

ELECTRICAL SPECIFICATION

**High Performance Gym
T2 Tailteann Building
Mary Immaculate College
Limerick**

Project No: 26.3138-MFC-V1-XX-SP-E-6900 (A4)
(C01) - Electrical Specification & Pricing Document

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Tender	0	17th June 2026	BC	JM	MF

A GENERAL PRELIMINARIES

A.1 STANDARD ENGINEERING SPECIFICATION

The Standard Electrical Building Services Engineering Specification shall be read in conjunction with all or any of the sections included in the Specification Summary Sheet.

The complete specification of works to be carried out shall include all forms of tender, forms of contract and contract drawings.

The aforementioned may be separate or combined together in one or more bundle to comprise the Tender Documents which shall be read as a whole and **all** items shall be included for in the submitted priced Tender with **no** exclusions or qualifications.

A.2 DEFINITIONS

In the Standard Engineering Specification, the following words and expressions shall have the meanings hereby assigned to them except where the context otherwise requires: -

"The Employer" shall be as defined on or with the Form of Tender.

"The Contract Administrator" shall mean the appointed representative Defined, on or with the Form of Tender.

"The Contract" shall mean the Form of Contract described on or with the Form of Tender.

"The Works" shall mean the whole of the Works described in the Specification to be executed by the Electrical Contractor.

"The Specification" shall mean the complete Specification of Works described above.

"The Main Contractor" shall mean the firm appointed to carry out the whole of the Contract where applicable.

"The Electrical Contractor" shall mean the firm appointed to carry out the whole of the Works described in the complete Specification.

Where the Form of Tender states that the Mechanical and Electrical Works shall be carried out under a Sub-Contract with a Main Contractor then the Mechanical and Electrical Contractor shall be referred to, and act as, a "Sub-Contractor".

A.3 COMMUNICATIONS

The Contractor shall communicate only with the Consulting Engineer.

A.4 VISITS TO SITE

Tenderers shall visit the site by prior arrangement with the Contract Administrator before completing their tenders and will be deemed to have satisfied themselves on the full nature of local conditions as regard accessibility, transport and storage of materials, the supply of, and conditions affecting labour and to have obtained all necessary information on all matters affecting the execution of the Works.

Claims on the grounds of want of knowledge in such respect, will **not** be admitted.

A.5 INSPECTION OF ARCHITECTURAL/STRUCTURAL DRAWINGS

Where the Works are part of a building project, Architectural/Structural or other Services drawings will be available for inspection during the tender period at the Contract Administrator's offices within normal working hours. Tenderers will be deemed to have inspected these drawing and included for all matters relating to the execution to the Works.

Claims on the grounds of want of knowledge in such respect will **not** be admitted.

A.6 LABOUR & SUPERVISION

The Contractor shall employ experienced and qualified workmen to carry out the Mechanical Works. Such workmen may be assisted by apprentices or labourers, but at all times during the execution of the Works, their numbers shall not exceed the number of skilled workmen.

The Contract Administrator may at any time request proof of the level of qualification and / or competence of any person involved with the Contract on behalf of the Electrical contractor and if not satisfied may request their replacement.

The Contractor shall employ one representative, whose name shall have been previously communicated in writing to the Contract Administrator, to superintend the carrying out of the Works on site. The said representative shall be present on the site at all times during working hours and any orders or instructions which the Contract Administrator may give to the said representative shall be deemed to have been given to the Electrical Contractor.

The Contract Administrator shall have the power to request the contractor to remove from the works any person employed by them who in their opinion is incompetent or misconducts themselves or does not comply with the above paragraphs of this clause. Any person or persons so removed shall not be employed again on the works without the permission of the person who requested their removal.

A.7 IDENTIFICATION

The Contractor shall ensure that all his operatives carry an identification card c/w Photograph when requested.

The contractor shall, prior to commencement of any work on the premise, report to the responsible person for that premise and produce his/her identification card for all operatives intending to carry out work.

A.8 WORKING HOURS

Work shall be carried out during the normal working hours of the site. However, it shall not be carried out outside the hours of 8.00 am to 6 pm, on Mondays to Fridays without the written approval of the client.

A.9 OVERTIME

Payment of overtime will not be considered unless written authority is given by the Client, and only then with agreement.

A.10 PROHIBITION OF TRANSFER OF CONTRACT

No part of the contract, or any interest in it shall be Transferred or assigned by the contractor directly or indirectly to any person or persons whomsoever.

A.11 SITE MEETINGS

Periodical meetings will be held at the site as and when required by the design team.

The contractor shall arrange to have an accredited representative present at each of these meetings.

The Contractor shall have previously communicated the name of the contractor's representative in writing to the design team.

A.12 SCHEDULE OF RATES

A Schedule of rates giving details of prices and quantities for each section of the work **will be required** to accompany the submission of tender.

This schedule must show the rates of **each** piece of apparatus, labour rate for erection, rates per unit length (inclusive of labour) for the installation of each size of cable, conduit, trunking etc.

The final grand total shall agree with the tender figure.

A.13 VALUATION OF VARIATIONS

The Specialist Contractor's price is lump sum fixed price, there will be no variations to the Contract Sum, unless additional works are instructed by the Employer's Representative, and these will be carried out in accordance with the appropriate clauses.

Notwithstanding the Conditions of the Contract, no work shall be commenced upon any variation or cost incurred, unless otherwise authorized by the Contract Administrator, before:

- a) The value of the variation has been agreed.
- b) The Contract Administrator's written instruction has been issued.
- c) The Main Contractor's official order has been received.

A.14 PAYMENTS

In the case where the Mechanical and Electrical Services Installer is named Sub-Contractor, payments will be made via the Main Contractor and the appropriate retention and Main Contractors Discount will be deducted.

On the issue of the Certificate of Practical Completion, or the Certificate of Taking Over, retention shall be held as prior agreed.

At the discretion of the Contract Administrator, after twelve months of the Defects Liability Period has elapsed, all retention monies will be released, providing a Certificate of Indemnity is received from the Mechanical and Electrical Services Contractor, indicating that the Employer is indemnified against the cost of remedying any defects, including consequential damage to the building, to fabric and furnishings and the cost of builder's work associated with the remedying of such defects and consequential damage which shall appear in the latter six months of the twelve months Defects Liability Period of the Contract.

B PARTICULAR PRELIMINARIES

B.1 CONTRACT DRAWINGS & SPECIFICATION

The Contract Drawings are intended to show the general arrangements of the various items of the Works as described in the Specification to be supplied and installed under the Contract. They do not necessarily show exact runs or full details of all accessories, fitting etc, required and in some instances are merely diagrammatic.

However, the Specification and Drawings must be understood to cover everything required to make a first-class installation and the Contractor should include for all items necessary for the proper execution of the Works in his Tender.

Anything shown on the Drawings which is not included in the Specification, or anything herein and not shown on the Drawings shall be deemed to be required as part of the Contract.

Any anomalies, which arise between Drawings or between Drawings and the Specification, should be reported to the Consulting Engineer before the Tender is submitted. Such discrepancies must be pointed out at the time of tendering and will not be accepted as a basis for extra claims and work during the progress of the installation. All Contract Drawings and the Specification are the property of the Employer.

All tender and contract drawings including specifications shall be issued in PDF format. In the event that paper copies are required from the consultant, a charge for paper copies shall be applied. Payment for such copies shall be made in full at handover of the paper copies. The following charges shall apply:

A1 – Black and White	€2.50 per sheet
A1 – Colour	€4.00 per sheet
A0 – Black and white	€3.50 per sheet
A0 – Colour	€5.00 per sheet

Specification up to 150 pages	€5.00 per copy
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B.2 WORKING DRAWINGS

Notwithstanding the provision of the Contract Drawings the Contractor shall be responsible for taking his own particulars and providing at his own expense all necessary working and detail drawings as requested by the Consulting Engineer, copies of which must be first submitted for comment before the work is put in hand.

Comments on working drawings will not relieve the Contractor of his responsibility to ascertain exact building dimensions and location of other services.

The Contractor is required to prepare the working drawings utilizing AutoCAD 2021 or equivalent. Digital Copy of drawings will be made available.

For ducting, pipework and containment installations, the Contractor shall submit for the Consulting Engineer's approval, either in electronic format or, three paper copies of drawings showing the proposed routes, dimensioned to show the exact points of vertical/horizontal runs and positions. If any of the services are installed prior to comment, or not in accordance with the issued drawings,

the Consulting Engineer will be entitled to instruct these to be altered, at the Contractor's cost, to comply with his requirements.

The Contractor will be responsible for taking dimensions from site for all equipment to be specially fabricated and for preparing his own detailed working drawings from these measurements. Such drawings shall be submitted, in electronic format for the Contract Administrator's comment before manufacture is commenced.

The Consulting Engineer's comment of working drawings will not relieve the Contractor of his responsibility for errors and incorrect setting out.

The Consulting Engineer's comment is to be general and is not intended to serve as a check and does not relieve the Contractor from furnishing the materials and performing the work as required by the Drawings and Specification.

The Contractor shall be responsible for any discrepancies, errors or omissions in the working drawings and other particulars supplied by him, whether such drawings and particulars have been approved, in principle, by the Consulting Engineer or not, provided that such discrepancies, errors or omissions be not due to inaccurate information or particulars furnished in writing to the Contractor by the Consulting Engineers.

Following the comments of any working drawing the Contractor shall formally issue digital copies of the approved drawing to the Consulting Engineers.

B.3 SETTING OUT

The Contract Drawings are for tendering purposes only and are not to be used for setting out. Except where specific dimensions are given, the Contractor will verify all setting out on site and shall make use of all detail, large scale, furniture and internal wall elevation drawings held by the Main Contractor.

Notwithstanding the submission, approval and issue of Working Drawings, the exact positions of all services, plant and equipment must be agreed on site with the Consulting Engineer before they are setout. Drawings shall not be scaled for this purpose.

The Contractor shall accurately set out the works and he shall keep them correct in every particular way according to the Drawings and Specification.

In all instances where services such as gas, hot and cold water, heating, electricity, Telecom. TV, etc. run in conjunction with and/or parallel to any particular service installation, the setting out of the whole of the services is to be approved before work is commenced on that portion of the installation.

B.4 BUILDERS' WORK

The following work shall be deemed to be Builders' Work, which shall be provided by the Main Contractor: -

- a. Cutting away through walls, floors and ceilings for passage of all mechanical and electrical services etc. and making good after.
- b. Chasing of walls for conduits, accessory boxes, pipework and fittings
- c. Auxiliary timber noggins and the like for supporting luminaires and ceiling mounted accessories.
- d. All underground pipe ducts, lighting column pits, trenching etc.
- e. All painting of surface services.
- f. Removal and replacement of other parts of the building fabric as may be necessary.
- g. Items of general and special attendance.

Taking delivery, unloading, taking on store, hoisting materials, Power for fixing, Scaffolding, Protecting completed installation

The Contractor shall inform the Main Contractor of the location and details of any of the above Builders' Work required by marking out on site or, if requested, by drawings.

The Contractor shall be responsible for the accuracy of the Builders' Work information and shall recompense the Main Contractor for any abortive work carried out due to inaccurate information.

The Contractor shall be fully responsible for the levels and squareness of fittings when fitted to chases etc., and to this end will ensure the accuracy of all works carried out in this connection by the Main Contractor.

The Contractor shall permit nothing to be done which may injure the stability of the works and no cutting through floors, walls, etc. will be allowed, other than where required by the Drawings, without the sanction of the architect.

The contractor shall be provided with general attendance, free of charge, general attendance shall include only allowing use of scaffolding, mess rooms, sanitary accommodation providing space only for office accommodation and for storage of plant and materials.

B.5 FIRE PROTECTION

When opes are cut through wall or floors to enable services to pass through, the Main Contractor must make them good with incombustible material. Internal fire barriers in conduit, trunking, ducts, etc. shall be the responsibility of the Electrical Contractor.

B.6 FIXINGS

The Contractor shall include for all drilling and plugging for the erection of all materials and equipment required by the Specification. This shall include the fixing of metalwork, screws, clips, bolts, brackets, saddles, etc. for the proper support of services and for the suspension or support of services.

In any building partially or fully occupied by the Employer or other person's noise and hindrance whilst carrying out any of the above shall be kept to a minimum.

The architect's and the Main Contractor's approval shall be obtained as to all methods of fixing proposed before the work is commenced and, in particular, the approval shall be obtained, in writing, before welding, drilling, burning, cutting, cartridge injecting or altering structures or foundations in any way.

The Contractor shall rectify at his own expense any damage whatsoever caused by negligence on the part of his workmen to decorations, paintwork, building fabric or structure etc.

B.7 PAINTWORK

The Contractor shall be responsible for protecting all equipment that has been installed from damage and shall thoroughly clean all equipment before it is handed over. Any damaged paintwork shall be made good in a colour and type of paint to match the original.

Mild steel or iron brackets or other items to be built in are to be painted before building in. In the case of materials or plant which is delivered to the site already primed, the Contractor shall ensure that the primer is suitable for the type of paint to be subsequently applied and shall make good any damage to the primer before further coats are applied.

