist installers shall be included within the Lightning Protection calculations, design, drawings and the Electrical Sub-Contractors tender submission.

The appointed Specialist shall be responsible for the production of proposed installation drawings for the system which are to be submitted to the design team for comment 2 weeks prior to the installation works commencing. Drawings shall include extent of the air termination network, spacing and location of down conductors, all connections and connections to equipment and a fully co-ordinated SPD layout and schematic.

The appointed specialist shall submit any and all alterations to the specification and drawings including materials to be used to the design team for comment 2 weeks prior to ordering of materials and installation works commencing.

The complete installation, both structural and electronic, shall be fully co-ordinated by the Electrical Sub-Contractor to ensure all key items collate with main build programme i.e. the Electrical Sub-Contractor shall ensure the Lightning Protection Specialist attends site on specified days to ensure other trades are not delayed.

The installation of the complete structural and electronic lightning protection system shall be installed by the nominated specialist. With the exception of SPD devices to be installed by the Electrical Sub-Contractor or equipment manufacturer, as detailed within specific sections of this specification.

The complete design and installation shall comply with the Construction (design and management) Regulations ensuring all items installed are located in fully accessible locations with sufficient working area for maintenance.

The Lightning Protection Specialist shall identify on their 'Working Drawings' and 'As Fitted' drawings and and all associated risks concerning the installation and future maintenance. All risks should be designed out as far as reasonably practical, where risks cannot be removed, industry approved and recommended safety procedures shall be employed.

Under no circumstances shall any installation works take place during, or sufficient threat of, a thunderstorm. Any such delays occurred shall be submitted to the Main Contractor in a timely fashion to maintain programme completion and co-ordination.

The testing of the structural protection system shall be undertaken at a select number of earth electrodes nominated by the Engineer. The resistance to earth shall be measured in isolation of the test point between the down conductor and earth electrode in the disconnected position.

It shall be ensured that if the resistance to earth of a lightning protection system exceeds 10 Ohms, the value shall be reduced, if the resistance is less than 10 Ohms, but significantly higher than the previous reading, the cause should be investigated and any necessary remedial action taken.

The BS EN 62305: 2011 details that the following records should be kept on site by the person responsible for the upkeep of the installation. The Lightning Protection Specialist shall ensure the following is provided as part of the Operating and Maintenance documentation: -

1. Scale drawings showing the nature, dimensions, materials and position of all component parts of the LPS and LMPS.
2. The nature of the soil and any special earthing arrangements.
3. The type and position of the earth electrodes, including reference electrodes.
4. The test conditions and results obtained.
5. General condition of the air termination network.
6. General level of corrosion and condition of corrosion protection.
7. General condition of fixings.
8. Any and all deviations from the standard.
9. Documentation of all danger both to the LPS and LMPS.
10. Design information.
11. Testing regime.

The Lightning Protection Specialist shall include for 12 months visual inspection and testing as required by BS EN 62305. This shall as a minimum include 1 No. revisit 12 months from practical completion (maximum 15 months from completion of LPS and LMPS) to fulfil the following: -

1. Visual inspection of LPS air termination network.
2. Visual inspection of earth connections.
3. Earth resistance testing of the complete LPS network.
4. Visual inspection of SPD's, feeding protective devices and cabling.
5. LPS Test and inspection certification

3.31 EARTHING & BONDING

The Electrical Contractor shall provide all earthing and bonding accordance with the requirements of the current edition of BS 7671.

The Electrical Contractor shall provide main bonding conductors to the following from the existing main switchgear to the following:-

- New building steel frame
- New heating pipe work
- Any other extraneous conductive parts
- Cable containment systems

Equipotential bonding conductor shall be sized in accordance with BS 7671.

Circuit Protective Conductor

A separate circuit protective conductor shall be provided for all circuits including sub mains and final sub circuits. The protective conductor shall be sized in accordance with BS7671.

Supplementary Bonding Conductor

Supplementary bonding conductors shall be provided to bond exposed conductive parts to other exposed conductive parts, extraneous conductive parts to exposed conductive parts and extraneous conductive parts to other extraneous conductive parts.

The supplementary bonding conductors shall be sized in accordance with BS7671.

The Contractor shall ensure all conditions in accordance with IEE Regulations are satisfied with regards to the application of supplementary bonding conductors.

The whole of the metallic portions of the building other than current carrying parts shall be electrically and mechanically bonded to the consumer's main earthing system with supplementary bonding conductors.

3.32 SUPPORTS AND BRACKETS

All supports and brackets necessary for the installation of all electrical services shall be provided by the Electrical Contractor. This shall include all necessary secondary support steel for support where no main steels are available.

Where stainless steel containment system are provided all supports, brackets and components shall be stainless steel.

Where galvanized steel containment system are provided all supports, brackets and components shall be galvanized steel.

All supports shall be submitted for the approval of the Structural Engineer.

No bottom purlin clips shall be used, all supports from purlins shall be of the wrap round type or secured to the purlin by a mid way drilled anchor.

Supports within process areas shall be installed in accordance with containment section of this specification.

3.33 TESTING

All circuits, mains, sub mains and final sub-circuits shall be tested in accordance with the current edition of BS 7671. All testing shall be recorded and copies handed to the Client as part of the Maintenance Manuals.

The Clients representative shall be required to witness testing on all items of plant and equipment and shall require seven days notice of tests which require witnessing. Witnessing shall be carried out on a random basis after the electrical contractor has certified his own installation.

3.34 AS INSTALLED DRAWINGS

During the progress of the works the electrical contractor shall record on drawings the information necessary for preparing "As Fitted Drawings." This information shall be available for inspection by the engineer.

On practical completion of the works the electrical contractor shall supply to the engineer "As Fitted Drawings, consisting of: -

- 3-No complete set of prints and 1-no CAD disk copy of all drawings

The "As Fitted Drawings" shall accurately reflect the installation upon completion including all circuit references etc.

3.35 OPERATION AND MAINTENANCE MANUALS

The manufacturer's technical literature for all items of plant and equipment, assembled specifically for the project, including irrelevant matter and including detailed drawings, electrical circuit details and operating and maintenance instructions. A copy of all Test Certificates (including but not limited to electrical circuits test, corrosion tests, type tests, works tests, start and commission tests) for plant and equipment used in the installations. A copy of all manufactures guarantees or warranties. Starting up, operating and shutting down instructions for all equipment and systems installed.

Control sequences for all systems installed.

Schedules of all fixed and variable equipment, settings established during commissioning.

Procedures for seasonal changeovers.

Detailed recommendations as to the preventive maintenance frequency and procedures which shall be adopted by the Client to ensure the most efficient operation of the systems.

Lubrication schedules of all lubricated items of plant and equipment.

A list of normal consumable items.

A list of recommended spares to be kept in stock by the Client, being those items subject to wear or deterioration, which may involve the Client in extended deliveries when replacements are required at some future date.

Procedures for fault finding.

Emergency procedures, including telephone numbers for emergency services.

The Manuals are to be A4 size, in plastic covered, loose leaf, four ring binders and hard covers, each indexed, divided and appropriately cover titled.

Drawings larger than A4 to be folded and accommodated in the binders so that they may be unfolded without being detached from the rings.

Prepare two temporary Manuals with provisional record drawings and preliminary performance data available at commencement of commissioning, to enable the Client's staff to familiarise themselves with the installation. These shall be of the same format as the final Manuals with temporary insertions for items which cannot be finalised until the installations are commissioned and performance tested. Provide the Project Manager with two copies of the final Manual not more than two weeks before Completions.

Before completion, explain and demonstrate to the Authority's maintenance staff the purpose, function and operation of the installations including all items and procedures listed in the Operation and Maintenance Manuals. Include for not less than one operating day for this purpose.

Operating and Maintenance Manuals must include a full technical description of each system installed, written to ensure that the Authority's staff fully understand the scope and facilities provided.

A technical description of the mode of operation of all systems.

Diagrammatic drawings of each system indicating principal items of plant, equipment, valves. etc.

A photo reduction of all record drawings to A1 size, together with an index.

Legend for all colour coded services.

Schedules (system by system) of plant, equipment, valves, etc, stating their locations, duties and performance figures. Each item of plant, equipment, valves, etc, installed shall have a unique code number, cross referenced to record the diagrammatic drawings and schedules.

3.36 PROVISIONAL SUMS

The Electrical Contractor shall include, within his tender price, the provisional and PC sums, which are identified within the tender summary, together with all necessary programming, attendance and coordination, etc., required in connection with these works, when the Electrical Contractor is instructed to place an order to cover same, which will be carried out within the contract period.