All items that are to be painted shall have an under-coating and a finishing coat in addition to a primer appropriate to the material being painted, the finishing coat shall be to a colour to be approved by the Consulting Engineer.

All paints, including priming, undercoats and finishing coats shall be of the best quality and shall be obtained from a reliable, and are to be used in accordance with the Maker's instructions. Painting shall be done in accordance with the best practices in the Trade, all surfaces to be painted, must be thoroughly prepared, including removal of dust, grease, and protective coatings, and in the case of iron and steel, the removal of rust and scale by abrasion, followed by the application of an anti-rust solution to remove pitted rust.

B.8 WORKMANSHIP

Workmanship shall conform to the highest standard of current electrical installation practice. The Consulting Engineer reserves the right to reject any work, which in his opinion does not meet such a standard. Rejected work shall be rectified immediately or taken down within two days and corrected as soon as is practically possible.

B.9 MATERIALS

Unless otherwise specified all material to be used throughout the installation shall be new and shall be of EU manufacture.

All materials shall be of the best of their particular type and the Contractor may be called upon to submit for approval samples of the various materials intended for use in the execution of the work.

All materials are to comply with the appropriate Standards and regulations.

Materials, which are specified, to be supplied by a particular Manufacturer shall **not** be varied without the written approval of the Consulting Engineer.

In these specifications trade names and/or suppliers are sometimes used for the purpose of brevity and clarity of technical, aesthetic and functional intent. Such references are for the conveniences of the tenderer in clearly indicating the standard of technical, aesthetic and functional requirements sought by the specifier. The intention is not to favor one product over another or to eliminate other products/suppliers.

Other materials/suppliers may be put forward for consideration as equivalent materials to those stated in the specification.

Approval for substitution of equivalent materials/suppliers will be given where the alternative material/supplier are demonstrable equal in full accord with the original specification.

Equivalence of an offered substitution will be judged on the basis of objective, clear and verifiable independent proof of similar compliance with equal standards to those specified.

Where appropriate verification is provided through a detailed technical dossier, drawings, data sheets and/or a test report from a recognized body, a material/product substitution will be permitted by the architect who is the client representative. Any increased costs arising whatsoever from such a substitution in terms of redesign, rescheduling, health and safety issues etc. shall be borne by the Contractor.

Alternative suppliers/installers will need to prove their ability to perform their sub-element part of the main contract through the submission of proof of their technical and/or professional capacity (education, experience, equipment etc.).

The contracting authority, through the client representative, will determine on a case by case basis, from a technical, aesthetic and functional perspective, what constitutes an equivalent standard/product. Verification will take place only after the award of contract, as part of the contract management regime. Sufficient time is to be allowed to check submissions and provide samples as indicated in this specification.

When for any reason the Contractor proposes a change from the specified materials for approval, he shall provide samples, free of charge, to the Consulting Engineer for evaluation together with all back up technical and other reference information requested by the Consulting Engineer.

The Contractor shall ensure that all materials, which are installed or stored on site, are properly protected. The Consulting Engineer reserves the right to reject any materials which are damaged or corroded due to poor storage, installation, or lack of protection, or materials which do not comply with the Specification.

Rejected materials, whether installed or stored, shall be removed from site within two days and replaced as soon as is practically possible.

It shall be the Electrical Contractor's responsibility to ensure that all materials are ordered and delivered to site in sufficient time so as to enable him to complete his work within the period of contract. No additional claims will be allowed for non-compliance.

B.10 PRODUCTS SPECIFIED BY NAME

It should be noted that, for tender purposes, the reference to any particular item or product within this specification lays down the parameters required for that product.

These parameters will include type and standard of aesthetic finish, applied technology/inter-component compatibility, thermal capabilities, technical suitability, and physical dimensions.

Alternative products may be offered if full details are submitted in writing, at the submission of any tender for evaluation and approval by the Consulting Engineer. Any such alterations shall be detailed in the form of a separate schedule indicating any projected cost savings against any scripted product.

B.11 TESTING AND COMMISSIONING

At an early stage of the Project the Contractor shall compile a programme of testing and commissioning of all services contained in this Specification document.

The Contractor shall further provide a method statement supported by risk assessments detailing the procedures for carrying out the onsite tests. The opportunity shall be afforded to the Consulting Engineer, or his appointed representative, to witness all or any tests carried out either on site or at manufacturer's works, and to facilitate this, the Contractor shall give not less than **eight days' notice** of tests to the Consulting Engineer.

The Contractor shall provide all necessary facilities and equipment to carry out all tests and inspections either on site or at manufacturer's works. An 'approved' engineer shall be appointed by the Contractor to supervise the whole of the testing, commissioning, performance testing and instruction of Client's staff together with all specialized personnel (including manufacturer's representatives) and all of their activities shall be coordinated by him.

All equipment, material and systems contained in this Specification document shall be tested and if such inspection/test fails, the process shall be repeated until satisfactory results are obtained. Comprehensive records of all commissioning and testing shall be maintained and shall contain the following information: -

- a) Project title
- b) Details and date of test
- c) Instruments used, serial numbers, calibration dates
- d) Signatures of those witnessing test
- e) Mechanical and Electrical Services Installer's name
- f) Specific location of the item(s) in the Works

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

B.12 COMPLETION DETAILS

At the completion and final hand over of the project, the Contractor is required to have carried out the following: -

- a. Fully completed all works detailed in the Specification and shown on the Contract Drawings.
- b. Fully completed all works relating to Variations to the Contract, for which Architect's Instructions have been issued, thus forming part of the Contract.
- c. Submitted to the Consulting Engineer, all duly completed inspection and Completion Certificates.
- d. Submitted to the Consulting Engineer, Record Drawings.
- e. Submitted to the Consulting Engineer, a Maintenance Manual and Job Profile.

B.13 INSTRUCTION PERIOD

After an installation has been completed, tested and handed over to the Employer, and when instructed, the Contractor shall supervise and be completely responsible for the running of the plant detailed in this Specification, for a period during which he shall demonstrate to the persons appointed by the Employer to be in charge, the running conditions, operation of the plant, correct setting and maintenance controls etc. to attain the desired results.

The Contractor should ensure that the person(s) is familiar with the positions of equipment and facilities for the isolation of the installation, particularly under emergency conditions. The instructional period may not take place immediately on completion, but when considered desirable by the Consulting Engineer.

B.14 OPERATION & MAINTENANCE MANUALS

Prior to the issue of the Practical Completion Certificate for Works, comprehensive Operation & Maintenance Manuals finalized in detail and approved shall be provided. It is advised that great importance will be placed upon the quality, accuracy, clarity, and completeness of the Operation & Maintenance Manuals and upon their being made available promptly.

A complete draft copy of the manual must be submitted not less than **2 weeks before** the date of Practical Completion. Any amendments necessary in the light of any comments shall be made and the manual re-submitted for the Consulting Engineer's approval.

Only after the Consulting Engineer's approval are the final copies of the manual to be produced.

The finalized copies are to be provided to the Consulting Engineer not less than **2 weeks before** the date of Practical Completion.

Failure to issue these in time will result in withholding the Practical Completion Certificate.

From time to time, as required throughout the execution of the Works, evidence of adequate and accurate records, to enable the ultimate completeness and accuracy of the Operation & Maintenance Manuals, shall be progressively examined as the work on site proceeds.

All Operation & Maintenance Manuals shall be provided in digital format containing all documentation, following the issue of one set for approval.

The Operation & Maintenance Manuals shall be adequate for the following purposes: -

- a. To clearly record the layout of the various sections of the Works as actually installed, and to identify and locate all component parts thereof especially isolation points, distribution boards etc.
- b. To make it possible to comprehend the extent and purposes of the Works and the method of operation thereof.
- c. To set out clearly the extent to which maintenance and servicing is required and how, in detail, it should be executed.
- d. To provide sufficient and readily accessible information properly to facilitate the ordering of spares and replacements.

The Operation & Maintenance Manuals shall be correlated so that the terminology and the numerical and/or other references used therein are consistent with and similar to those used in the physical identification of component parts of the Works. Operating and Maintenance Instructions shall be provided and shall comprise the following as applicable (all contained in volumes strongly bound in flexible covers and suitable for heavy usage over a long period), written to be read in conjunction with the Record Drawings:

- a. A general description of the scope, purpose, and manner of working of each system or apparatus forming part of the Works.
- b. A detailed description of the scope, purpose, and manner of working of each system of automatic controls and/or monitoring instruments.
- c. A detailed description of the scope, purpose, and manner of working of each system of special services.
- d. Data on general design parameters and normal operating conditions (e.g., voltage, current etc.) based on commissioning tests.
- e. Clear and comprehensive instructions for the switching on, starting up, running, and closing down of each such system or apparatus.
- f. Clear and comprehensive instructions for dealing with emergency conditions for each system or apparatus.
- g. Instructions in respect of any precautionary measures from time to time necessary (e.g., against corrosion or freezing).
- h. Instructions in respect of the care of apparatus when subject to seasonal disuse.
- i. Instructions as to the nature, extent, and frequency of servicing necessary to properly maintain the Works in good condition and as to the materials to be used for the purpose. This information may be supported in detail, but not replaced by, maintenance instructions provided by the suppliers of particular component apparatus.
- j. The names and addresses of suppliers of all major components of the Works as may be required to obtain spare parts or replacements.

Copies of manufacturers' data shall be supplied with respect to the nature, type and method of operation of individual pieces of equipment, together with their detailed maintenance instructions.

An asset list of all equipment and services together with all associated technical information pertinent to such services and information shall be included. A copy of all Test Certificates, Inspection and Test Records, Commissioning and Performance Test Records for the installations and equipment, etc., used in the installations.

B.15 RECORD DRAWINGS

Prior to the issue of the Practical Completion Certificate for the Works, comprehensive Record Drawings finalized in detail and approved shall be provided. It is advised that great importance will be placed upon the equality, accuracy, clarity, and completeness of the Record Drawings and upon their being made available promptly.

Drawings prepared by suppliers of component items shall be in the same form as above, except where they are incorporated in Instruction Manuals when paper is acceptable.

The Record Drawings shall include the information listed in the following paragraphs, as applicable. All such drawings shall clearly be endorsed **RECORD DRAWING** near to the title block and shall be drawn to a scale of not less than one hundredth full size, which shall show the following as installed: -

- a. The location, including level if buried, of Public Service connections provided, together with the points of origin and termination, size and materials of cables, ducts, pipes and/or other relevant information.
- b. Location, identity, size and details of all apparatus and control equipment served by, or associated with, each of the various services. The information with respect to size and details may be presented in schedule form subject to the prior agreement of the Contract Administrator.
- c. The location and identity of each room or space housing plant, machinery, or apparatus.
- d. Main and sub-main cables, showing original, route, termination, size, and type of each cable.
- e. Distribution diagram, or diagrams, which shall show size, type, and length (to within one yard for imperial measure or one meter for metric measure) of each service.
- f. Control wiring diagrams, which shall show all equipment supplies as part of the Works.
- g. Manufacturer's drawings and internal wiring diagrams which shall show all special equipment supplied as part of the Works.

B.16 DEFECTS LIABILITY, MAINTENANCE & SERVICING

Notwithstanding the conditions of the Contract the Contractor shall be responsible for any defects which may occur, for a period of 12 months from Practical Completion, in the entire installation detailed in the Specification.

Following notification of a defect the Contractor shall rectify the item within 24 hours except as may be agreed otherwise with Consulting Engineer.

The Client will carry out routine maintenance to the installation in accordance with the documentation issued by for all building engineering services thus ensuring that such installation is maintained and serviced correctly thus meeting all statutory requirements.

B.17 EMERGENCY CALL OUT

For the duration of the contract and for the defects period an Emergency Call out Service must be available 24 hours per day at all times including weekends and bank holidays.

The Call Out is to be covered as soon as possible and the operative attending site must be on site within 2 hours of receiving the Emergency Call Out notice.

If the Contractor is unable to respond to the call out within the time specified, attendance by others operating on a representative basis for the Contractor will be acceptable but the standard and performance of the representative is entirely the responsibility of the contractor.

In the event of failure by the Contractor to respond to the call out within the time stipulated, the Client reserves the right to employ and pay others to carry out the work involved, and the costs incurred will be deducted by the Client from any monies due to the Contractor under this contract or will be recoverable from the Contractor by the Client as a debt.

This latter action will in no way invalidate the guarantee inherent in the defect's liability period implicit in the terms of the contract.

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

To facilitate the call out procedure the Installer **upon** placing of an order with him for the contract works will be required to give a Call Out telephone number or numbers where 24-hour contact will be available and the Client will give corresponding 24 hour Call Out contact numbers for the relay of information.

Included in this Emergency Call out Procedure is the attendance to any operational fault or breakdown to any temporary plant that may be installed as part of the contract.

C GENERAL CONDITIONS OF CONTRACT

C.1 EXTENT OF WORK

The Scope of works is as follows:

- Existing main board is to be relocated as indicated. Extend all existing circuits from a new junction box above the existing board location to the new board location in the room behind.
- Strip out and replace with new services in the Cardio Area including Lighting, general services, fire alarm etc.
- High Performance Gym – provide some new power and data outlets, existing low level outlets to be raised up as indicated on the drawings
- Provide new power and controls wiring to new mechanical ventilation and air-conditioning systems as indicated on the drawings
- Convert existing store to office
- Other minor works (e.g. power to new turnstile) as indicated on the drawings.

The contractor is required to visit the existing site during the tender period to determine the full extent of services already installed.

C.2 FREEDOM OF INFORMATION

Information in relation to this tender may be made available on demand in accordance with Freedom of Information Act 2003. You are asked to consider if any of the information supplied by you in the tender should not be disclosed because of its sensitivity.

If this is the case, you should, when providing the information, identify same and specify the reasons for its sensitivity. The Client will consult with you about sensitive information before making a decision on any Freedom of Information request received.

If you consider none of the information supplied by you as sensitive, please make a statement to that effect. Such information may be released in response to a "Freedom of Information Request.

C.3 DEFINITIONS

In reading this Specification, or any other tender documentation including drawings, the following terms shall have the accompanying meanings assigned to them:

Throughout this document the term "Client" shall be deemed to refer to:

Name: Mary Immaculate University

Address: S Circular Road, Limerick

Throughout this document the term "Architect" shall be deemed to refer to:

Name: Quinn Architects

Address: 12 Barrington St, Limerick

Throughout this document the term "Quantity Surveyor" shall be deemed to refer to:

Name: Linesight Consultants

Address: The Red Church, Henry Street, Limerick

Throughout this document the term "Engineer" shall be deemed to refer to:

Name: Moloney Fox Consulting,

Consultant Address: 46 O'Connell Street, Limerick

C.4 CONTRACT TYPE – PUBLIC WORKS

GCCC Form of Contract

The Main Contract Form shall be the current version of the Minor Public Works Contract reference PW-CW6 as published by the Department of Finance.

Submission of a tender shall be taken as acceptance of the proposed contract form.

C.5 AWARD OF CONTRACT

Contractors will not be remunerated for any trouble or expenses they may incur in making up their tenders. It is the responsibility of prospective tenderers to obtain for themselves, at their own expense, any additional information necessary for the preparation of their tender.

The award of contract will be made at the discretion of the client and will be made to the contractor whose tender has determined to be the most economically advantageous tender and who meets the required standards capability and financial responsibility.

C.6 BILL OF QUANTITIES

The completed Bill of quantities shall be furnished by the successful tenderer within 7 days. The bill shall list separately the material costs and labour costs.

C.7 CHANGE ORDERS / CHANGE OF REQUESTS

No addition will be made to the Contract Sum if the tenderer has failed to ascertain, before tendering, all the requirements for carrying out the works, which inspection of the Site or of the Specification and Tender Drawings would have disclosed. No change will be made to the Contract sum unless the variation is authorized by an instruction from the Client's Representative.

Within 14 days of the date of issue by the Client's Representative of any instructions varying the content of the Contract works, submit such pricing information to the Consultant M & E Engineer as he requires.

Variations shall be valued in accordance with the Valuation Rules of the Contract, excepting that, where work is omitted, it shall be fully measured and the quantities priced at the unit rates included in the Schedule of Rates or Tender Summary, as appropriate.

The Contractor's price is lump sum fixed price, there will be no variations to the Contract Sum, unless additional works are instructed by the Employer's Representative

C.8 VALUATIONS FOR INTERIM CERTIFICATES

At the time of every valuation of the works for interim certificates, submit to the Consultant Engineer a statement showing:

The gross amount (including retention) claimed in the current application.

A detailed breakdown of the amounts allocated to each section of the contract Works as detailed in the Tender Summary, and the relevant amount claimed for each section.

The amount certified to date by the Clients Representative. Statements shall not include any equipment or material stored off site.

Amounts in terms of valuations shall not be included unless these statements are issued by the Contractor.

C.9 LOCAL LABOUR

The contractor shall insofar as practicable and without affecting the efficiency of the work employ locally as deemed necessary.

C.10 PHASING OF WORKS

The contractors shall co-ordinate their programme of works in line with the main contractor's programme. The sub-contractors shall produce a sub contractor's programme in line with the main contractor's programme.

D STANDARDS, REGULATIONS & DIRECTIVES

D.1 STANDARDS

The whole of the installation carried out under this contract must comply with the following regulations and requirements, together with the latest revisions and amendments or substitutes, which apply at the time of installation.

- Building Regulations.
- Local Authority Bye Laws, Regulations and Notices.
- The local Fire Authorities requirements.
- The relevant C.I.B.S.E. requirements.
- British, Irish and EU Standards, whether applicable in part or whole.
- ETCI: National Rules for Electrical Installations: IS10101
- IS3217:2023: Code of Practice for Emergency Lighting
- IS3218:2024: Code of Practice for Fire Detection and Alarm Systems.
- ISEN62305:2006: Code of Protection against lightning
- BS5839 Part 9 Code of Practice for emergency voice communication systems.
- BS5588 Part 8 Code of Practice for means of escape for disabled people.
- CIBSE Guide 2005 K CIBSE guide for electrical installation.

The works shall be carried out in accordance with:

- The Electro-Technical Council of Ireland:
- National Rules for Electrical Installations, General Requirements
- Code of Practice for Design, Selection and Erection of Low Voltage Switchgear Assemblies
- Requirements of the Health and Safety Authority / SI 138
- Building Regulations
- Requirements of the Fire Officer
- Requirements of the E.S.B
- Factories Act / Statutory Instruments.
- Client Safety Protocol
- Client Specifications
- Chartered Institute of Building Services Engineers
- EMC Directive
- Low Voltage Directive
- Machinery Directive

D.2 HEALTH & SAFETY

The Contractor shall take account of the general principles of prevention as stated below:

- Safety Health and Welfare at Work (Construction) Regulations, 2013
- Health and Safety Authority: "Guidelines to the Safety Health and Welfare at Work (Construction) Regulations, 2005".
- Architects Council of Europe: "Memorandum on Council Directive 92/57/EEC", January, 1994.
- Construction Industry Research and Information Association: "Control of Risk: A Guide to the Systematic Management of Risk from Construction", Report FR/CP/32, 1995.

D.3 WORK SAFETY PROTOCOL (COVID 19)

The project will be subject to the requirements of the Work Safely Protocol (the “Protocol”), published jointly by the Department of Business, Enterprise and Innovation and the Department of Health in consultation with the Labour Employer Economic Forum on 9th May 2020.

The contractor shall include in their tender for the following in their tender:

- Augmenting site infrastructure and welfare facilities such as toilets, canteen, isolation spaces, and access, egress and circulation routes to meet the standards set out in the Protocol.
- Cleaning to the standard required in the Protocol.
- Covid-19 supervisor role(s) as necessary to meet the requirements of the Protocol.
- Covid-19 Personal Protective Equipment (PPE) to meet the requirements of the Protocol.
- Social distancing to meet the requirements of the Protocol.

The contractor shall include realistic prices in their tender against these items. The contract sum will be deemed to include for the implementation of all measures - including hygiene, access management, materials procurement and delivery, work sequencing and work practices - required to construct the work safely and to minimize the risk of disease contagion for the Contractor’s Personnel, the Employer’s Representative, Employer’s Personnel and third parties visiting the site.

Should there be a reason to impose greater restrictions on movement to combat any significant increases in the spread of the virus to the extent that construction activities cease in the manner imposed between 28 March 2020 and 18 May 2020, the contractor is entitled to an extension of time in accordance with the form of tender and schedule, part 1K (PW-CF1 to PW-CF5, or sub-clause 2.7 of CW-PF6), but no financial recompense.

Where the project involves an extension and/or alterations to an existing building, additional precautions will be required in relation to Covid-19 to ensure the safety of occupants of the existing building. Such precautions would involve, at a minimum, maintaining social distancing between Contractor’s personnel and other personnel, wearing of appropriate PPE and sanitizing any work areas in the existing building on a daily basis.

E ELECTRICAL TECHNICAL SPECIFICATION

E.1 OUTLINE SCOPE OF WORKS

The Scope of works is as follows:

- Existing main board is to be relocated as indicated. Extend all existing circuits from a new junction box above the existing board location to the new board location in the room behind.
- Strip out and replace with new services in the Cardio Area including Lighting, general services, fire alarm etc.
- High Performance Gym – provide some new power and data outlets, existing low level outlets to be raised up as indicated on the drawings
- Provide new power and controls wiring to new mechanical ventilation and air-conditioning systems as indicated on the drawings
- Convert existing store to office
- Other minor works (e.g. power to new turnstile) as indicated on the drawings.

The contractor is required to visit the existing site during the tender period to determine the full extent of services already installed.

Power:

- Relocate existing main board
- Strip out existing services in Cardio Area
- Raise existing sockets in High Performance Gym
- Supply and install new general services as indicated on the drawings
- New Power supplies to mechanical plant items as indicated on the drawings

Lighting:

- Strip out existing services in Cardio Area & Store
- Supply and install new lighting in the above areas
- Supply and install new emergency lighting for the above areas
-

Fire Alarm:

- Strip out existing services in Cardio Area
- Supply and install new lighting in the above areas
- Connect to existing system and test/recommission
-

Intruder Alarm/Access Control Installation

- Power and data cable to new turnstile access control

IT System Installation

- Raise existing Data Outlets in High Performance Gym
- Supply and install new outlets as shown on the drawings
- New outlets to be wired in Cat6A back to existing comms cabinet
- Test and commission

Controls:

- New controls cabling for A/C & Heat Recovery Ventilation as indicated on the drawings

E.2 GENERAL REQUIREMENTS FOR ELECTRICAL SERVICES

The whole of the work detailed in the Specification shall be carried out in compliance with the regulations as listed in Section D of the Specification Document.

The Main Contractor will be responsible for the provision and safety of all temporary electrical services, for the payment of all accounts for the consumption of electrical energy during the progress of the work, and for the negotiations with the Supply Authority for the connection of all temporary services.

This specification shall be read in conjunction with all relevant Irish standards and codes of practice, Irish building regulations, technical guidance documents to the Irish building regulation, E.T.C.I National wiring rules and all the relevant laws of the Republic of Ireland. The requirements of these documents shall be fully adhered to by the Electrical Subcontractor in his execution of the sub contract works. In the event of there being any conflict between the requirements of this specification and any of the above-mentioned Irish Standard documents, the requirements of the Irish Standard documents shall prevail over those of this specification. The Electrical Subcontractor shall, giving adequate notice before taking any particular course of action, inform the architect or project manager of any such disagreement in the documentation. Adequate notice shall never be less than one week.

This specification shall be read in conjunction with the relevant drawings and Bill of Quantities. In the event of there being any conflict between the drawings, specifications and Bill of Quantities the Electrical Subcontractor shall allow for the most onerous option when submitting a tender.

The Electrical Subcontractor shall satisfy himself that the installation is in accordance with all codes and standards as set out in the General Electrical Specification

E.3 VERIFICATION, INSPECTION & TESTING

In accordance with ETCI Regulations IS10101 tests shall be required as the installation progresses for insulation resistance, and continuity of conduit, cables, and circuit protective conductors to verify the installation is in full compliance with the regulations. The Electrical Services Contractor must ensure that the person who carries out such tests is fully competent to do so. Notice shall be given to the Consulting Engineer when tests are to be made. The complete record of all of all ongoing tests shall be documented and copies included the OM Manual. The Electrical Services Contractor must ensure that the instruments used for the tests are to BS EN 61010 -1 and have been recently calibrated to ensure their accuracy.

Prior to the performance of testing, inspection of the installation shall be carried out to ensure the constituent part of the installation is in a satisfactory condition to undertake the tests.

When the installation is complete, testing in accordance with ETCI Regulations IS10101 will be carried out. The Consulting Engineer reserves the right to call upon the Electrical Services Contractor at any time to carry out tests which he may deem necessary. For the purpose of these tests, the Electrical Services Contractor is to supply instruments, materials, labour and attendance that may be necessary in the presence of the Consulting Engineer, without extra cost, before the expiry of the period of guarantee.

If any part of the installation shall fail during or as a result of any test, or if the results obtained shall not, in the opinion of the Consulting Engineer be satisfactory, the Electrical Services Contractor shall forthwith, without any charge, make good any defects so occasioned, and shall submit the installation to further tests in the presence of the Consulting Engineer.

On the satisfactory completion of the tests, the Electrical Services Contractor shall provide a Completion Certificate and Inspection Certificate as described in ETCI Regulations.

The Electrical Services Contractor shall be responsible for all test notices, fees, etc., required by the Supply Authority and is to ensure that the necessary notices are submitted at the correct time to ensure no delay in the energizing of the system.

The works shall be carried out in accordance with:

The Electro-Technical Council of Ireland:

National Rules for Electrical Installations, General Requirements

Code of Practice for Design, Selection and Erection of Low Voltage Switchgear Assemblies

Requirements of the Health and Safety Authority / SI 138

Building Regulations

Requirements of the Fire Officer

Requirements of the E.S.B

Factories Act / Statutory Instruments.