SECTION 4
TENDER DOCUMENTS

TENDER SUMMARY

SPORTS PAVILION - SAWTRY

PROJECT REF. AX1937 – ELECTRICAL SERVICES

1.0	Preliminaries	£……
2.0	Relocation of Existing Incoming Electricity Supply (Temporary Builders Supply)	£……..
3.0	Incoming Electricity Supply	£……..
4.0	Incoming Telecoms Infrastructure	£……
5.0	Distribution	£……
6.0	Lighting & Emergency Lighting	£……
7.0	External Lighting	£……
8.0	General Power	£……
9.0	Structured Cabling	£……
10.0	Wiring to Mechanical Services	£……
11.0	Fire Alarm System	£……
12.0	Disabled Toilet Alarm	£……
13.0	Induction Loop	£……
14.0	Intruder Alarm	£……
15.0	TV System	£……,.
16.0	CCTV System	£……
17.0	Lightning Protection	£……
18.0	Earthing and bonding	£……
19.0	Test and Commission	£……
20.0	As Installed Drawings	£……
21.0	Operating and Maintenance Manuals	£……
	Sub-total	£……
	Provisional Sums	
22.0	Incoming Electricity Supply	**£4,000.00**
23.0	Incoming Openreach Fibre Services	**£7,000.00**

24.0	Contingency	**£ 4,000.00**
	Sub-total	**£ 15,000.00**
	TOTAL FIXED PRICE TENDER SUM	£……

This form is to be completed in full (with separate costs shown against each individual item) and duly returned as part of the tender submission.

We the undersigned agree to carry out the foregoing works in compliance with the Specification, Appendices, drawings and other Contractor Documents and we agree to submit to the Engineer within fourteen working days of receiving an official order, a schedule of rates and working drawings in accordance with the Specification.

Signed : .....

Name : .....

Position Within Company : .....

Company : .....

.....

Address : .....

.....

.....

Date : .....

SCHEDULE OF TENDER REDUCTION OFFERS / ALTERNATIVES

SPORTS PAVILION - SAWTRY

PROJECT REF. AX1937 – ELECTRICAL SERVICES

Tenders must be priced on the basis of the Specification and Drawings but the Contractor may indicate below any cost reductions that he wishes to be considered. Reductions offered for alternative manufacturers will be considered by the Engineer, however, the Engineer's decision shall be binding as to whether the saving is to be implemented or not.

Contractor to Note: Demonstrate that any alternative equipment offered fully complies with the specification and drawings. Any additional costs, builders work, co-ordination of services, engineers time in looking at proposed changes, etc. resulting from such changes are to be wholly the Contractor's responsibility.

Where the phrase 'or equal and agreed' appears in the Specification, the named body shall be included in the Tender Sum and any 'equal' offer shall be detailed on this page.

Equipment	Specified Make	Alternative	Reduction

Signed: ……..

For and on behalf of:

……..

……..

Date: ……...……

(To be completed at time of Tendering)

Disclose: ……

……

……

*Delete as applicable

Dated this: …… day of …… 2014

Signature: ……..

Full Name: ……

In the capacity of …… (state official position) being a person duly authorised to sign tenders for and on behalf of:

Company Name: ……..

Address:……..

……

……

SECTION 5

APPENDICES

APPENDIX A SCHEDULE OF TENDER DRAWINGS

APPENDIX B GLAMOX OFFER/LUMINAIRE SCHEDULE (INTERNAL LIGHTING)

APPENDIX C KINGFISHER LIGHTING OFFER/LUMINAIRE SCHEDULE (EXTERNAL LIGHTING

APPENDIX D UKPN OFFER FOR RELOCATION OF EXISTING ELECTRICITY SUPPLY

APPENDIX E BT OPENREACH LETTER CONFIRMING REGISTRATION OF THE DEVELOPMENT

APPENDIX A

SCHEDULE OF TENDER DRAWINGS

AX1937/E01	LIGHTING, EMERGENCY LIGHTING AND FIRE ALARMS
AX1937/E02	SMALL POWER AND DATA
AX1937/E03	EXISTING SITE PLAN SHOWING DEMOLITION AND STRIP-OUT
AX1937/E04	PROPOSED SITE PLAN SHOWING CCTV, EXTERNAL LIGHTING AND INCOMING UTILITY SERVICES
AX1937/E05	ELECTRICAL SERVICES ROOF SPACE
AX1937/E06	ELECTRICAL SERVICES SYMBOLS

APPENDIX B

GLAMOX OFFER/LUMINAIRE SCHEDULE (INTERNAL LIGHTING)
Revised Quotation Required for Rev B Drawings

Glamox Luxonic

Green Field Sports Field Sawtry

Quote
00127129

Axis Mechanical & Electrical Consulting Engin

No 8 Poplars Court
Lenton Lane
NG7 2RR
United Kingdom

Your Ref:

Our Ref:
00127129

06.07.2022

Green Field Sports Field Sawtry

With reference to the above project, we now have the pleasure in submitting our quotation for your consideration.

This quotation supersedes all previous versions and revisions and we reserve the right to amend the prices shown if the quotation is not ordered in its entirety.

Every effort has been made to ensure that the quoted items are in accordance with the specification but it is the responsibility of the ordering party to ensure that the products and quantities satisfy the end users requirements and that all quantities of luminaires are checked and cross referenced with the latest drawings prior to an order being place.

The below prices are subject to our standard terms & conditions of sale, which are available on our website. Prices will be subject to VAT but include the current environmental tax (WEEE Directive) both at the prevailing rates. The quotation is valid for 60 days from date of issue and any order placed after that date may be subject to price revisions.

We have a minimum nett order value of 400.00(GBP) for carriage paid orders to any UK mainland address (excludes Scottish Highlands). If under 400.00(GBP) nett, a carriage charge of 25(GBP) will be applied to your order. Additional carriage charges may apply for next day timed deliveries or designated vehicles depending on the weight and size of the delivery.

We trust the enclosed meets with your approval but should you require any further information, please do not hesitate to contact us.

Please forward any orders to salesorders@glamoxluxonic.co.uk.
Please state our quotation reference number on any orders placed.

Pos	Art No	Type	Quantity	Sales Price	GBP
C	A70214201	A70-S410 LED 2800 HF 840 WH	13	111,15	1 444,95
					
C	A70269016	A70-S410 DECOR RING WHITE	13	6,03	78,39
					
CE	A70214234	A70-S410 LED 2800 HF 840 WH E3/S	19	161,15	3 061,85
					
CE	A70269016	A70-S410 DECOR RING WHITE	19	6,03	114,57
					
CS	A70214211	A70-S410 LED 2800 HF 840 WH SMR-SEN	9	130,80	1 177,20

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Pos	Art No	Type	Quantity	Sales Price	GBP
					
CS	A70269016	A70-S410 DECOR RING WHITE	9	6,03	54,27
					
CES	A70214235	A70-S410 LED 2800 HF 840 WH SMR-SEN E3/S	9	190,80	1 717,20
					
CES	A70269016	A70-S410 DECOR RING WHITE	9	6,03	54,27
					
G	A70114201	A70-S290 LED 1200 HF 840 WH	2	91,00	182,00
G	A70169016	A70-S290 DECOR RING WHITE	2	5,17	10,34
					
HE	I40L52724	I40-1500 LED 5500 HF E3/S 840 TW PC	1	128,70	128,70
					
K	I60087210	i60-1200 LED 4600 HF 840 OP	6	74,90	449,40
					
KE	I60087220	i60-1200 LED 4600 HF E3/S 840 OP	6	134,90	809,40
					
L	C95231425	C95-SC525 WH LED 4000 DALI 840 MP	1	244,80	244,80
					

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Pos	Art No	Type	Quantity	Sales Price	GBP
LE	C95546560	C95-SC525 WH LED 4000 DALI 840 E3/S MP	2	304,80	609,60
M	C95231545	C95-PC525 WH LED 4400 DALI 840 PRE C2 MP	4	287,70	1 150,80
					
ME	C95231557	C95-PC525 WH LED 4400 HF 840 PRE C2 E3/S MP	2	347,70	695,40
					
N	I60087232	i60-1500 LED 6000 HF 840 OP	5	84,75	423,75
NE	I60087240	i60-1500 LED 6000 HF E3/S 840 OP	7	144,75	1 013,25
Exit	E80103130	E80-S 10x26 UP LED E3/S	4	109,20	436,80
					
Exit R/L (Wall)	E80103120	E80-S 10x26 L/R LED E3/S	3	109,20	327,60
					
Exit R/L (Wall)	E80000010	E80 WALL SUSPENSION	3	11,70	35,10
					
Total					GBP 14 219,64

Product datasheets

Yours sincerely
Glamox Luxonic Limited

Michael Prenderville
National Sales Manager - Medical & Industry

Glamox Luxonic Limited | Priestley Road, Basingstoke, Hampshire RG24 9JP | +44 (0) 1256 363090 | info@glamoxluxonic.co.uk | www.glamox.co.uk

07710 035461
michael.prenderville@glamoxluxonic.co.uk

APPENDIX C

KINGFISHER LIGHTING OFFER/LUMINAIRE SCHEDULE (EXTERNAL LIGHTING)

NOTE TYPE BW/BWE FITTING ON KINGFISHER QUOTATION = L/LE LUMINAIRE ON AXIS DRAWINGS

Revised Quotation Required for Rev B Drawings

Kingfisher Lighting

QUOTATION

AXIS MECHANICAL & ELECTRICAL
NO.8 POPLARS COURT
LENTON LANE
NOTTINGHAM
NOTTINGHAMSHIRE
NG7 2RR
Tel No: 0115 979 1875
Fax No: 0115 924 9719