Client Safety Protocol

Client Specifications

Chartered Institute of Building Services Engineers

EMC Directive

Low Voltage Directive

Machinery Directive

E.4 ELECTRICAL SUPPLY

Electrical and all other services shall be protected from any harmful mutual effects under normal service conditions. The contractor shall ensure the electrical installation complies with ETCI Wiring regulation IS10101 with regards to separation and bonding in this matter.

The earthing system shall be TN-C-S as defined in the ETCI National Rules, cited above. The Electrical sub-contractor shall insure the external earth fault loop impedance (Z_e) < 1 ohm.

Where it is a requirement that space be allowed for the accommodation of the ESB's metering equipment, the Electrical Sub-Contractor shall be responsible for making contact with the ESB, determining their requirements, and making the necessary provision in the Main Board.

The Electrical Sub-Contractor shall familiarise himself with the requirements of the ESB 'National Code of Practice for Customer Interface' ('White Book'). Under no circumstances will any variations be entertained in with regard to lack of familiarity with these documents.

E.5 HIGH VOLTAGE (>1000V) INSTALLATIONS

Particular Safety Precautions and protective measures are required when working with or around high-voltage installations.

Duties with regard to carrying out work in relation to high-voltage systems are detailed in the following:

- I.S. EN 50110-1 Operation of Electrical Installations - Part 1: General

- I.S.EN 61936-1 Power Installations exceeding 1KV (AC) Part 1: Common Rules

Where the project requires high voltage works, the contractor and system owners/operators shall comply with the following:

1. High-voltage installation owners and operators (incl. the Transmission System Operator and Distribution System Operator) only energise high-voltage installations, which a suitably competent person has confirmed as being compliant with I.S. EN 61936-1.
2. Contractors delivering high-voltage works have a nominated person employed or engaged as a consultant with the necessary competence to confirm high-voltage works as compliant with I.S. EN 61936-1.
3. High-voltage installations owners comply with I.S. EN 50110-1, including appointing an Installation Manager and providing Electrical Safety Rules and organisation, as required by clauses 3.2.1 and 4.3.1 of I.S. EN 50110-1.
4. Operations and work on or near high-voltage installations are carried out in accordance with I.S. EN 50110-1 and only on high-voltage installations which are managed in accordance with Electrical Safety Rules by a nominated Installation Manager.
5. Contractors and high-voltage installation owners have clear processes in place for the assessment of competence and Authorisation of Persons managed by a nominated competent person.

E.6 SWITCHGEAR

E.6.1 SWITCHGEAR – MAIN SWITCHBOARDS

All main panels shall be constructed complete with digital meters c/w mod bus connections, Type 1 Surge Arrestors, 3 spaces for future MCCB's. Each MCCB shall have a digital meter for local energy monitoring.

Type 1 Surge arrestors - All surge protection arrestors shall comply with BS EN 61643-11. The product configuration shall comply with the following characteristics:

- Thermal and dynamic disconnection
- Increases equipment life (by providing clean power)
- DIN mounted devices
- MAX Discharge 8kA
- 2-4 poles
- Removable tabs on replaceable cartridges to give the contractor the option of allowing the consumer to replace the cartridge
- IP20
- Does not disconnect your installation from supply when experiencing a transient over-voltage
- Conforms to BS EN 62305-2 / BS EN 62305-3 / BS EN 61643-11

The main distribution panel is intended for indoor use. It shall be free standing of heavy gauge sheet steel (1.5mm min.) bolted frame construction (frame min. 2mm steel) totally enclosed, degree of protection I.P.42. The steel shall be treated with a rust inhibiting primer and finished grey stove enamelled.

The switchgear shall be constructed in such a manner that it may be divided into sections for transportation and for installation on site. The weight and dimensions of each section shall be such that it will not be necessary to use a crane on site for off-loading or installing the equipment.

The switchgear shall be extensible at both ends and constructed in vertical modules.

Each free-standing switchgear assembly shall have a steel plinth to allow horizontal erection/fixing of the assembly independent of floor finish. The metalwork and finish of the plinth shall be as stated for the complete assembly. Where free standing switchgear assemblies are specified to be placed over a floor duct. The switchgear manufacturer shall supply all steel channels required in order to support the assembly over the duct.

Free standing switchboards whether factory assembled, or site assembled shall be mounted on a plinth of minimum height 100mm. Where factory assembled switchboards are specified, duplicate copies of the manufacturer's test certificate and dimensioned general arrangement drawings shall be submitted to the Consulting Engineer for approval before the equipment is delivered.

Where switchboards are site assembled, a test certificate shall be provided indicating that the equipment is capable of withstanding without breakdown or flashover, an applied voltage test equivalent to that specified in the British/ EN Standard for similar factory-built equipment.

All switchboards shall be fitted with a metering facility on all incoming and outgoing circuits.

All switchboards shall include provision for **Detuned Power Factor Correction** and transient over-voltage protection.

E.6.2 SWITCHGEAR – DISTRIBUTION BOARDS

Each distribution board shall be of the size type and rating as detailed in the specification and on the Contract Drawings and shall fully comply with the relevant Standards.

The distribution boards shall contain the maximum number of fuse or miniature circuit breaker ways irrespective of the number being used. All spare ways shall be fitted with fuse carriers and all spare MCB ways shall be blanked off using the appropriate manufacturers blanking plates.

All distribution boards shall be fitted with integral isolators. All distribution boards shall be fitted with a locking facility. All distribution boards supplied from a non-metered source shall be fitted with a metering facility.

All distribution boards shall be fitted with Type 2 surge arrestors to be provided in all electrical panels.

Type 3 surge arrestors to be provided in all comms / CCTV / sensitive loads.

All surge protection arrestors shall comply with BS EN 61643-11. The product configuration shall comply with the following characteristics:

- Thermal and dynamic disconnection
- Increases equipment life (by providing clean power)
- DIN mounted devices
- MAX Discharge 8kA
- 2-4 poles
- Removable tabs on replaceable cartridges to give the contractor the option of allowing the consumer to replace the cartridge
- IP20

- Does not disconnect your installation from supply when experiencing a transient over-voltage
- Conforms to BS EN 62305-2 / BS EN 62305-3 / BS EN 61643-11

All miniature and moulded case circuit breakers shall be of the thermal and magnetic or magnetic hydraulic type, and fully comply with:

BSEN 60898:1991, BSEN 60898-2:2001, BSEN 60898-2:2006, BSEN 60947-2:2006.

All circuits throughout shall be connected to the correct phase(s) exactly as indicated on the Contract Drawings and connected in the same sequence within their respective protective device and terminal blocks. Any change must be agreed with the Consulting Engineer.

All distribution boards shall be fitted with engraved laminate labels which shall be brass screwed or riveted to the door. The label shall be engraved with 6mm black characters on white background illustrating the following information:

- Title and reference number of the distribution board
- Supply source
- Supply cable size
- Rating of distribution board and isolator size

Included inside each distribution board shall be a neatly typed circuit schedule, enclosed in a plastic envelope, indicating the position, number of outlets/ luminaires fed, approximate load and size of each fuse or circuit breaker.

All busbars and other conductors which are common to more than one circuit shall be run in separate compartments from incoming and outgoing conductors and components. Covers to busbar chambers shall be fitted with screw-fixed trafolyte labels, coloured red and engraved with 6mm high letters as follows: "DANGER 380 VOLT BUSBARS". All such covers that give access to live components shall be fixed to the switchgear framework by means of nonferrous rivets.

Front access to all cubicles of the assembly with the exception of busbar compartments shall be by means of hinged doors. Hinged doors shall not deflect during operation or distort due to their weight. Doors shall be constructed of sheet steel of minimum thickness equal to that specified for cladding material. The enclosures shall be so arranged that the doors do not exceed 1000 mm in height and 600mm in width.

All compartments shall be formed using rigidly framed sheet steel dividing panels capable of containing the effects of the most severe fault within the compartment

Each compartment shall contain busbars, cables, wiring and components of its own circuit only.

Separate trunking shall be provided for cables or busbars which are common to more than one circuit. Each compartment shall be labeled with trafolyte tags.

Mechanical door safety interlock or complete internal shrouding shall be provided in all circuit breaker compartments.

Where cross interlocking is required between circuit breakers, it shall be carried out using approved type interlocks.

Each starter compartment shall contain cables, wiring and components of its own circuit only with suitably rated plugs for incoming, outgoing mains and control circuits.

Each door shall be fitted with a neoprene or similar approved non-ageing gasket to prevent ingress of dust or moisture.

Where starters are stacked in a control panel, they shall be adequately spaced to avoid heating of the equipment near the top of the panel. The maximum number of starters in any vertical section shall be ten (10 No.) and these shall utilise the maximum amount of space available.

The starters shall be separated horizontally and vertically, and the controls shall be clearly labelled in horizontal groupings.

Access to cubicle sections shall be via metal recessed triangular, square key or other approved type.

The minimum number of fasteners that shall be provided are stated below: -

Doors less than 500mm high - 1 fastener

Doors greater than or equal to 500mm high - 2 fasteners

Doors greater than 1200mm - 3 fasteners

Busbar compartment shall be fully isolated from all other compartments to a level greater than or equal to IP30. A removable insulating barrier shall separate the busbars and the compartment covers where non-insulating busbars are installed. Front access to all busbar compartments and all rear panels shall be by means of captive screws.

Cable compartments shall be sized to allow installation of the cables shown on the single line diagram(s) and shall be suitable for top or bottom entry of cables as required. Minimum bending radii of cables shall be a principal factor in determining cable compartment dimensions.

Cable compartments may be at the rear of the switchgear assembly where rear access is indicated in the schedule of particulars or where rear access is not available, a front access cable compartment shall be provided for each vertical stack of outgoing service units.

The minimum width for front access cable compartments shall be 400mm.

Armoured cables may be glanded at the entry point to cable compartments. Gland plates at entry points to cable compartments shall be of 4mm minimum sheet steel.

The following arrangement for termination of outgoing cables shall be strictly adhered to:

Where Form 4 assemblies are specified, cables shall be terminated at the apparatus terminal within the appropriate functional unit sub-compartment.

Where assemblies other than Form 4 are specified cables shall be terminated at either the apparatus terminals or at a terminal rail.

Where cables enter individual compartments, the switchgear manufacturer shall provide access for individual cores such that the degree of protection of the completed installation is not less than IP20. Where metal partitioning is provided, holes shall be suitably grommeted.

Particular care shall be exercised in the design of cable entry and glanding points to ensure that additional cables can be easily installed if required in the future.

Where single core non armoured cables enter a switchgear assembly, the switchgear manufacturer shall provide a base of 4mm aluminium or brass plate.

All metalwork and assembly accessories shall be electro-galvanised and exposed metalwork shall be epoxy powder coat finished in the manufacturer's standard colour unless otherwise specified. Where this is impractical, alternatives must be clearly detailed at tender submission.

The completed assembly shall be full sealed to prevent the entry of vermin.

Removable plates shall be provided for access to busbars for switchgear extension purposes.

All busbars and busbar assemblies shall comply with I.E.C. 600439. All busbars shall be of rectangular section, hard drawn copper. Details of current rating for phase, neutral and earth busbars shall be as stated in the Specification. Tenders shall give details of the section of busbars with their quotation.

Busbars shall be suitably supported and anchored to avoid vertical, horizontal or lateral movement. Busbar supports shall be of shockproof insulating material with adequate creepage/spacing characteristics to comply with the clearance to earth and between phases stated in the Standards to which the M.C.C. is constructed. All busbars shall be enclosed in separate air insulated compartments with inter cubicle insulation to prevent transfer of arcs between panels.

Busbar interconnections and joints shall be of the overlap type with direct surface contact area equal to the width of the lesser busbar squared. Busbar joints shall be made using two or more cadmium plated high tensile steel bolts with two flat, one shake proof washer and one nut, or two flat washers, one nut and one locknut.

Fixing bolts, studs or set screws shall not be used in any circuit as the sole means of carrying current.

Where the incoming supply is at the end of the busbar system, the busbars shall be rated to carry the maximum rated overload current of the incoming circuit breaker or switchfuse.

Where the incoming supply is at the centre of the busbar system, the busbars shall be derated to carry 75% of the maximum rated overload current of the incoming circuit breaker or switchfuse. In such cases, the busbars between the circuit breaker/switchfuse and the centre busbar joints shall be fully rated, taking special care to have maximum surface contact between busbars at the central joint.

Supply connections from busbars to outgoing circuit switch fuses/circuit breakers shall be in hard drawn rectangular copper section bars for all circuits exceeding 125 amps.

Copper cable connections, suitably supported in cleats of insulating material and separated from all other "live" or "earthed" metal, fitted with compression type (crimped) cable lugs at both ends may be used for interconnections of 125 amps rating or less. The cables shall be installed in a short circuit proof manner and all cable conductors and branch busbars shall comply with Clause All of the I.E.E. Regulations for the Electrical Equipment of Buildings.

Main and secondary busbar systems shall incorporate the neutral busbar which shall be contained in the main and secondary busbar compartments. Neutral terminals shall be provided in each functional unit alongside the phase terminals.

Neutral busbars shall not be installed in cable compartments without specific approval in writing.

Main and secondary earth busbars shall be not less than 25mm x 5mm solid hard drawn copper and secondary earth busbars shall be provided in all cable compartments for direct bonding of cable armouring.

The neutralising link shall be located in a separate compartment adjacent to the incoming functional unit or within the main incoming functional unit compartments where all live terminals are fully shrouded over the complete face area of that cubicle. One side of the neutralising link shall be solidly bolted to the main earthing busbar and the other side to an extension of the main neutral busbar.

The end of the neutral link connected to the neutral bar shall be slotted such that the link can be swung away from the earth bar connections without removing the link from the neutral bar or removing the bolt from the freed end.

The location of the neutralising link shall be clearly identified on the compartment door by means of labels as detailed elsewhere in this specification.

Withdrawable functional units shall effectively isolate incoming and outgoing power terminals in the test position and shall be provided with mechanical safety catches which must be operated to allow complete withdrawal from the switchgear assembly.

Each unit shall be provided with mechanical lever or other facility to assist with withdrawal and inspection of withdrawable units to ensure both correct alignment of terminals and correct insertion force.

Switch actuator interlocks shall be provided to ensure that units cannot be withdrawn on load and multipin plugs and sockets shall be used for connection of auxiliary and/or control circuit wiring.

Withdrawable units, in the test, disconnected and removed positions shall result in a degree of protection at the unit and switchgear assembly IP20 or better.

The outgoing terminals of outgoing functional units of fixed pattern design shall be wholly within the functional unit sub-compartment. adequate space to accommodate crimped type cable lugs shall be provided.

Live side terminals of functional outgoing units shall be shrouded to IP20 or better.

The switching device actuator shall be interlocked with the switch unit to ensure that the functional unit is in the OFF position before the door can be opened.

All mechanical switching devices shall be of the load break fault make air brake pattern, shall have an AC23 utilization category and shall be rated for intermittent duty.

The short circuit capacity shall be as stated for the complete switchgear assembly in the attached details sheets.

All mechanical switching devices shall be "switches" as defined in IEC specifications unless otherwise stated.

Local isolators, where specified, shall be as defined above for switches and shall be mounted in standard indoor locations.

Local isolators where used to isolate motors, shall be capable of breaking the locked rotor current safely.

Facilities shall be provided for padlocking the isolating switch in the "OFF" position only. Each isolation switch shall have clear "ON" "OFF" flag indication. All outgoing units shall have padlocking facilities. All MCCB's, ACB's, or switch fuses shall be provided with facilities for padlocking in the "OFF" position.

The terminals shall be fully shrouded with insulating material.

One spare switch operating handle shall be supplied for each rating of switch. The spare handles shall be fitted in spring retaining clips in the instrument compartment of the switchgear.

All fuses shall be of the H.R.C. type and shall comply with B.S. 88, 1967 or IEC 600269.

Fuses protecting power supply cables (other than those in a 'fuse board section') shall be B.S. or DIN standard type. All switchgear shall be fitted with fuses unless otherwise agreed.

Spare fuses equalling 25% of the total number of each rating shall be supplied, but the minimum number of spare fuses of any rating shall be not less than three (3 No.).

Individual fuse-link types and ratings shall be as shown on the single line/schematic layouts and distribution schedules. All switchgear shall be provided with fuses unless otherwise agreed.

All fuse ratings to be confirmed with Engineers prior to notification of readiness for equipment inspection by Engineers.

Where the Engineers select a fuse type and rating to perform a particular task, the switchgear manufacturer shall ensure that all components within the same assembly fed through that fuse have a fault rating greater than the let through current of the device and that discrimination between the in-line devices is achieved.

Circuit breakers shall be suitable for continuous operation and shall be capable of handling the fault currents specified in the attaching details list.

Combined fused switches of the 'over-centre cam' type, spring operated are acceptable as an alternative to switch fuses.

All switches shall be spring loaded, quick make and break type and it shall not be possible to draw an arc by attempting to 'tease' the switch to the open or closed positions.

Circuit breakers shall be complete with arcing contacts, arc suppression shields and all equipment, such as C.T.'s, relays, control fuses, shunt trip coil, live terminal shrouds etc. All contacts shall be removable for ease of maintenance.

Where 'Bus-Section switches' are specified, standard circuit breakers shall be fitted. The feeder circuit breakers and the 'Bus-Section switch/breaker' shall be cross interlocked.

All circuit breakers and power feeder switches shall be of the fault make and break pattern, i.e. capable of making the maximum fault current at any time, without damage to the equipment or the operator.

Circuit breakers shall comply with IEC 9471/2/3 or BS4752: Part 1 and shall be of the fixed pattern, trip free type, complete with stored energy closing and tripping facilities. The stored energy shall be supplied from a hand wound spring/operating handle or equal alternative device.

Where MCBs to IEC 600997-2 are used, only those with Type B, C, or D characteristic shall be acceptable. MCBs shall, in addition to ON and OFF positions have an intermediate tripped position or a tripped indicator flag and the mechanism shall be of the trip free type.

The MCB mechanism shall be designed to provide quick break on manual and tripped operation.

MCBs shall be correctly selected either for the prospective fault level specified in the schedule(s) of the particulars or for the fault level provided by the back-up protective devices.

RCCBs shall be of the differential current operated type and shall be in compliance with the requirements of the ETCI in relation to tripping time unless otherwise stated and shall have a maximum differential current to trip value of 30A. The mechanism of RCCB's shall be trip free and shall have direct fault simulation test facilities. RCCB's shall conform to EN 60.898. EN 61.009.

Only MCCBs of the "no fuse" current limiting type with short circuit performance as stipulated in IEC 947-2 shall be used.

MCCBs shall, in addition to the ON and OFF position, have an intermediate "tripped" position or trip indicator flag and the mechanism shall be of the "trip free" type.

Where MCCBs are used as the Main Incoming Protective Device connected to the ESB supply, they shall comply fully with the requirement detailed in Section 6.6.3 of the ETCI Code of Practice and shall have written approval of the ESB. A copy of such approval must be submitted at tender stage.

Air circuit breakers shall have an ultimate breaking capacity and service breaking capacity performance as stipulated in (IEC 947). ACB's shall have a minimum fault current breaking capacity in excess of the maximum prospective fault current specified.

Air circuit breakers shall be fitted with integral CT's and shall have adjustable setting thermal and magnetic over-current and short time delay trip setting on the magnetic release mechanism shall be provided.

Air circuit breakers shall be fitted with shunt trip mechanisms and shall have 2 no. N/O and 2 no. N/C auxiliary contacts.

Where indicated on the drawings, restricted earth fault protection shall be provided. Restricted earth fault protection shall be of the 4Ct circulating current type utilising a high impedance high sensitivity voltage operated relay with a range of trip settings from 20% to 80% of rated current. Where required, the system shall be provided with a compensating resistor.

Contactors shall have, in addition to the auxiliary contacts for the control functions required, 2 no. sets of N/O and N/C auxiliary contacts.

All control switches, push buttons and indicators shall be standard 22mm dia. Type protected to IP54 or better. Terminals on all control devices shall be shrouded to IP20 or better.

Fixing of control devices into the front face of panels shall be by means of 22mm. Nut complete with washers. Openings in panel faces for control devices shall be keyed to ensure

that devices cannot rotate or loosen in service.

Signal lamp units shall be of the LED type lens shall be of translucent self-coloured material.

Push button control units with the exception of emergency stop units shall be provided with guard rings. All push button, selector switch and indicator units shall be provided with legend plates bearing the appropriate legends.

Colours of push buttons and indicator lights shall be in accordance with BS4099: Part 1.

Control and instrumentation wiring shall be terminated by means of insulated crimped ferrules. Every control and instrumentation connection wire shall be identified at each termination using numbered interlocking plastic ferrules. Wire numbers shall correspond exactly with those used in the manufacturer's schematic diagrams.

Internal control and instrumentation wiring shall be 1.5 sq. mm 600/1000-volt grade flexible panel wiring unless otherwise specified. Internal control and instrument wiring shall be enclosed in slotted PVC cable trunking with clip-on lid. Where serving door mounted equipment, cables shall be protected by means of flexible PVC tubing rigidly fixed at both ends and fitted at the hinged side of the door.

All internal cabling/wiring protected by fuses, i.e., control, metering, alarm and interconnection cables, shall be run to outgoing terminal racks of Klippon manufacture or equal and approved, type SAK4 Screw type clamp terminals shall be used and shall be so designed that the terminal screws and clamping yokes are of hardened steel. Current carrying links shall be of copper or brass. The cables to be terminated shall be brought into firm contact with the grooved current carrying link by means of a stirrup type clamping arrangement.

Terminals of the type where clamping screws act directly on cables shall not be used. All terminals for control and instrument wiring shall be of the DIN rail mounted type. Terminals shall have facilities for cross connections and identification and complete terminal assemblies shall afford protection against direct contact equal to IP20 or better.

All cables shall be in continuous lengths, joints are not acceptable. Where possible, access shall be provided for outgoing feeder cables to be connected directly to their supply switch fuse or isolator terminals.

All cabling and wiring shall comply with ETCI Wiring Regulation IS10101.

Minimum C.S.A. for power wiring = 4.0 sq. mm.

Minimum C.S.A. for control/alarm wiring = 1.5 sq. mm.

Suitable access and removable gland plates shall be provided for all cables of the types detailed on the attached single line distribution drawing. Cable trunking shall be provided to give access from the gland plate to the outgoing terminals of switch fuse or isolator.

Adequate space shall be provided for the spreading of cores and clearance for fitting crimped type lugs to the cables, terminal boxes shall be provided, if necessary, for core spreading and for cables connected in parallel.

All cable glands will be provided by the supplier of the cables. Crimp type lugs for external cables shall be provided by the supplier of the cables.

Terminal identification markers shall be of white thermoplastic with markings in black. Markers shall clip into moulded slots on each terminal.

Outgoing cable connections shall be segregated in such a manner that circuits/cables may be added or disconnected without the operator being exposed to any live parts of the other circuits.

Terminal for power circuit wiring shall be generally specified for control circuit wiring with the exception that for cables of cross sectional area 10 sq. mm. or fully shrouded stud type terminals shall be used.

All cables in excess of 70 sq. mm cross sectional be terminated directly at the terminals concerned.

Adequate space between glanding position of cables and terminal rails shall be provided to ensure completed installation is in compliance with IEE regulations in relation to minimum bending radii of cables. To this end, the minimum distance between glanding plate and terminal rail outgoing side face shall be twice the minimum bending radius of the largest incoming cable core plus 25mm subject to a minimum dimension of 75mm.

Instrumentation shall be supplied as specified on the drawings and shall be of the flush panel mounted type complying with IEC 61036.

Meters utilising a current function may be a direct reading up to a 50A but shall utilise CT's for currents greater than 50A.

Meters shall have accuracy classifications equal to or better than their CT's but shall not be less than Class 1.

The range of all meters with the exception of frequency and power factor shall be so chosen as to indicate values up to 120% of rated maximum values. Frequency meters shall be range = rated frequency +/- 10%.

Type tested switchgear assemblies shall be certified by an **approved** Testing Authority as having passed short circuit testing in accordance with IEC 439 or BS 5486. Details of testing procedures not covered in the above Specifications shall be submitted by the **Subcontractor**.

No switch, breaker or fuse gear in switchboards will be accepted unless it has type test certification to the requirements of the relevant British Standard from an independent testing authority.

An insulation resistance test shall be made immediately prior to and following the routine pressure test and using a 500V testing instrument. This test shall be made with all isolators closed and power fuses fitted but having all electronic components, time switches, and control equipment likely to suffer damage under test, removed.

An insulation resistance of not less than 20 megohms shall be obtained between each of the following points:

- Phase to Phase
- Phase to neutral
- Phase to earth
- Neutral to earth

A routine high voltage pressure test shall be carried out with all isolators closed and power fuses fitted but having all control circuits disconnected. The panels shall withstand for one minute a pressure of 2kV across the following points:

- Phase to phase
- Phase to neutral
- Phase to earth
- Neutral to earth

Works tests on busbars in accordance with the requirements for routine tests to Section 6 of BS159 shall be included.

Works tests on air circuit-breakers in accordance with the requirements for routine tests to Section 8 of BS4752: Part 1 shall be included.

Prior to attendance by the engineers for the purposes of inspection and witnessing of test, the switchgear manufacturers shall perform the required tests and carry out a detailed inspection to ensure that all faults have been eliminated.

The Engineer shall be notified when the switchgear is completely assembled and ready for inspection and witnessing of tests as listed in the ETCI IS10101 for low voltage switchgear.

E.7 CABLE INSTALLATION

Provide all of the mains and sub-mains cables shown on the drawings or detailed in the cable schedules or the Schedules of Work.

All cables shall be rated LSOH DCA,S2,D2,A2 Dcas2d2a2 as a minimum in line with Chapter 527 of the Standard cables throughout unless specifically stated to the contrary in the particular specification.

All cables shall comply with ETCI IS10101. All conductors shall be copper.

The definition of 'low voltage' and 'Medium Voltage' given in the ETCI Wiring Regulations shall apply.

All cables shall be delivered to site with the manufacturers' seals, labels, or other proof of origin intact. Such labels and seals shall not be removed until the cable is required for use and shall be retained for inspection.