Date: 30/06/2022
Our Ref: 496201 / 1
Contact:
PSE: Tyrone Robinson (07929 829006)

Project: D46600/1 GREEN FIELD SPORTS FIELD - SAWTRY - AMENITY
This Quote Is Asssociated To Kingfisher Lighting Ltd Drawing Number D46600/ae/A

For the attention of: Nick Ross

Qty	Product Code	Description	Each Nett	Total
7	**46600/496201/1**	**Ref A - Comprising The Following Items:-**	461.70	3,231.90
1		Viva-City Pro, 5,880lum.lm, 40W, 805mA, 147lm/W, 4000K, Asym. Forward Throw Optic - 70°, DALI Driver, Class 1, RAL7016 Anthracite Grey Finish, Post Top 60/76mm, Side Entry 60/76mm, IP66, IK08, 6kg, Dimmable		
1		5m Tubular Steel Rooted Column 76mm diameter Shaft, Hot Dip Galvanised Finish.		
1		Fused Cut Out Unit comprising Cut Out with 6 Amp Fuse & Termination for Loop in Loop Out Cables. *to accept up to 25mm² 2 core circ/10mm² 3 core*. Double pole, single LST fuse, single phase fuse.		
8	**46600/496201/2**	**Ref BW - Comprising The Following Items:-**	214.50	1,716.00
1		Semita Urban LED Wallpack Comfort Optic.		
1		Semita Urban LED Wallpack, 802 lum.lm, 6W, 134lm/W, 4000K, Cycle Optic, IP66, IK10, Anthracite Grey RAL7016. Digital Dimmable.		
2	**46600/496201/3**	**Ref BWE - Comprising The Following Items:-**	257.40	514.80
1		Semita Urban LED Wallpack Comfort Optic.		
1		Semita Urban LED Wallpack, 802 lum.lm, 6W, 134lm/W, 4000K, Cycle Optic, IP66, IK10, Anthracite Grey RAL7016. Digital Dimmable. 3 Hour Emergency.		
			Total:	**5,462.70**

DELIVERY:- Currently tbc from confirmation of required delivery date. Carriage charges apply for Orders under £300 and can apply to certain Orders over £300.
Please see attached delivery map for lead times and additional charges.

VAT:- All prices exclude VAT.

ACCEPTANCE:- This quote is firm for 15 days.

NOTE:-

PAYMENT:- Subject to agreed credit. Payment to be within your individual agreed credit terms.

Quote Is Based On All Items Ordered At The Same Time. Split Deliveries May Incur Extra Carriage Charges.
E & OE.

The Delivery Lead Time advised is based upon supply of the complete order, if some items are required sooner then please contact Our Office for specific details. Additional delivery surcharge applies for feeder pillars.

SAFCA Ancillary Contractor
HEA Highway Electrical Association No. H047 HEMSA
BSI ISO9001 FS575858
LUMICOM MEMBER
LIGHTING INDUSTRY ASSOCIATION
INVESTOR IN PEOPLE
INSTITUTION OF LIGHTING PROFESSIONALS ILP

APPENDIX D

UKPN OFFER FOR RELOCATION OF EXISTING ELECTRICITY SUPPLY

Registered Office:
Newington House
237 Southwark Bridge Road
London SE1 6NP

Registered in England and Wales No: 3870728

Company:
UK Power Networks
(Operations) Limited

Nick Ross
Axis 8 Lenton Lane
Nottingham
NG7 2RR

13 July 2022

Our ref: 8110084119

Dear Ross,

Site Address: Greenfield Sports Field, Straight Drove, Sawtry, PE28 5XP

I am writing to you on behalf of Eastern Power Networks PLC the licensed electricity distribution network operator for the above site.

Thank you for asking us to look at the electricity connection at the above site. Please find enclosed your quotation to carry out the Works described in the Schedule in accordance with the attached Terms and Conditions. **It is important that you read the Terms and Conditions carefully. They contain provisions that limit or exclude our liability to you and the circumstances when the price and completion date may change.**

Subject to the Terms and Conditions, the Works will be completed for the price stated in the Schedule. Based on the information that you have provided we have included a provisional date for completion of the Works in the Schedule. Please note that you can change this date (please see the section overleaf headed “Completion Date” for more information). You will need to contact us again to agree a firm date for carrying out of the Works (please see the section overleaf headed “Completion Date” for more information on how and when to do this).

Digging near live electricity cables and other underground services is dangerous. Therefore if you wish to arrange for or carry out the excavation of the joint bay yourself, before accepting the quotation you must ensure the person who will carry out the excavation has read and understands the booklet "Avoiding danger from Underground Services" (HS (G) 47) published by the Health & Safety Executive (available at hse.gov.uk) and agrees to carry out the excavations in accordance with this guidance.

The Works that are the subject of this quotation may be carried out in roads that are subject to lane rental charges. Lane rental charges are daily charges levied by certain road authorities such as TfL where a utility is carrying out works in roads that are covered by a lane rental scheme. Please note that the price may be amended to reflect the costs arising from such lane rental charges in accordance with the Terms and Conditions.

Please note that your quotation may fall within the Quotation Accuracy Scheme (QAS). This provides information so that you can assess whether the specific charge included within the quotation is accurate in terms of consistency with our Connection Charging Statement. More information can be found at www.ukpowernetworks.co.uk

Validity and Accepting this quotation

This quote is valid for 6 months. You can accept the quote at any time up to the anniversary of the date of this letter. After this date, if you later wish to proceed with the Works we will be happy to provide you with a new quotation.

To accept this quote please make payment either by credit card on the telephone or sending a cheque. If you send a cheque please ensure that you write your name and address and the quote reference number at the start of this letter on the back of the cheque (for more details please see the Schedule). Please note that in making payment (either by telephone or by post) you are accepting this quotation and you will be bound by the Terms and Conditions.

Completion Date

We have included in the Schedule a provisional Completion Date for our Works based on the information that you provided to us. However, we understand that you may wish to discuss this date with us and agree an alternative Completion Date to fit with your construction programme. Therefore, before we can schedule the Works, you must telephone us on number below to either:

(i) confirm that you wish for the Works to take place on the provisional Completion Date in the Schedule; or
(ii) agree with us an alternative Completion Date.

If the Works **do not require long lead items** you must contact us not less than 30 days before the date that you would like us to carry out the Works to confirm the provisional Completion Date or agree an alternative Completion Date.

If the Works **require long lead items**, to enable us to make the necessary arrangements, you must contact us not less than 14 weeks before the date that you would like the Works to take place to confirm the Provisional Completion Date or agree an alternative Completion Date. Where long lead items (such as road closures) are required this will be made clear in the box marked “Description of the works carried out by UK Power Networks” in the Schedule.

Please note we may terminate the quote if for any reason the works are not completed within six calendar months from the date that you accept the quote.

Cooling off period

Once you have made the payment to accept this quotation you have fourteen (14) days from the date of payment within which to notify us in writing (quoting the job number) if you wish to cancel the Works. Following receipt of your written cancellation notice, you will be refunded the Price.

Please note that if Your Works are not satisfactorily completed when we arrive at Your Site to carry out the Works we will not be able to start the Works. In such circumstances we will have to charge you a cancellation fee and arrange another time for us to carry out our Works.

What happens once you have accepted the Quotation? UK Power Networks will contact you or your nominated representative. We will confirm what work needs to be completed by you before we can start the Works. At this stage we will also let you know if we need to revise the quotation or amend the date of connection should you wish to change this. If you want to discuss this quotation or the date of connection, please contact UK Power Networks Connections Coordinator on 0800 141 3344 between 8.30am and 5pm.

Yours sincerely

Lauren Farrell
Kings Lynn Coordinator
Connection Services
UK Power Networks

Schedule

Correspondence Address	Job Details	
Nick Ross Axis 8 Lenton Lane Nottingham NG7 2RR	Job Number Quotation Expiry Date Connection Coordinator	8110084119 18 Jan 2023 Lauren Farrell

Site Address :	Greenfield Sports Field, Straight Drove, Sawtry, PE28 5XP

Description of work to be carried out by you ("**Your Works**"):

These will be described in the Customer Responsibilities Document that will be issued to you by UK Power Networks after the site visit. These works may include (but are not limited to):

- excavation and reinstatement on your property;
- excavation and re-instatement of the joint bay in accordance with our instructions and the booklet "Avoiding danger from Underground services" 9HS (G) 47 published by the Health and Safety Executive;
- supply and install of electrical duct;
- arranging for third party consents where required;
- internal electrical works to British Standard BS7671;
- appointing an electrical supplier;
- supply and installation of a sub main;
- supply and installation of a meter cabinet/cubicle;
- supply and installation of meter tails and earth wire.

Connection Timescales:

Provisional Completion Date: 13/07/2023

(This date can be altered to suit your construction programme.)

Description of the Works to be carried out by UK Power Networks:

SUBJECT TO-

Customer to excavate a joint hole and trench to new meter position
Customer to supply and install a kiosk to UK Power Networks specifications
Customer to arrange for an electrician for internal wiring.
Customer to arrange meter supplier to move meter on same day of works
Customer to arrange for parking for up to two UK Power Network vehicles
Customer to ensure work area is clear
Customer to reinstate groundwork on own property
Wayleaves consents

WORKS DESCRIPTION-

Alteration of existing 3 phase service joint only and 12 metres of service cable and duct.

Movement of an existing electricity supply to a different position. As you have decided to complete all excavation and reinstatement works yourself, this quotation is only for the electrical works as detailed below: - Electrical works within the hole to alter the existing route of the three phase service cable - Installation of the main fuse in the new position - Electrical safety testing of UK Power Networks' equipment - Removal of UK Power Networks' redundant equipment (Please note: Your electricity supplier will need to move the meter)	£1,184.00
New cable installation within an existing trench. This is charged per metre and includes the: - Provision of new ducting (protective tubing) into the trench - Provision of electrical warning tape above the duct - Installation of new three phase service cable into the duct	£204.00
For the purposes of the Terms and Conditions the following elements of the Works are "Diversionary Works"	
Total Excluding VAT	£1,388.00
VAT @ 20%	£277.60
Total (including VAT)	£1,665.60

Please note that the Price and the Completion Date are subject to the Terms and Conditions attached to this letter

You can pay by either:

- **Card**: please call 0800 141 3344 we are open Monday to Friday 8.30am to 5.00pm. We accept all major credit and debit cards - apart from American Express; or
- **BACS/CHAPS/Bank Transfer**: Please quote 8110084119 as the Reference Number as we will not be able to progress your work without it.
- **Account Name**: UK Power Networks (Operations) Ltd
- **Account Number**: 02302934 Sort Code: 40 05 30 or
- **Cheque**: please complete and return the Acceptance Slip attached

Acceptance Slip for Cheque Payments

Please return to: UK Power Networks, Finance Department, Energy House, Carrier Business Park, Hazelwick Avenue, Three Bridges, Crawley, West Sussex
RH10 1EX

Please make cheques payable to: "UK Power Networks"

Payer name: Address:	Job No: Quotation Expires on: Full Payment of the price: Customer Name: Site Address:	8110084119 18 Jan 2023 £1,665.60 Greenfield Sports Field, Straight Drove, Sawtry, PE28 5XP

YOUR TO DO LIST

What you need to
do to get connected

UK Power Networks
Delivering your electricity

Customer name:

Title: Mr

First Name: Nick

Last Name: Ross

Site address:

House No.:

Building Name: Greenfield Sports field

Street Name: Straight Drove

Town/City: Sawtry

County: Cambs

Postcode: PE28 5XP

Reference number: 8110084119

If you are not carrying out the work, please make sure you share this with your builder or electrician.

1. Contact your electricity supplier to move or install meter

- [x] Speak to your electricity supplier to arrange installation.
  - [x] New service. You will need a supply number for the meter.

    This is a 13 digit number known as an MPAN (Meter Point Administration Number).
    We will give this to you after you have paid your quote.
  - [ ] Moving a meter to reconnect your existing supply.
  - [ ] Upgrade your existing meter.
  - [ ] Downgrading to a single phase meter (to replace an existing three phase meter).

2. Fit meter cabinet + protective tube

- [ ] Internal installation. Meter cabinet not required.
- [ ] Access hole required.
- [ ] UK Power Networks supplied (if specified on quote)
- [ ] I will supply. You will need to buy an approved meter cabinet – surface or flush mounted - and a 38mm protective tube (This is often referred to as a Hockey Stick and protects the cable as it exits the ground). Cabinet dimensions may vary slightly.
  - [ ] Standard surface mounted electricity meter box (single-phase) 560mm (h) x 400mm (w) x 215mm (d)
  - [ ] Large surface mounted electricity meter box (three-phase) 780mm (h) x 550mm (w) x 225mm (d)
  - [ ] Standard flush mounted electricity meter box (single-phase) 595mm (h) x 409mm (w) x 210mm (d)
  - [ ] Large flush mounted meter box (three-phase) 770mm (h) x 550mm (w) x 210mm (d)
  - [ ] Hockey Stick - black
  - [ ] Hockey Stick - white

    38mm 50mm
- [ ] Arrange installation. Although UK Power Networks can supply meter cabinets, **we do not fit them.**
- [ ] Drill access hole through the wall at the back of the cabinet to inside of the property. This is to accommodate the installation of meter tails by your electrician (meter tails should not exceed 2 meters in length).
  - [ ] 20mm (for a standard home connection - single-phase supply).
  - [ ] 30mm (for a three-phase supply).

3. Install Temporary Builder's Supply

- [x] Yes
- [ ] N/A

Install Permanent Kiosk

- [ ] Yes
- [x] N/A

4. Book an electrician

☐ Arrange for a qualified electrician to adjust your internal wiring.

5. Reserve parking

☐ Reserved space for ☐ 1 van ☐ 2 vans ☐ 3 vans

☐ UK Power Networks has applied for suspension of 2 x Resident's bays. ☐ Customer to arrange for TTRO

6. Clear work area

☐ Clear the area of any obstructions or hazards including any scaffolding near the agreed work areas.

7. On-Site Excavation

☐ Excavate cable trenches.

Depth of cover above ducting needs to be a minimum of: ☐ 450mm ☐ 600mm ☐ 1,200mm

☐ UK Power Networks excavating trenches.

☐ Excavate joint bay/hole to required specification.

☐ Combined excavations - Customer to excavate cable trenches to within 1m of the base of a Electricity Pole, UK Power Networks to excavate the final meter (this is necessary for safety purposes) .

☐ UK Power Networks excavating joint bay/hole.

8. Install cable ducting

☐ UK Power Networks supplying (32mm, 50mm, 125mm and 150mm only)

- ☐ Delivered on same day as electrical installation
- ☐ Delivered and installed on pre-agreed date (Trenching must be ready and dug to correct specification. 7 day's notice required)
- ☐ Delivered to site in advance of work date
- ☐ Deliver to alternative address in advance of work date

  Where ducting is supplied in advance of the work date it must either be available for inspection within an open trench, or if it is necessary to backfill the duct then photographs with depth indicators must be available.

☐ I will supply black polythene ducting marked 'electric cable duct' (Enter amount in boxes below e.g. 2)

☐	32mm x 25m	☐	125mm x 3m
☐	32mm x 50m	☐	125mm x 6m
☐	32mm x 100m	☐	125mm coupling
☐	32mm coupling	☐	125mm double socket bend - 0.61m bend radius, 45° angle
☐	50mm x 25m	☐	125mm double socket bend - 0.61m bend radius, 90° angle
☐	50mm x 50m	☐	125mm double socket bend - 2.4m bend radius, 11.25° angle
☐	50mm coupling	☐	125mm double socket bend - 2.4m bend radius, 22.25° angle
☐	125mm x 2m	☐	100mm Steel ducting - Number of meters

Note: dimensions refer to internal diameter of ducting

☐ Supply and install draw cord through the entire duct length (to enable our engineers to pull the cable though)

9. Not ready in time?

If you think you're not going to be ready on the agreed date, please contact us as soon as possible. Ideally within a minimum of five working days. If we arrive on site and you are not ready, we will be unable to commence our works.

10. Site specific requirements

☐ I understand that if I have not completed my Things To Do, prior to UK Power Networks arrival, the job may be postponed, which could have financial or time delays for my project.

Customer name	Site Surveyor	Date

1. Contact your electricity supplier to move or install meter

UK Power Networks do not fit meters. You will need to contact your electricity supplier – the company who you buy your electricity from.

If it is a new installation. You will need a Meter Point Administration Number MPAN before you call them. This is a 13 digit number. We will supply this when we receive payment for your quote.

If you already have a meter you will still need to ask your electricity supplier as in most cases UK Power Networks are unable to move it.

You will need to arrange for your electricity supplier to visit your site after we have completed our work if you wish to have power on the same day. It can take up to 10 working days to arrange this, so please make sure you speak to your energy supplier as soon as you have paid our quote.

You may also need to provide your electricity supplier with a BS7671 certificate signed by your electrician before they can connect the power to the internal wiring in your property. Some electricity suppliers will install a meter with a 'self connect' option so your electrician can connect your property to the supply at a later stage. This means you do not need to provide a BS7671 certificate, but you should check with your electricity supplier beforehand.