Unless otherwise specified herein or indicated on the drawings or in the Cable Schedules all cable over sheaths shall be black.

Cables shall be handled, terminated, and installed in accordance with the cable manufacturers' recommendations. The technical advice of the manufacturer's specialists shall be followed if any special conditions or unusual circumstances apply.

Any cables and flexible cords used in the installation shall carry the certifying marks of the CE Marking.

All cables shall be installed strictly in accordance with ETCI Regulations Wiring Regulations and the recommendations of the cable manufacturers.

Cables shall be in continuous lengths without joints, terminating only at the terminals on the main switchgear and distribution equipment. Where the length required is in excess of the length obtainable in one piece from the cable manufacturer, the installation of a joint shall be sanctioned.

The position of all joints shall be approved by the Consulting Engineer.

Cables erected on walls or steel work shall be supported in accordance with IS10101.

Drawings showing any special arrangements of multi-way racks shall be submitted to the Consulting Engineer for approval before being fabricated.

Any cables considered being in a poor condition due to bad handling or fixing shall be rejected at the discretion of the Consulting Engineer. Where any cables are installed in any location where it is liable to be covered by thermal insulation the Electrical Installer shall take due cognizance of the appropriate section of the ETCI Regulations and ensure the current carrying capacities of the cables are suitable.

All sockets' circuits shall have individual RCBO protection. The minimum conductor cross sectional areas to be used throughout for 13A power circuits shall be 4.00 sq. mm copper conductor LSOH DCA,S2,D2,A2 insulated cables.

All sub-circuit cables shall be installed as set down and described elsewhere in this document. Final sub-circuit cables, unless otherwise stated, shall be 600/1000-volt grade, LSOH DCA,S2,D2,A2 DCA,S2,D2,A2 insulated stranded copper conductor type in accordance with BS 6004, 1969 and amendments thereto, run in conduit and/or trunking as set down and described elsewhere. Cables shall be colour coded to comply with ETCI Regulations.

Lighting circuits shall be run in 1.5 sq.mm cable radial circuits with a separate circuit for each 1kw load.

Emergency lighting circuit shall be run in 1.5 sq. mm core cable.

All fire alarm cables shall be PH120 minimum rated.

PVC/SWA/PVC cables shall be 600/1000volt grade manufactured in accordance with BS.6346.

Cables shall have shaped cores with phase and neutral conductors constructed of the same size and stranded copper. Cable terminations shall be made by using controlled compression type glands complete with cone grip armour clamps manufactured in accordance with BS.6121 and BS EN 50262, dust tight and oil tight as applicable.

Efficient earth continuity shall be ensured between cable armoring, glands, and switchgear at both ends of cables unless of minimum conductor size 70mm².

Where cable runs are at less than 30° from the vertical they shall be fixed in accordance with the vertical maximum spacings and where more than 30° from the vertical they shall be fixed in accordance with the horizontal maximum spacings.

All glands shall be fitted with black plastic shrouds, external or internal type as appropriate.

PVC cables can only be handled or installed when both the ambient and cable temperatures are above 5°C and have been so for the previous 24 hours, or where special precautions have been taken to maintain the cable above this temperature.

Where cable is employed for indoors usage the oversheath shall be of LSOH DCA,S2,D2,A2 DCA,S2,D2,A2 (Low Smoke and Fume) compound.

No joints will be permitted unless with the expressed agreement, in writing, of the Consulting Engineer. Straight-through and Tee joints where approved shall be made in standard joint boxes purpose made for armored and sheathed cables and filled with a cold pouring sealing compound. Compression joints shall be made with the correct size of tool and pressure for the ferrules used.

XLPE Cables shall be 600/1000-volt grade manufacture in accordance with BS.5467:1997.

Cables shall have shaped cores with phase and neutral conductors constructed of the same size and stranded copper. Cable terminations shall be made by using controlled compression type glands complete with cone grip armor clamps manufactured in accordance with BS.6121: 2005 and BS EN 50262:1999, dust tight and oil tight as applicable.

Efficient earth continuity shall be ensured between cable armoring, glands, and switchgear at both ends of cables unless of minimum conductor size 70mm².

Where cable runs are at less than 30° from the vertical they shall be fixed in accordance with the vertical maximum spacings and where more than 30° from the vertical they shall be fixed in accordance with the horizontal maximum spacings.

All glands shall be fitted with black plastic shrouds external or internal type as appropriate.

If XLPE Cables contain PVC bedding or PVC oversheath it shall only be handled or installed when both the ambient and cable temperatures are above 5°C and have been so for the previous 24 hours, or where special precautions have been taken to maintain the cable above this temperature.

If XLPE Cables contain non-hygroscopic tape bedding and appropriate oversheath it can be handled and installed at temperatures not exceeding 10°C.

To take full advantage of the short circuit rating of XLPE insulated cables only compression type connectors are to be used. Soldered type connectors are not permitted.

Where XLPE cable is laid direct in the ground an appropriate de-rating factor should be employed due to the high operating temperature (90°C) of the cable, which could cause an increase in thermal resistance of the surrounding soil.

Where XLPE cable is employed for indoors usage the oversheath shall be of LSOH DCA,S2,D2,A2 DCA,S2,D2,A2 (Low Smoke and Fume) compound.

All cables shall be LSOH DCA,S2,D2,A2 (Low Smoke and Fume) 600/1000-volt grade single core and shall comply with BS 6004:2000 and 6500:2000.

Cable colours shall conform to the ETCI Regulations IS10101.

All single core PVC insulated cables shall be contained in conduit / trunking.

All cables shall **only** be drawn in after the erection of the conduit and trunking systems complete with all outlet boxes etc. Cable runs between terminals points shall be installed without intermediate joints.

Where it is necessary to make direct connection between the hard wiring and flexible cables, the wiring is to terminate in a circular conduit box behind the fitting which shall contain a porcelain shielded connector and heat resisting tails shall connect to the lamp holder or luminaires.

PVC/PVC cables shall be twin with earth continuity conductor and 600/1000-volt grade to BS.6004: 2000 and BS.6346: 1997.

The wiring shall be carried out on the loop-in principle and no junction boxes will be permitted.

Generally, all cables shall be concealed in floor voids, in roof spaces and walls.

All cables installed in walls shall be protected with earthed metal conduit.

Cable routes are to be chosen so that the cables are kept away from water pipes, gas pipes, telephone and bell installations. They shall not be installed where ambient temperatures are likely to exceed 45°C.

Cables run in roof spaces shall be secured at intervals not exceeding 200mm except that cable liable to mechanical stress shall be supported at all such places of stress.

Where PVC/PVC cables are to be installed above suspended ceilings they shall be so supported in accordance with the section: ceiling installations for suspended ceilings.

All flexible cords insulated with PVC, vulcanized rubber, butyl rubber, EP rubber or silicone rubber or glass fibre shall be manufactured to BS 6007:2006 and BS.6500:2000.

The installation of flexible cords shall comply with the ETCI Regulations.

Flexible cords are to be 0.75mm² twin twisted round circular white finish and heatproof.

All flexible cables forming part of a luminaire are to be not less than 0.5mm² glass fibre insulated and all luminaires on site are to be pre-wired with this type of cable.

Multiple flex suspensions are to be wired with heatproof cables, white circular finish and provided with a steel suspension wire as part of the flexible. (It is to be noted that all luminaires specified for the installation are to comply with the above).

With regard to the usage of flexible cords, the Electrical Services Contractor should, when ordering luminaires, ensure that the correct flexibles are provided with the fitting.

Connections from a ceiling box to the flexibles of a luminaire are to be by means of a mechanical connection, the connections being porcelain or other approved materials.

The connections are to be rated not less than the current rating of the cable so connected and under no circumstances are plastic type connectors to be used.

Wherever possible, use shall be made of 'plug-in' ceiling roses.

Flexible cables and cords shall have an earth conductor of sufficient length to ensure that no undue mechanical stress is placed on the conductor.

The length of flexible cables connecting to fixed equipment should not exceed 1500mm.

All distribution boards and every outlet position (i.e., switches, T.S.S.O.'s, switched fused spur units, isolators and luminaires) shall have a plastic ferruled cable marking system at every termination indicating on each conductor: -

- Distribution board reference (i.e.) DB/M as in distribution board Main.
- L-N-SW-E respectively with associated colors.
- Phase reference with respective colors.
- Circuit reference.

E.8 CONTAINMENT INSTALLATION

The conduit and fitting used throughout the whole of the installation shall be in accordance with BS.4568 Parts 1:1970, AMD 1132:1973, AMD 5384:1987, BS EN 50086-1:1994, AMD 12052:2000, AMD 13548:2002 and BS EN 50086-2-1:1996, AMD 10513:2000, AMD 13547:2002 and shall not be less than 20mm in size.

A screwed conduit system must be mechanically and electrically continuous across all joints, so that the electrical resistance of the earthing lead, measured from the earth electrode or any other position, satisfies the requirements of ETCI Regulations.

No manufactured elbows, tees or purpose made bends will be permitted.

Where conduits terminate in boxes which have no spout entry the connection of the conduit to the box shall be made by means of a hexagon smooth bore long reach brass male bush screwed from the inside of the box into a machine faced coupling on the end of the conduit, the whole to be screwed up tightly in such a manner that there are no exposed threads.

The smooth brass bushes shall be tightened with spanners and if any bushes become marked or mutilated, they shall be replaced. No type of ring bush shall be used in the installation.

Conduit shall be mechanically and electrically continuous, tightly screwed between various lengths so that they butt together at the centre of the coupling joints, and against the shoulder provided in conduit boxes.

There shall be no exposed threads after erection of conduit, except at running joints use of which shall be kept to a minimum.

All exposed threads shall be painted using a zinc rich paint.

All conduit runs are to be kept as straight as possible and the conduit system shall be carefully planned and erected to avoid all unnecessary bends, sets or changes of direction

The distance between draw in boxes shall not exceed two conduit lengths.

Conduit shall have no more than two right angle bends without the provision of a draw-in box.

Saddles shall be fixed at a maximum distance between saddles of 1.2 meters.

Conduit shall be cleaned of all lubricant and swarf internally and externally. Internal cleaning shall be achieved by use of a "draw-rag" pulled through its entire length.

The whole of the conduit system shall be swabbed clean before any cables are drawn in. The interior of conduit ends shall be reamed to ensure that the edge of the cut is smooth and free from defects. Where conduits end have to be left open, stop ends shall be fixed to prevent the entry of rubbish. Wood plugs or rag will not be allowed.

Where the finish has been chipped or damaged, the Electrical Services Contractor shall apply a liberal coating of red oxide paint, followed by a top coat of appropriate colour.

Conduits shall be installed for a looped wiring and inspection system in such a manner that the wiring can be carried out from fittings or accessory boxes.

Ceiling boxes fitted whilst the building is in the course of erection shall be fixed as nearly flush with the surface of the ceiling as possible, collar extension rings being introduced when the runs are not within 7.5mm of the finished surface.

In the event that an alternative metal conduit is proposed, the system shall consist of plain ended conduit tube located into special malleable iron or pressed steel fittings, which shall **fully** comply with BS.4568 Parts 1:1970, AMD1132:1973, AMD 5384:1987, BS EN 50086-1:1994, AMD 12052:2000, AMD 13548:2002 and BS EN 50086-2-1:1996, AMD 10513:2000, AMD 13547:2002.

Both the malleable iron and pressed steel fittings shall be so constructed that where joints are formed between the plain ended conduit and appropriate fittings, a positive connection is made to ensure both mechanical rigidity and electrical continuity.

It is important that the above fixing method should not be fully tightened until the conduit installation has been completed and finalized to prevent any possibility of loose joints thereby destroying the mechanical stability and electrical continuity of the system.

The Electrical Services Contractor is to ensure that all the required fixing between the plain ended conduit and fittings are correctly installed, and the electrical continuity of the system is to be tested.

Where this type of conduit system is employed, a separate circuit protective conductor shall be installed.

Flexible steel conduit and adaptors shall conform to BS EN 50086-2-3:1996, AMD 10515:2000 and AMD 13549:2000 and shall be utilized at structural expansion joints and at equipment which is adjustable or liable to vibration.

All flexible conduits shall be LSOH DCA,S2,D2,A2 DCA,S2,D2,A2 (Low Smoke and Fume) covered flexible steel.

The minimum size of flexible conduit shall be 20mm, and all fittings shall have a metric thread.

The maximum length of flexible conduit shall not exceed 2 meters. The maximum distance between supports shall be 500mm.

In all cases a separate circuit protective conductor shall be installed and solid type adaptors, with a suitable hole and external lug for connection of the circuit protective conductor shall be used.

All conduits shall be installed at least 150mm clear of, and preferably under hot water pipes and 50mm clear of gas, water and other services. If it is necessary for the hot water services to pass within 50mm of the conduit then thermal insulation is to be provided between the conduit and hot water pipes.

The Electrical Services Contractor shall pay particular attention to the method of fixing switchboxes, socket outlet boxes, etc., so that these will, when completed, be in an exact position relative to the finished wall surface to permit the cover plates to be fixed accurately.