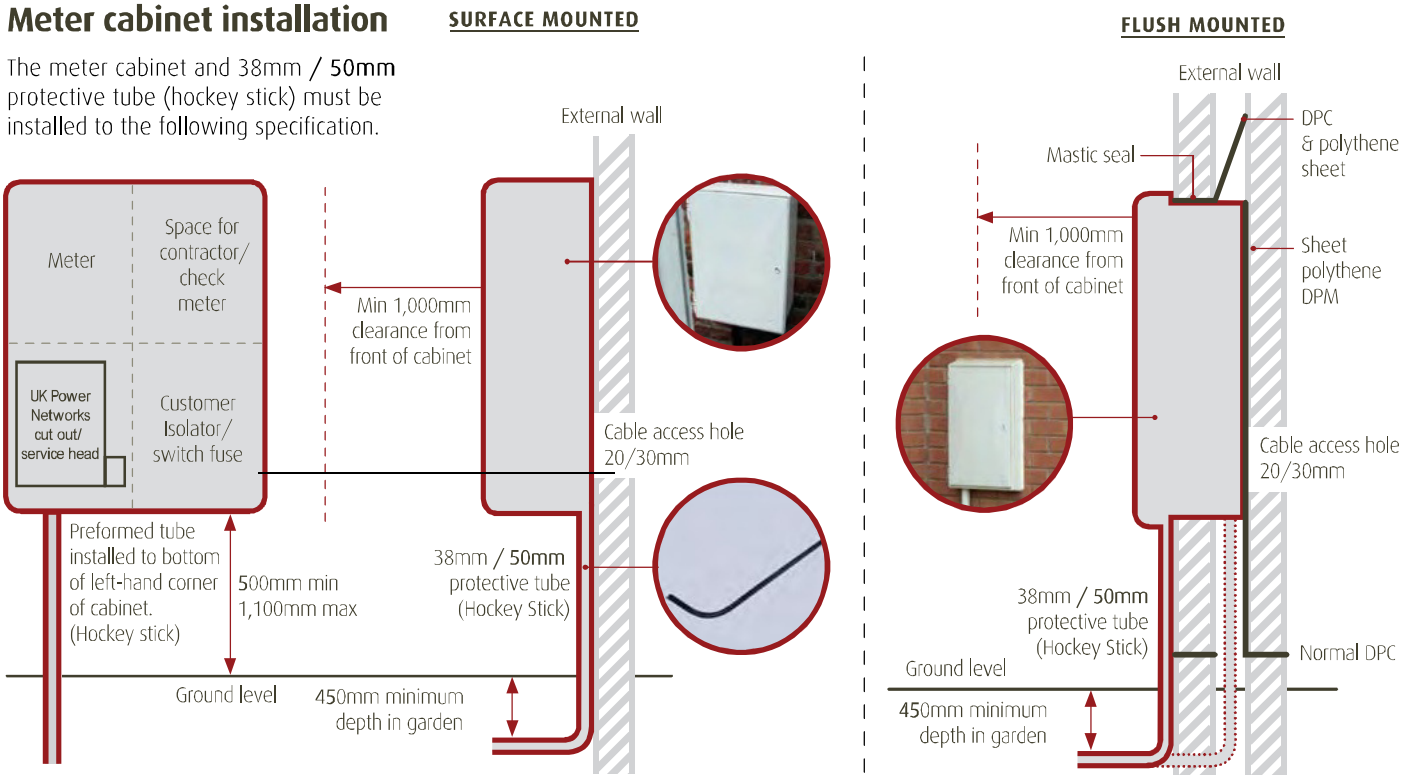
2. Fit meter cabinet

There are two types of meter box: surface mounted and flush mounted (recessed into the cavity wall). These are available in two general sizes to suit a single phase service or a three phase service (this is larger in size). Whatever box you choose, it's important it's one that's approved by UK Power Networks and is installed to the correct guidelines. It must be lockable and made from Glass Reinforced Plastic with a baseboard fitted inside to mount the meter and electrical equipment. Dimensions may vary slightly from the quoted sizes, but alternative slim fit boxes do not comply with our standards and may prevent the installation of your supply. **There are also two sizes of protective tube (hockey stick) that should be used, depending on the service type i.e. 38mm for single phase and 50mm for three phase (check P.1 to see what size you need).**

There are a number of suppliers you can choose from such as Essex Groundworks, Jewsons, Mitra composites (www.meterboxes.co.uk) and Travis Perkins.

Meter cabinet installation

The meter cabinet and 38mm / 50mm protective tube (hockey stick) must be installed to the following specification.



Power service cable – this is the main power cable that runs from our network. It will pass either under the ground or will go overhead from a pole and be clipped to your property.
UK Power Networks will install this and we own it.

Cut out/Service head – this is the main fuse. UK Power Networks will install this and we own it. It cannot be altered by anyone else.

Meter tails – these cables connect the meter to your consumer unit. You will need to ask your electrician to install these before you arrange for your energy supplier to fit your meter. In order to provide you with a fuse rating of 100 Amps (for a service capacity of up to 23kVA), 25mm stranded copper double insulated PVC meter tails with a 16mm earth wire is required. The meter tails should not exceed 2m in length. Where the distance between UK Power Networks service head and your consumer unit exceeds 2m it will be necessary for your electrician to install a mechanically protected sub-main cable into the building from the meter box to the consumer unit position.

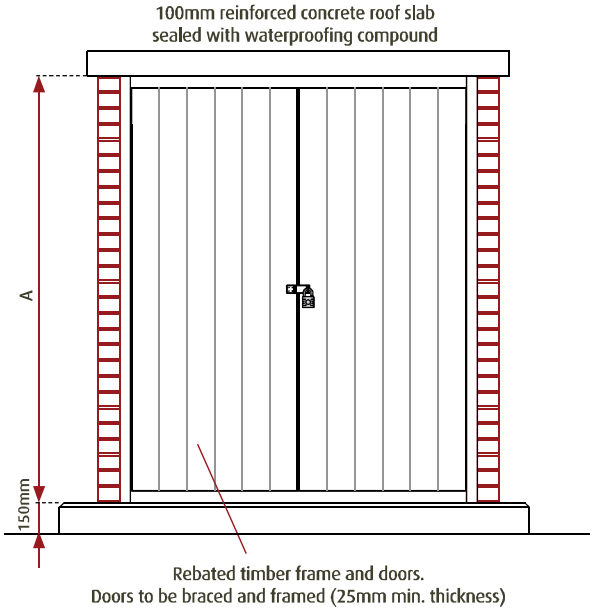
Meter – this is the property of your energy supplier who is responsible for supplying, installing/removing, and operated this piece of equipment. Your supplier will connect the meter tails between the meter and UK Power Networks cut out/service head after we have installed the electricity service cable. Your energy supplier may request a BS7671 certificate signed by your electrician to show the internal wiring in your property meets the government standards before they can connect the power to the consumer unit.

Consumer unit – often referred to as a fuse box.
This contains one or more fuses, circuit breakers, residual current operated devices which control the different circuits for lighting and appliances. The correct installation of the unit is the responsibility of your electrician.

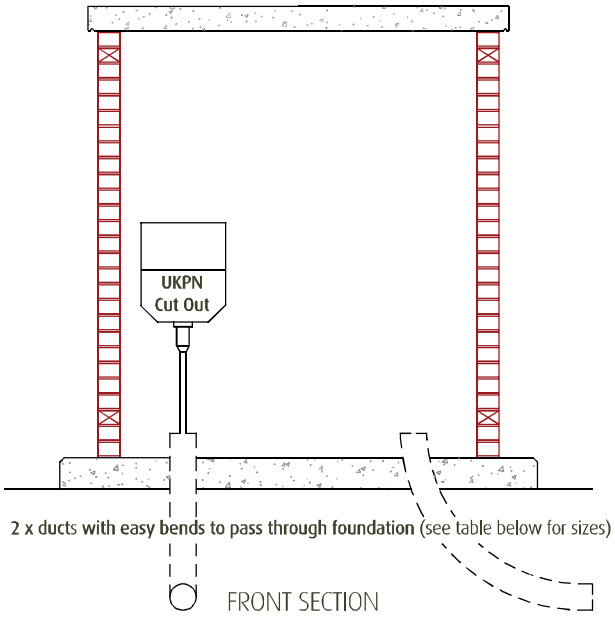
3. Temporary builder's/Permanent electricity supply housing

There are two options to house the supply. A purpose built brick housing or a pre-made GRP (Glass Reinforced Plastic) housing. Whatever option you choose, the supply housing must be built within 2 metres of the site boundary unless specified otherwise by a UK Power Networks Site Surveyor during the site visit. If the site is not enclosed housings must also be lockable.

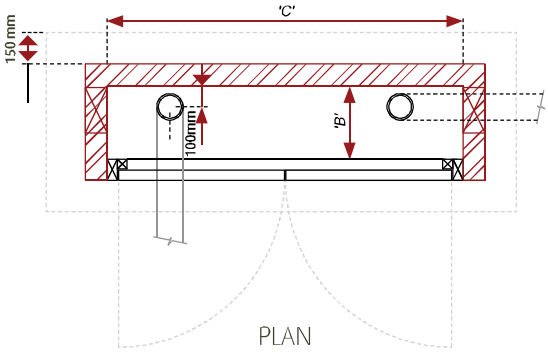
Brick housing specification



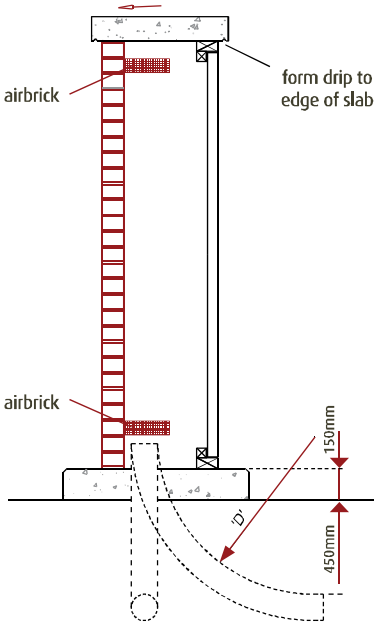
FRONT ELEVATION



FRONT SECTION



PLAN



SIDE SECTION

1) Only a brick cabinet or approved Glass Reinforced Plastic (GRP) shall be acceptable. Approved GRP manufactures are Envico Engineering Ltd and Kingsley Plastics.

2) Provided dimensions are the minimum suitable for the provision of UK Power Networks equipment only; additional space will be required for any additional equipment.

3) It is important that this compartment be made completely waterproof. Where the structure is to be erected on an unsecured site it is recommended that the doors be hung on butts with concealed hinge pins & secured with a heavy duty padlock and concealed coachbolt fixings.

4) Plinth to sit on suitable sub-base.

5) Cable ducts through concrete base are installed by the customer (check table below for duct sizes or ask your Surveyor).

6) It is recommended that high impact plastic trunking be installed for Temporary Builders Service (TBS) installations.

7) An earthing pin will be required for TBS installations.

8) An RCD and main isolator to be installed for TBS installations.

REQUIRED DIMENSIONS	A	B	C	Radius D	Duct size
Single-phase services	900mm	300mm	600mm	250mm	32mm
100A 3-phase services	1100mm	300mm	600 mm	250 mm	50mm

Special note:

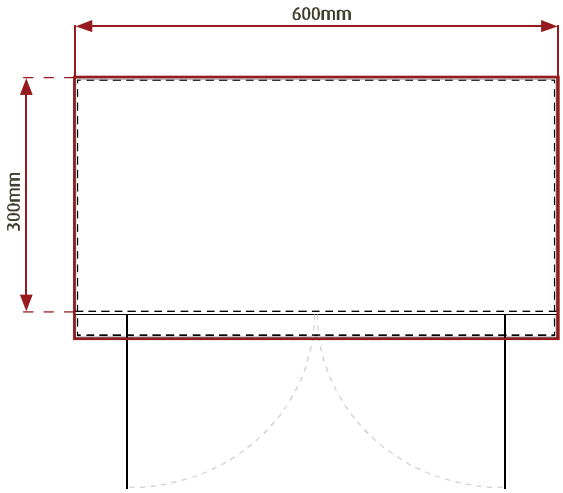
Where there is a need to comply with the "Petroleum Consolidation Act 1928" the minimum height of the company's equipment will be increased to ensure that any possible ignition is minimum of 1200mm above floor level. In this case a larger kiosk will be required. Please contact UK Power Networks for further guidance on this

3. Temporary builder's/Permanent electricity supply housing cont.

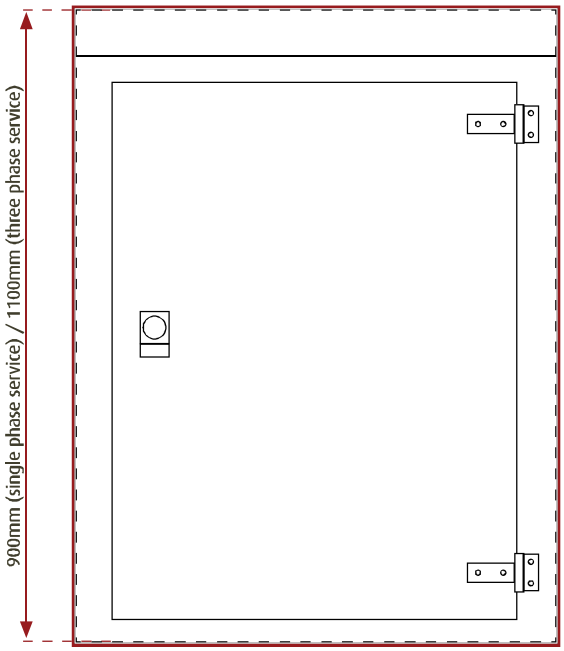
GRP kiosk specification

GRP kiosks must be mounted on a concrete plinth (as per the brick built specification on page 4), with two customer installed ducts for the network power service cable and the site supply. The housing should be fixed to the plinth with four galvanised 10mm Rawl through bolts screwed to the internal flange. It must also have a mounting board inside for the electrical equipment.

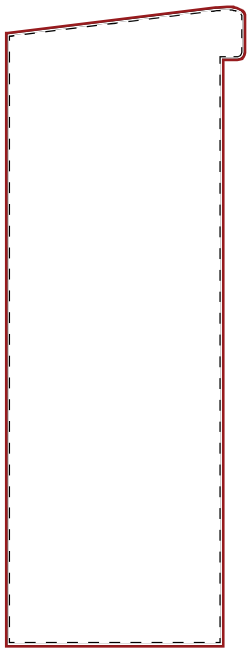
Kiosks are available from a number of suppliers such as Envico Engineering, meterboxes.co.uk and Kingsley Plastics.



EXTERNAL PLAN VIEW



EXTERNAL VIEW WALL 1



EXTERNAL VIEW WALL 2

4. Book an electrician

If you want your electricity connected to your property on the same day as we complete the installation of your power service cable you will need to arrange for a suitably qualified electrician to visit after we have finished our work.

If you do not have a qualified electrician, you can find one in your area by visiting www.competentelectrican.co.uk All electricians listed and permitted to display the mark are registered with an electrical Competent Person Scheme Operator, and have been authorised by Government to self-certify that their work is compliant with Building Regulations. This means they meet strict entry requirements, their work is regularly assessed, demonstrating their ability and ongoing competence, and that it meets the correct standards.

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5. Reserve parking

Off-street

If there's off street parking, for instance, on a driveway, this is perfect. Just remember our vans are quite large – about 1.5 times the length of a normal car. We need enough space to move safely around them and remove equipment.

Free street parking

This can be one of our biggest challenges. There are often vehicles parked in the area of the street we require to work in when we arrive. Parked vehicles often mean we cannot proceed with your connection on the date you require.

There are options to avoid the job being cancelled on the day due to parked cars:

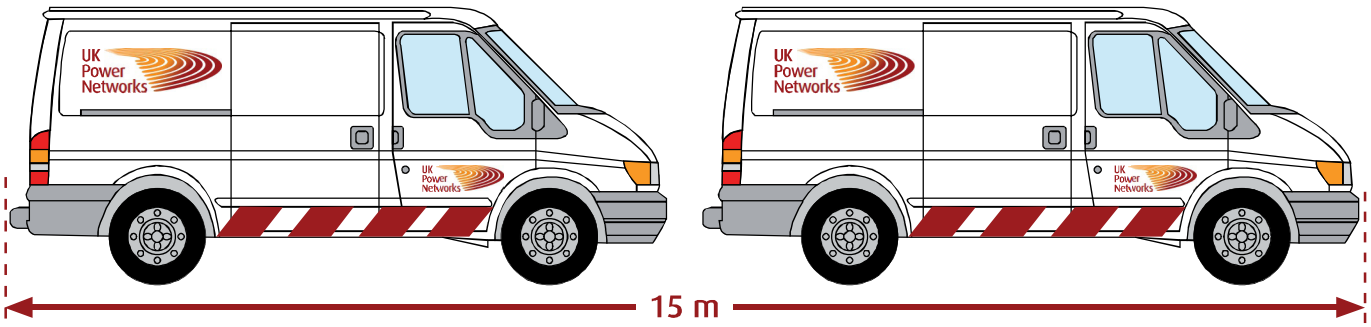
1. We can apply to the Local Authority for a Temporary Traffic Regulation Order (TTRO). The Local Authority apply a charge for this, which will be listed on your quote. ***Please note, a TTRO can take up to 14 weeks for the Local Authority to process, so please factor that time frame into your project plan***
2. We can place no parking cones in the area we need to reserve, the day prior to the works taking place if the area is free of parked cars at the time. Or we can leave the cones with you to place when the area becomes free. ***Please note, this method does not provide any guarantee that the area will be clear when we arrive to commence your works as cones are often moved***
3. You can park vehicles in the area where we need to work, physically reserving the space, which can then be moved when we arrive to commence works

Resident's parking

If there is Resident's parking we should have already applied on your behalf to have the bays suspended. The Local Authority charge for this will be listed on your quote.

Double yellow lines and other parking controls

If there are double yellow lines or other parking controls outside your site and you made this clear on your application, we should have already liaised with the necessary authority in advance to find a solution.