The Electrical Services Contractor shall ensure that any discrepancy between the face of the box and the finished wall surface is remedied by the use of an extension collar.

The Electrical Services Contractor shall be held fully responsible for any faults or inaccuracies in this respect. Boxes shall be fitted by at least two screws of approved size and be round headed brass or electro zinc plated.

Accessory boxes shall be suitable for flush or surface mounting, as indicated. Unless otherwise indicated, metal boxes for general use inside buildings shall be of steel with medium category of protection against corrosion; for use in plant rooms, they shall be steel with heavy category of protection; and for use outside buildings and in other locations as indicated they shall be cast iron with heavy category of protection or of a corrosion proof material.

Accessory boxes shall be of adequate depth to accommodate the accessories without causing compression of the cables. Generally, boxes shall be 35mm deep.

Earthing terminals shall be fixed inside each accessory box and on the grids of grid switches. The earthing terminal of each grid shall be connected by a separate protective conductor to the earthing terminal of the box.

Front plates of accessories shall be of the material and finish as indicated, but generally the finish of various types of accessories in the same area shall match. For flush mounting the plates shall overlap the boxes; for surface mounting the plate shall match the profile of the box, without overlap.

Where indicator lamps are required, they shall comprise a neon lamp with resistor and a red colored lens, unless otherwise indicated.

Accessories with their boxes and front plates shall provide a minimum degree of protection of IP41 when used inside building and IP44 when used outside buildings or at other locations where indicated.

Drainage holes or 'Tee' boxes with short length spouts shall be installed at the discretion of Consulting Engineer, at the lowest part of the installation to allow ventilation of wiring and drainage of moisture due to condensation.

In positions where the appearance of the conduit run is likely to be enhanced by the introduction of dummy lengths of conduits, and in all positions where a more secure fixing for the suspension

of equipment, luminaires, etc. would be obtained, then the conduit will be extended beyond the normal terminations, by such dummy conduits and extensions.

Conduits throughout the installation shall be of sufficient diameter and so arranged with draw-in boxes to permit the easy draw-in or withdrawal of one or all cables. The number of cables contained in a conduit shall in no way exceed that as indicated the ETCI Regulations.

The Electrical Services Contractor shall provide and install perforated mild steel cable trays above suspended ceilings and in ducts etc. as indicated in the Specification and drawings.

The cable trays shall be constructed of 16 s.w.g. mild steel and galvanized finish. Cable tray bends and tees shall be purpose made and have a similar type and finish.

Cable tray shall be run continuously, and all lengths of cable tray shall be inter-connected by means of purpose made couplers and bonded to ensure continuous earthing along all cable tray runs.

The cable tray shall be loaded in accordance with manufacturer's recommendations and shall be supported at intervals of no more than 2m utilizing trapeze / wall brackets to suit conditions and to the approval of the Consulting Engineer.

The Electrical Services Contractor shall provide and install cable baskets above suspended ceilings and in ducts etc. as indicated in Specification Document.

The cable baskets shall be manufactured from mild steel wires, of diameter 4.5mm –7mm (dependent on basket width) and galvanized finish. Bends and Tees shall be site constructed to manufacturer's recommendations and have a similar type and finish.

All lengths of cable basket shall be inter-connected by means of coupling clamps incorporating earthing terminals to ensure continuous earthing along all basket runs.

The cable baskets shall be loaded in accordance with manufacturer's recommendations and shall be supported at intervals of no more than 2m utilizing trapeze / wall brackets to suit conditions and to the approval of the Consulting Engineer.

When formed the cable baskets shall be fitted with spacers to give separation to the different cabling systems installed in the basket. These separate compartments shall be fitted with ID Labels every 3M along it's length.

The trunking system shall be zinc coated mild steel dimensioned as shown in the Specification Documentation and/or on the Contract Drawings. All bends, tees couplings and accessories shall be a standard pattern produced by the manufacturer.

Trunking and fittings shall comply with BS.4678 Part 1:1971, AMD 1125:1973, AMD 2679:1978, AMD 5485:1988 BS.4678 Part 2:1973.

Generally trunking and fittings shall be protected in accordance with Class 2. Class 3 protection shall be used in damp situations.

Where conduit entries are made, the conduit shall terminate at the trunking by means of a hexagon smooth bore brass male bush screwed from the inside of the trunking into a machine faced coupling on the end of the conduit, the whole to be screwed up tightly in such a manner that there are no exposed threads.

Trunking shall have all sharp edges, burrs and swarf removed internally and externally.

The trunking shall be butted solidly into all fittings so as to ensure a continuous mechanical installation.

Visible earth continuity links shall be fitted to each joint in the trunking system.

Trunking shall be supported in accordance with the suppliers' recommendations using 'unistrut' type supports and with the lid fitted to underside:

Internal cable supports shall be provided every 500mm throughout the length of the trunking and cable supports (pin supports) shall be inserted every 1 metre in vertical runs.

Where trunking passes through floors and partitions, which form fire barriers, internal fire barriers to the equivalent standard shall be fitted.

E.9 GENERAL SERVICES

The electrical sub-contractor shall include for the general power outlets as indicated on drawings.

The electrical sub-contractor shall supply and install all general services in all areas as indicated on the drawings.

There shall be a maximum of 4 No twin socket outlets per circuit. All general socket outlet circuits shall be protected by residual current devices of 30mA maximum trip setting. The protection devices shall be suitable for operation in circuits supplying switch mode power supply units and frequency converters.

Socket outlets and accessories shall conform to BS 1363-1 and AMD 9541 but shall be of the same manufacture and finish as the lighting switches, surface or flush dependent upon the type of installation.

Where ring circuits are specified, no spurs will be allowed.

All sockets to be switched type.

Where RCBO sockets are specified, they shall conform to BS 7288.

The minimum conductor cross sectional areas to be used throughout for 13A power circuits shall be 4.00 sq. mm copper conductor LSOH DCA,S2,D2,A2 DCA,S2,D2,A2 insulated cables.

Plug tops correctly fused shall be connected to the flexible cords of the equipment as detailed and on drawings provided that the equipment is delivered to site before the final completion of the installation. Plug tops shall conform to BS 1363-1:1995, and AMD 9541:1997, and BS 1363-2:1995, and AMD 9542:1997

Refer to drawings for full details of general services installation.

Socket outlets for 50-volt circuits shall be rated at 5A and for 110-volt circuits they shall be rated at 16A.

A separate terminal shall be provided for each outgoing conductor; bunching of conductors in one terminal will not be accepted. Conduit entries shall be provided for input and output cables.

Time switches shall be of the plug-in or din rail type as appropriate. All time clocks to be 365-day digital timeclocks.

Terminal blocks shall comprise connectors contained within a moulded housing.

Conductors shall be clamped between metal surfaces and no screws shall make direct contact with conductors. The design shall be such as to maintain sufficient contact pressure to ensure connections of negligible impedance at all times.

Metal in contact with conductors shall be 85% copper alloy and any screws shall be of metal that is electrolytically compatible with the copper alloy. The moulded housing shall be of an insulating material suitable for the maximum operating temperature of the conductors.

E.10 GENERAL LIGHTING INSTALLATION

The Electrical Services Contractor shall be requested to carry out works as described:

Lighting circuits shall be run in 1.5 sq.mm cable radial circuits with a separate circuit for each 1kw load. All lighting circuits shall be contained in steel conduit and trunking.

All internal wiring shall be in high temperature LSOH DCA,S2,D2,A2 flexible cables with copper conductors.

Cables shall be clipped at intervals of not more than 100mm and a standard colour code shall be used for the wiring of all fittings.

Where false ceilings are installed, the final connection to each luminaire shall be via KLIK units.

Final length of each flexible connection shall not exceed 1000mm.

Load per circuit shall not exceed 1kw unless indicated otherwise. Contactor controlled circuits and photo electric cell-controlled circuits are as indicated on the drawings.

Where Luminaires are mounted directly on the trunking, the trunking shall be Soffit level and shall be supported by means of brackets and threaded rod from the concrete.

Luminaires for exterior or damp locations whether exposed to direct rain or not, shall be dust and water resistant to IP65.

Diffusers shall be made from glass, acrylic, ultraviolet stabilized polyethylene or other light stable material. Diffusers shall be moulded, extruded or otherwise manufactured in one piece.

Internal wiring shall be heat resistant to suit the service temperatures reached within each

luminaire. Minimum acceptable insulation shall be LSOH DCA,S2,D2,A2 rated to withstand a temperature of 105WC. Where higher internal temperatures are reached silicone rubber or glass insulated wiring shall be used.

Internal wiring shall be colour coded in accordance with the ETCI Rules and clipped within the luminaires at maximum 300mm centres. Grommets shall be used where wiring passes through holes. Under no circumstances shall wiring be permitted to rest or rub in raw metal edges.

A fixed terminal block shall be provided for termination of external wiring within each luminaire. Each terminal shall be of sufficient size for two 2.5mm² cables.

All non-current carrying metal parts of luminaires shall be effectively electrically continuous to a main earthing terminal which shall be provided within each fitting.

The earthing terminal shall be a brazed or welded bronze or steel or other stud or other permanent and reliable means by which an earth wire can be terminated.

The Lighting design shall provide the appropriate illumination and shall be of the correct intensity and colour.

The light fittings shall be fitted with LED lamp source throughout, shall be of good quality, robust and be easily maintained with CE Marking and 5 years manufactures Warranty.

Full technical submittals shall be submitted as part of the technical submittal approval process.

Light Fittings shall not be located so as to present health and safety difficulties in lamp replacement.

The positioning of light fittings shall not give rise to shadows or glare.

Lamp selections shall be based on the most energy efficient and economical solution available. The operation of lighting in each space shall be contained within that space.

The switching of lights in all areas shall be so arranged that natural daylight may be maximised and individual rows serving areas benefiting from daylight are separately controlled.

In corridors where some areas may benefit from external glazing and others not, the lighting shall be zoned to take account of the various daylight influences.

Light switches shall be standard plastic light switches where recessed and metal clad finish with grid type switches where surface mounted and be Client ed to fit flush with the backbox.

Lighting in toilet areas shall be controlled via a proprietary lighting system based on presence detection in conjunction with ventilation and urinal flushing controls as appropriate.

The Electrical Contractor shall supply and install all luminaires complete with all necessary control gear and lamps etc.

The Design solution shall include for the support of luminaires from the suspended ceiling or within the suspended ceiling/off walls/from ceiling structure or within ceiling structure as appropriate and as agreed with the client to achieve required illumination.

The general lighting shall be controlled by combination of intelligent PIR's and Lighting switches.

As part of the technical submittal and product approval process, the contractor shall submit full technical submittals for each lighting product including light fittings, light switches and light sensors.

The technical submittal shall include:

- CE Marking
- Product Data Sheet
- DOP Certificate
- Minimum lumen output
- Light loss factor (LLF)

- Illuminating Engineering Society (IES) Light Measurement LM-79: Electrical and Photometric Measurements of Solid-State Lighting Products
- IES LM-80: Measuring Lumen Maintenance of LED Light Sources
- IES Technical Memorandum TM-21: Projecting Long Term Lumen Maintenance of LED Light Sources
- Minimum lifespan (LED components and driver)
- Minimum color rendering index (CRI)
- Color temperature
- LEDs from the same batch
- Inrush current
- Surge protection
- Radio frequency interference (RFI), total harmonic distortion (THD), power factor
- Compatibility with dimming controls if applicable
- Commissioning/functional testing
- Manufacturer background and longevity
- Warranty and availability of replacement parts

All products must be client approved prior to installation.

E.11 ELECTRICAL ACCESSORIES PART M COMPLIANCE

Electrical Accessories throughout must be visually contrasting with their background. The contractor is to ensure that there is a 30% Light Reflectance Value contrast between faceplates for switches and sockets with the background wall or material.

Generally, accessory faceplates should be dark grey or black in colour (as per MK Logic Plus Graphite colour or equal and prior approved). Switches themselves (lights switches and rocker switches on sockets) shall be a contrasting colour to the faceplate – typically switches shall be white where the faceplates are dark grey.

Twin Switched Socket outlets shall be fitted with outboard rockers. Rockers shall also be fitted with neon indicators unless indicated otherwise.

Individual switches on panels and multiple socket outlets should be well separated

Combinations of green and red should not be used in combination as indicators of on/off

E.12 EMERGENCY LIGHTING INSTALLATION

Servicing, Testing and Commissioning.

The electrical contractor shall be responsible for supplying, installing and commissioning the emergency lighting system in accordance with IS 3217: 2013 + A1 2017 "Code of Practice for Emergency Lighting.

New emergency lighting or replacement of emergency light fittings or emergency directional signage, the following standards shall apply:

National Standard, IS 3217: 2013 + A1 2017 "Code of Practice for Emergency Lighting" in conjunction the following European Standards:

Base Standard: IS 3217:2013 – Emergency Lighting Code of Practice

System Standards: IS EN 1838 – Emergency Lighting Levels

IS EN 50172:2004 – Testing Requirements

IS EN 62034 – Automatic test systems.