We will require parking for one or two (three if carrying machinery) of our vans when carrying out the groundworks and installing your electricity supply

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6. Clear work area

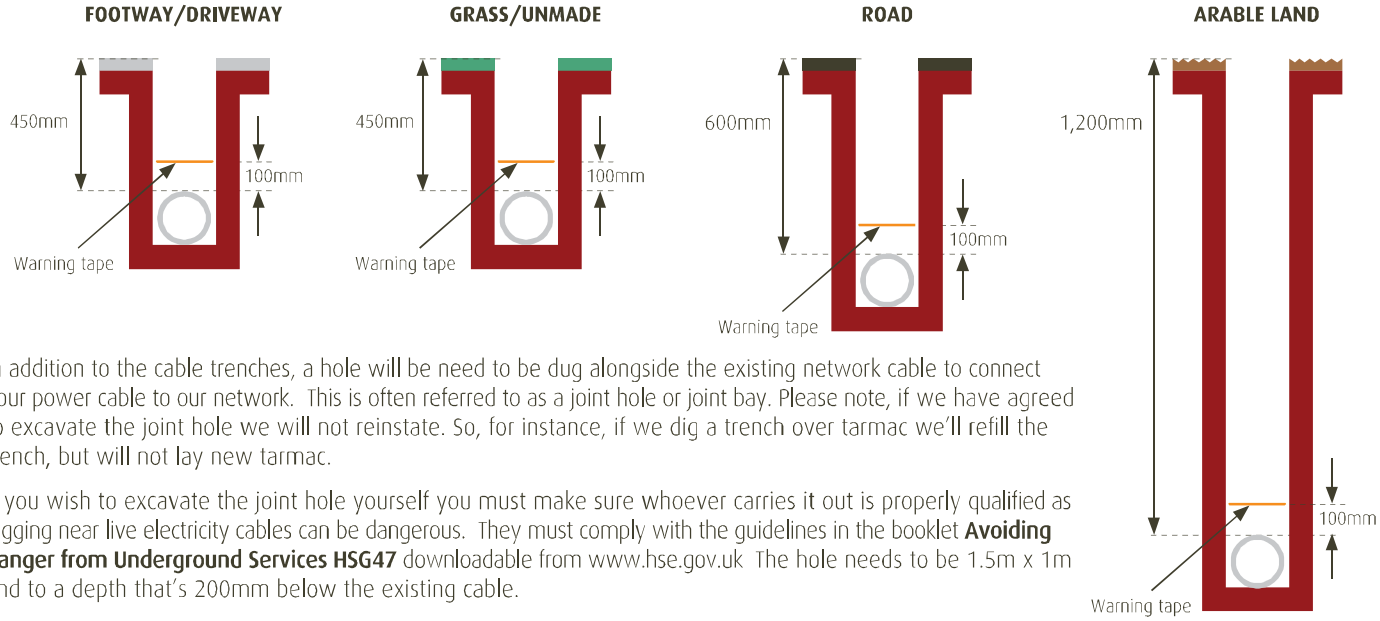
Please make sure the area where we need to carry out the works is clear of obstructions such as skips or building materials. We cannot work under of near scaffolding either. So any scaffold must be removed before the agreed date of our works.

7. On-site excavation

The cable route will have been agreed at your site visit. If we are digging the trenches we will only backfill after we have laid the cable. You will need to dispose of any leftover material and reinstate the original surface.

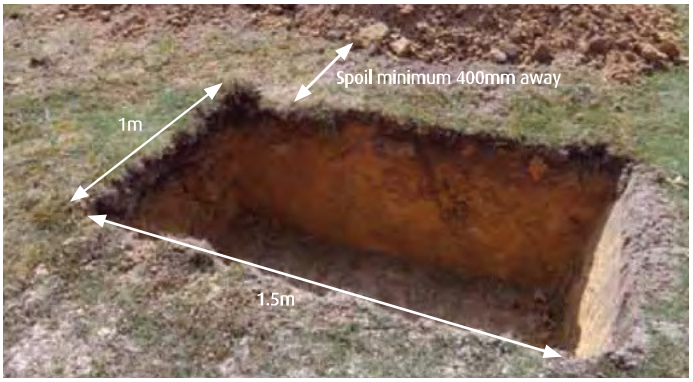
If you are doing your own digging, the depths for different surfaces are shown below. Prior to backfilling, you will need to place approved warning tape (see image below), marked 'Caution - Electric Cable Below', 100mm above the top of the ducting.

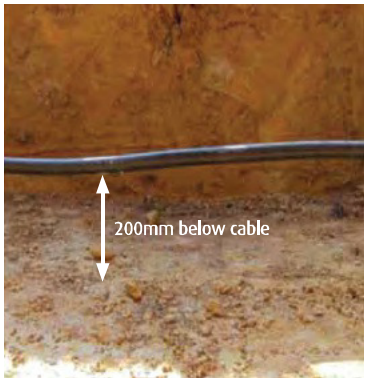
Please note: If you are doing your own digging we will not install the ducting unless it complies with our specification. So please check the depth of your trenches beforehand to avoid any delays.



In addition to the cable trenches, a hole will be need to be dug alongside the existing network cable to connect your power cable to our network. This is often referred to as a joint hole or joint bay. Please note, if we have agreed to excavate the joint hole we will not reinstate. So, for instance, if we dig a trench over tarmac we'll refill the trench, but will not lay new tarmac.

If you wish to excavate the joint hole yourself you must make sure whoever carries it out is properly qualified as digging near live electricity cables can be dangerous. They must comply with the guidelines in the booklet **Avoiding danger from Underground Services HSG47** downloadable from www.hse.gov.uk The hole needs to be 1.5m x 1m and to a depth that's 200mm below the existing cable.





UK Power Networks will use 200mm x 2.5mm TERRAM Tapetile protection warning tape. Visit www.centriforce.com for more information.

8. Cable ducting

Ducting for electricity cables is rigid, black protective tubing and the electricity cable is held within the black ducting. It must have the words 'Electric Cable Duct' stamped down the side so it's easy for anyone coming across it to know exactly what's inside. It is also important that ducting of the correct size is installed on site so that UK Power Networks can successfully deliver your works. The diameter of ducting varies depending on the type of service required. For single-phase electricity supplies a 32mm internal diameter duct is suitable. For three-phase electrical services a 50mm or 125mm internal diameter duct is suitable. In some circumstance it is necessary to provide a larger mains electricity cable which must be installed into a 125mm or 150mm internal diameter duct.

Once laid, you will need to install a drawstring through the ducting so that we can pull the power service cable through it.

We insist that where you are completing your own excavations and installing the ducting yourself that either your trench is left open for an inspection, or that photographic evidence with depth indicators must be available in the event that it is necessary to backfill excavations.

UK Power Networks uses ducting made by Polypipe which you can buy from the following stockists: Burdens, Buildbase Civils, Essex Groundworks, Jewson, Rouden Pipetek and Cirrus Trading Ltd.

Steel ducting is used in some locations in London e.g. when the supply goes through concrete or into a basement. We recommend seamless steel ducting with an internal diameter of 100mm which meets BS1387. This has a smooth internal surface that's free from rough edges and sharp projections.

Where you require ducting to be delivered in advance of your work date please ensure that you give us at least 7 days notice to arrange this.

APPENDIX E

BT OPENREACH LETTER CONFIRMING REGISTRATION OF THE DEVELOPMENT

Good news! your development is eligible for an ultrafast full fibre network

Dear Nick,

Thanks for choosing to register your development with Openreach. Your site has access to the latest full fibre infrastructure technology enabling ultrafast speeds to your new development for the cost of just **£5932** + VAT. Please see further down the email for your handbook.

To continue your site registration please complete and return the attached Contract and Billing Form. Once you've filled in all the relevant yellow fields, return the Signed agreement to nsdeveloperresponse@openreach.co.uk **as soon as possible** and we'll progress your application.

Please be advised, we need a signed contract returned on all developments.

Full fibre benefits

A full fibre connection provides essential benefits for developers and homeowners. Broadband infrastructure is becoming as important to a new home as any other utility, with 78% of people saying slow broadband would put them off buying or renting a property. A high quality broadband connection can also increase the value of a house by up to 1%, with poor quality broadband potentially reducing house prices by up to 3%.
The average data usage of a modern family is increasing by 40% year on year, with connected leisure and utility devices quickly becoming commonplace. **By delivering speeds of up to 1Gbps - 24 times faster than the UK average - full fibre provides a future-proof selling feature for your new homes.**

You can view more about the benefits of full fibre broadband by clicking on the images below to view our ultrafast network brochures and handbook.

Below you'll see a rough guide to the various timescales during the infrastructure delivery process.

Site registration	Site planning	Proposal sign off	On-site build

APPENDIX F

CIRCUIT SCHEDULES

Reference	LP
Served by	FUSED ISOLATOR
Description	GENERAL LIGHTING AND POWER DISTRBUTION BOARD
Location	STORE
Number of ways	24
Spare capacity	20.0%
Phases	3 (Board is Non-essential)
Board device type	Eaton, EMBH Range Type B (10kA) 30mA

Circuit ref	Device size (A)	CPC size	Cable size	Cable type	Circuit type	Description	Number of Cores	RCD used	Device type
1 L1	-	-	-	-	Spare	-	-	-	-
1 L2	6*	1	1 x 2 core x 1.5*	LSF multi RE	Lighting	ENTRANCE CORRIDOR	2	Yes	EMBH Range Type B (10kA) 30mA
1 L3	6*	1	1 x 2 core x 1.5*	LSF multi RE	Lighting	PART CLUB RM/KITCHEN	2	Yes	EMBH Range Type B (10kA) 30mA
2 L1	-	-	-	-	Spare	-	-	-	-
2 L2	6*	1	1 x 2 core x 1.5*	LSF multi RE	Lighting	OFFICAL 2 CHANGE PLACE ACC WC	2	Yes	EMBH Range Type B (10kA) 30mA
2 L3	6*	1	1 x 2 core x 1.5*	LSF multi RE	Lighting	PART CLUB RM/STORES	2	Yes	EMBH Range Type B (10kA) 30mA
3 L1	6*	1	1 x 2 core x 1.5*	LSF multi RE	Lighting	PLAYERS CORRIDOR	2	Yes	EMBH Range Type B (10kA) 30mA
3 L2	6*	1	1 x 2 core x 1.5*	LSF multi RE	Lighting	CHANGE 4	2	Yes	EMBH Range Type B (10kA) 30mA
3 L3	6*	1	1 x 2 core x 1.5*	LSF multi RE	Lighting	EXTERNAL WALL LIGHTS BACK	2	Yes	EMBH Range Type B (10kA) 30mA
4 L1	6*	1	1 x 2 core x 1.5*	LSF multi RE	Lighting	CHANGE 3	2	Yes	EMBH Range Type B (10kA) 30mA
4 L2	-	-	-	-	Spare	-	-	-	-
4 L3	6*	1	1 x 2 core x 1.5*	LSF multi RE	Lighting	EXTERNAL WALL LIGHTING FRONT	2	Yes	EMBH Range Type B (10kA) 30mA
5 L1	6*	1 x 1.5	1 x 2 core x 1.5*	PVC/swa/pvc	Lighting	EXTERNAL LIGHTING COLOUMNS	2	Yes	EMBH Range Type B (10kA) 30mA
5 L2	6*	1	1 x 2 core x 1.5*	LSF multi RE	Lighting	PART ROOF VOID	2	No	EMBH Range Type B (10kA) 30mA
5 L3	6*	1	1 x 2 core x 1.5*	LSF multi RE	Lighting	MALE/FEMALE WC	2	No	EMBH Range Type B (10kA) 30mA
6 L1	6*	1 x 1.5	1 x 2 core x 2.5*	PVC/swa/pvc	Lighting	EXTERNAL LIGHTING COLOUMNS	2	No	EMBH Range Type B (10kA) 30mA
6 L2	-	-	-	-	Spare	-	-	-	-
6 L3	-	-	-	-	Spare	-	-	-	-
7 L1	-	-	-	-	Spare	-	-	-	-
7 L2	-	-	-	-	Spare	-	-	-	-
7 L3	-	-	-	-	Spare	-	-	-	-
8 L1	-	-	-	-	Spare	-	-	-	-
8 L2	-	-	-	-	Spare	-	-	-	-
8 L3	-	-	-	-	Spare	-	-	-	-
9 L1	-	-	-	-	Spare	-	-	-	-
9 L2	-	-	-	-	Spare	-	-	-	-
9 L3	-	-	-	-	Spare	-	-	-	-
10 L1	-	-	-	-	Spare	-	-	-	-
10 L2	-	-	-	-	Spare	-	-	-	-
10 L3	-	-	-	-	Spare	-	-	-	-
11	40*	1 x 10*	1 x 4 core x 16*	XLPE/swa M	Fixed power	HEAT PUMP	4	Yes	EMCH Range Type C (10kA) 30mA
12 L1	20*	1.5	1 x 2 core x 4	LSF multi RE	Radial 13A sockets	HRU'S	2	Yes	EMCH Range Type C (10kA) 30mA

* denotes fixed size

12 L2	20*	1.5	1 x 2 core x 4	LSF multi RE	Radial 13A sockets	HRU'S	2	Yes	EMCH Range Type C (10kA) 30mA
12 L3	-	-	-	-	Spare	-	-	-	-
13 L1	20*	1.5	1 x 2 core x 2.5	LSF multi RE	Radial 13A sockets	KITCHEN FANS	2	Yes	EMCH Range Type C (10kA) 30mA
13 L2	32*	4	1 x 2 core x 10	LSF multi RE	Fixed power	HYDRO BOX	2	No	EMCH Range Type C (10kA) 30mA
13 L3	32*	1.5	1 x 2 core x 4	LSF multi RE	13A ring	KITCHEN RING	2	Yes	EMBH Range Type B (10kA) 30mA
14 L1	32*	4	1 x 2 core x 10	LSF multi RE	Fixed power	HYDRO BOX	2	No	EMCH Range Type C (10kA) 30mA
14 L2	-	-	-	-	Spare	-	-	-	-
14 L3	32*	1.5	1 x 2 core x 2.5	LSF multi RE	13A ring	PLANTROOM RING	2	Yes	EMBH Range Type B (10kA) 30mA
15 L1	-	-	-	-	Spare	-	-	-	-
15 L2	20*	2.5	1 x 2 core x 2.5	FP200	Radial 13A sockets	FIRE ALARM PANEL	2	Yes	EMBH Range Type B (10kA) 30mA
15 L3	32*	4	1 x 2 core x 10	LSF multi RE	Fixed power	HOB	2	No	EMCH Range Type C (10kA) 30mA
16 L1	-	-	-	-	Spare	-	-	-	-
16 L2	20*	1.5	1 x 2 core x 4	LSF multi RE	Radial 13A sockets	HAND/HAIR DRYER CHANGE 4	2	Yes	EMCH Range Type C (10kA) 30mA
16 L3	32*	1.5	1 x 2 core x 2.5	LSF multi RE	13A ring	CLUB ROOM RING	2	Yes	EMBH Range Type B (10kA) 30mA
17 L1	-	-	-	-	Spare	-	-	-	-
17 L2	20*	1.5	1 x 2 core x 4	LSF multi RE	Radial 13A sockets	HAND DRYERS OFFICAL 2 CHANGE P	2	Yes	EMCH Range Type C (10kA) 30mA
17 L3	20*	1.5	1 x 2 core x 2.5	LSF multi RE	Radial 13A sockets	PLANTROOM ONT	2	Yes	EMBH Range Type B (10kA) 30mA
18 L1	32*	2.5	1 x 2 core x 6	LSF multi RE	Fixed power	MECH CONTROL PANEL	2	No	EMCH Range Type C (10kA) 30mA
18 L2	32*	1.5	1 x 2 core x 2.5	LSF multi RE	13A ring	CLEANERS SOCKETS	2	Yes	EMBH Range Type B (10kA) 30mA
18 L3	20*	1.5	1 x 2 core x 4	LSF multi RE	Radial 13A sockets	HAND DRYER MALE WC	2	Yes	EMCH Range Type C (10kA) 30mA
19 L1	32*	1.5	1 x 2 core x 2.5	LSF multi RE	13A ring	CLEANERS SOCKETS	2	Yes	EMBH Range Type B (10kA) 30mA
19 L2	20*	1.5	1 x 2 core x 2.5	LSF multi RE	Radial 13A sockets	HAND DRYER ACCESS WC	2	Yes	EMCH Range Type C (10kA) 30mA
19 L3	20*	1.5	1 x 2 core x 4	LSF multi RE	Radial 13A sockets	HAND DRYER FEMALE WC	2	Yes	EMCH Range Type C (10kA) 30mA
20 L1	20*	1.5	1 x 2 core x 4	LSF multi RE	Radial 13A sockets	HAND/HAIR DRYER CHANGE 3	2	Yes	EMCH Range Type C (10kA) 30mA
20 L2	32*	1.5	1 x 2 core x 2.5	LSF multi RE	13A ring	SOCKETS ROOF VOID	2	Yes	EMBH Range Type B (10kA) 30mA
20 L3	32*	1.5	1 x 2 core x 2.5	LSF multi RE	13A ring	SOCKETS MALE/FEMALE WC	2	Yes	EMBH Range Type B (10kA) 30mA
21 L1	-	-	-	-	Spare	-	-	-	-
21 L2	-	-	-	-	Spare	-	-	-	-
21 L3	20*	1.5	1 x 2 core x 2.5	LSF multi RE	Radial BS4343 sockets	SOCKETS COMMS	2	Yes	EMBH Range Type B (10kA) 30mA
22 L1	-	-	-	-	Spare	-	-	-	-
22 L2	-	-	-	-	Spare	-	-	-	-
22 L3	20*	1.5	1 x 2 core x 2.5	LSF multi RE	Radial 13A sockets	INTRUDER ALARM PANEL	2	Yes	EMBH Range Type B (10kA) 30mA
23 L1	-	-	-	-	Spare	-	-	-	-
23 L2	-	-	-	-	Spare	-	-	-	-
23 L3	-	-	-	-	Spare	-	-	-	-
24 L1	-	-	-	-	Spare	-	-	-	-
24 L2	-	-	-	-	Spare	-	-	-	-
24 L3	-	-	-	-	Spare	-	-	-	-

* denotes fixed size