Product Standards: IS EN 60598.2:22.1999 – Emergency Luminaire Standard

IS EN 50171:2001 – Central Systems

EN 60924 – Conversion Module Standards

EN 60925 - Conversion Module Standards

EN 61347-2-7 - Conversion Module Standards

Generally, emergency illumination shall be provided by standalone LED fittings with local CTU's provided in local DB's.

The Contractor shall be responsible for ensuring that the following criteria apply to all emergency lighting modules:

- a) All emergency luminaires and luminaires inverted for emergency use shall incorporate high frequency ballasts.
- b) All invertors shall be capable of running low mercury lamps to avoid pinking.
- c) Minimum Ballast Lumen Factor shall be 25%.

A means of lockable local isolation shall be provided to all exit signs.

All emergency test equipment, luminaires and inverter packs shall be procured from an approved single manufacturer.

The emergency lighting consists of a 3-hour maintained self-contained luminaires.

The supply and installation of emergency lighting system shall meet the requirements of IS 3217 and the local fire authority.

The areas where self-contained luminaires are installed, the emergency luminaire supplies shall be derived from the feeder terminals of the same MCBs supplying the normal lighting luminaires in that area.

A separate neutral conductor shall be installed for each sensing circuit.

Self-contained emergency luminaires that incorporate inverter/ battery packs shall be fitted with a Green LED, fixed either to the body or the trim in such a way as to be visible at all normal times and to indicate that the inverter supply is healthy.

All Invertors shall be of the fully enclosed type, either metal or plastic can. All Batteries utilized integral to luminaires shall be high temperature (55°C), sintered plate, nickel-cadmium or metal hydride, secondary cell type, rechargeable. All Conversions shall, wherever possible, be integral to the original luminaire, only following specialist assessment, investigation and test, to

ascertain the suitability for conversion from an electrical, electronic, mechanical, thermal, EMC, Serviceability and safety viewpoint.

All Conversions shall not affect the Ingress Protection Classification (IPXX) of the original luminaire and shall not affect the photometric performance of the original luminaire and shall also not affect the Safety Classification of the luminaire (Class I, II, III).

The Contractor shall include for the re-certification of the original luminaire following the conversion process, specific to the EMC and LV Directives, Ingress Protection Classification, Safety Classification and Performance criteria by the System Supplier.

The Battery and Charger Circuit utilized shall be fully encapsulated and come complete with battery disconnect male/female connector(s) to aid isolation and services. All batteries used shall be either Gas Re-Combination Sealed Lead Acid of the High Temperature variety or Sintered Plate, High temperature Nickel Cadmium. The charger shall come complete with a neon warning light to indicate that all circuitry is complete and functioning correctly and that the batteries are being charged. Batteries shall have a minimum recharge time of 24 hrs at 230V 50 Hz.

Each self-contained battery unit shall be capable, after 24 hours charge, of 3-hour emergency duration of rated output. The battery/charger units installed remote from the luminaries shall be housed in a suitable heavy-duty metal enclosure. The design of the enclosure shall take into account the proposed location of the luminaires and installation method to ensure access for maintenance is available.

The Contractor shall take due consideration of the size and weight of the battery packs and the type of ceiling construction when deciding on the final location of the same.

The Entire Emergency Lighting system shall be installed such that a Central Test System is capable of testing each Emergency Luminaire and/or circuit in a manner as defined by IS 3217:2013.

The Central Test/Timer Unit shall be four channels electronic, with digital indication, which shall energise the relay coil at specific times (software selectable) to discharge the emergency luminaires for specified periods, nominally for-five minutes and three hours.

Emergency Lighting Circuits shall be run in 1.5sq.mm., 2-core cable, with 1.5sq.mm earth as above, and cables shall be colour coded to latest ETCI Regulations. The supply to the Emergency Luminaires shall be taken from the local Distribution Centre.

All Emergency Luminaires shall be fed from the downstream terminals of the MCB feeding the local lighting circuits, with not more than four luminaires per circuit, via a normally closed contact of a multi-pole relay. The multi pole relay in each Distribution Boards shall be controlled from a Central Test/Timer Unit. All Exit Signs shall be connected to a switched and un-switched supply.

All Exit signs shall be ceiling mounted of the maintained, self-contained type with white finished steel body, opal diffuser LED lamps and the running man motif, silk-screen printed in green upon the diffuser and operated from three-hour battery set with automatic recharging set. All exit luminaires shall comply with ISO7010.

All Exit Luminaires in Plant Areas shall be of the maintained, self-contained type, surface mounted and complete with LED and "running man" logo, in 125mm high silk screen lettering

printed in green upon the lens and operated from 3-hour battery set with automatic recharging set.

The Emergency Lighting Luminaires / Equipment shall be to the approval of the Client and comply with the requirements of EN 60598-2-22.

All Emergency Luminaires shall incorporate separate protection for each incoming supply line, to include the un-switched and switched supplies, integrally, within the luminaire by means of suitably fused terminal block(s) to aid safety, isolation and discrimination functions. All fused terminal blocks for the purpose of connection to the supply network shall be suitably sized for the connection to each terminal of at least 2 No. 1.5sq.mm cables or 1 No. 4.0 sq.mm.

The Contractor shall include for Testing and Commissioning of the System by the System Suppliers and for attendance on the Suppliers during Commissioning. The System shall not be deemed complete until a satisfactory commissioning Certificate is submitted to the Client Certificate shall be in exact accordance with I.S. 3217: 2013 + A1 2017 Code for Emergency Lighting.

As part of the technical submittal and product approval process, the contractor shall submit full technical submittals for each product.

The technical submittal shall include:

- CE Marking
- Product Data Sheet
- Body Type
- Light Output
- Protection Class
- Electrical Class
- Lamp Type
- Battery Type
- Lighting Control Unit
- Manufacturer background and longevity
- Warranty and availability of replacement parts

All products must be client approved prior to installation.

The contractor shall include for emergency lighting as specified on the drawings. In addition to this, the contractor shall include in their tender for additional emergency light fittings that will be required due to fire officer requirements, architectural changes and client modifications.

Type E1 – 15 no.

Type E2 – 15 no.

Type E3 – 15 no.

E.13 FIRE ALARM INSTALLATION

The electrical contractor shall be responsible for supply, installation and commissioning the fire alarm system in accordance with IS 3218: 2024 "Code of Practice for Fire Detection and Alarm.

Where works require new fire alarm devices, cabling, etc. the following standards shall apply but not limited to:

National Standard IS 3218: 2024 "Code of Practice for Fire Detection and Alarm.

The fire alarm system shall be installed in full compliance with IS3218:2024, and to the requirement of the local Fire and Rescue Service.

Each constituent component (e.g. detectors, release mechanisms, control and indicating equipment) shall conform to the relevant part of the relevant standards.

Categories of Systems

In accordance with the standard, the category of systems installed shall be in accordance with the Fire Safety Certificate. There will be no permissible variations on the certificate.

Level of Coverage shall be L1 Coverage.

Types of Systems

The type of system operation shall be Analogue Addressable system.

System of Wiring

The wiring of the fire alarm system shall be carried in accordance with the relevant part of IS3218:2024

The cable type shall be PH120 Enhanced cable c/w the appropriate over sheath.

Analogue Addressable System

The system shall be analogue in operation, with each sensor device providing signal levels relative to the current operating environment. These analogue samples shall be transmitted to the control panel in a digital format to reduce possible corruption.

Addressing of any devices directly connected to the system shall be carried out in a manner that does not require manual setting of switches in either, the head or the base i.e. all addressing shall be carried out automatically by the control panel.

All field devices connected to the control panel are to be wired directly via 2 core loop circuits. Loop cable types shall be selected in accordance with manufacturer's recommendations to ensure optimum performance

The system shall be capable of providing fire, fault disablement and supervisory monitoring facilities as required by BS EN 54 Pt 2. Short or open circuit wiring fault isolation shall be provided within every device to protect the system. "Group Circuit Monitors" which isolate/protect sections of a loop circuit, i.e. a group of field devices are not acceptable

The system shall be capable of connection of repeat panels.

The system shall be scalable to allow for the addition of 'daisy chaining' control/indicating panels in different buildings on the same campus.

The system shall be capable of multi-protocol interfaces.

All wiring shall, where practically possible, be concealed in the building fabric and or in conduit.

All fire alarm system cabling shall be earthed in accordance with the requirements of ETCI Regulations.

All cables shall be installed in such a manner that they are physically continuous throughout the length of each circuit other than where connection is made at the terminations of a system component or at a designated riser junction box. No other cable connections are to be used.

The panels shall have a dedicated power supply. The mains supply shall be taken directly from the main switchgear panel and shall be controlled by an isolating protecting device. This isolating protective device shall be reserved solely for the fire alarm system, coloured red and labeled "FIRE ALARM: DO NOT SWITCH OFF" and secure from unauthorised operation.

Power supplies to the ancillary services shall be such that the power supply to the fire alarm system is not prejudiced and only those ancillary systems which take power when there is a fire may be operated from the fire alarm supply. Any ancillary system which takes power in the non-fire state shall not be taken from the fire alarm supply, but shall be derived from an alternative source.

The Electrical Services Contractor shall interface the fire alarm system with any existing systems or systems in adjacent buildings to ensure in the event of an alarm condition in either the existing or the new buildings all available warning devices are activated.

A framed zone chart identifying the building fire alarm zones shall be provided and mounted adjacent to the master fire alarm panel and adjacent to any repeater panels.

Analogue Addressable System Control & Indicating Equipment

Where control panels need to be replaced, any new control panel shall be suitable for surface or flush mounting.

The control panel shall be multi-tasking in operation with each loop utilizing microcomputer technology to communicate with the main panel controller processor. The control panel will be modular in type to allow for future additions up to a maximum of 4 detection loops.

All internal cards shall be fully monitored, for fault conditions and any relevant information shall be displayed and/or printed on the integral printer.

The Control and Indicating Equipment shall provide the following visual indications for each of the following conditions:

- Power on
- Sounder fault
- Common fire
- Common fault
- System fault
- Disablement

The Control and Indicating Equipment shall be provided with the following as standard:
Full QWERTY keyboard

User controls to start sounders, stop sounders, reset cancel buzzer, verify function controls.

- 2 x monitored sounder circuits
- 2 x DPCO volt free programmable auxiliary contacts
- 1 x SPCO volt free manned centre link connection (MCL)
- 1 x RS232/RS485 connection
- 1 x RS 485 panel networking connection back-lit text display printer

The control panel shall be designed to meet the requirements of: BS EN 54 parts 2 & 4.

Analogue Addressable System Loop Parameters

Individual loop circuits shall be capable of accommodating the following:

- Up to a maximum of 126 addressable devices:
- Up to 126 dedicated addressable sounders / Up to 126 loop powered electronic strobes
- Up to 60 loop powered combined electronic sounders and strobes
- Up to 126 sensors with integral sounder

The detection loop shall have the ability to support both sensors and sounders connected on the same 2 core loop circuit.

Analogue Addressable System Events Log

The control panel will log the following:

- (a) A minimum of the last 100 fire events on a last in first out basis.

This information can be either printed and/or displayed giving the date and time of Fire , Devices number and loop number, and the status of Initiation Device to sense “Fire Condition” e.g. “Heat Sensor”.

- (b) The previous 255 panel events, all relevant events excluding the operation of the fault buzzer being cancelled.
- (c) The previous 255 supervisory (non-fire) events, indicating the time activated and the time de-activated.

All fire fault and supervisory events to be logged immediately with the illumination of an array of appropriate coloured LED's (Red for Fire, Yellow for Fault and Amber for supervisory) and the internal buzzer to give the appropriate audible signal.

Power Supply & Standby Batteries

The system shall comprise of an integral charger and 2 sets of individually monitored sealed lead acid cells enclosed within a separate ventilated enclosure. The batteries are to be maintenance free. The charger will be pre-set at a nominal DC output. The batteries will be provided to maintain a standby period of 24 hours (minimum) with a further 30 minutes under full alarm/control load conditions.

The charging current shall be automatically adjusted according to the batteries ambient temperature.

Shall a full discharge of the cells take place, then the system will be capable of completely re-charging them within a 24hr period.

If any form of malfunction is detected within the charger/cells unit then an appropriate fault message shall be displayed.

The battery enclosure shall have a key access hinged door in the same finish as the fire alarm control panel.

The minimum design life of the batteries shall be in accordance with BS EN 50171, with a minimum declared life of 5 years.

Analogue Sensors & Bases

All analogue sensors and bases shall be provided by the manufacturer of the control system. No other make of sensors will be permissible.

The bases for interfacing between the loop wiring and the sensor head shall be manufactured by means of injection moulded ABS plastic coloured white and shall not contain any electronics. The base fixings shall be suitable for the industry standard BESA or conduit boxes.

The construction of the analogue sensor shall be divided into 2-sub assemblies:

The Electronics module which includes the detection chamber and electronics and an individual short circuit isolate device, which in the event of a single cable fault will isolate the “culprit” piece

of cable and retain all devices on the loop operationally in less than 1 second. The chamber of the sensor can be removed when contaminated without the need to remove the sensor electronics and therefore maintain the integrity of the detection loop.

The sensors provided must be locked into position at all times and removal of the detection chamber and electronics module shall be a 2-stage operation, achievable only through the use of the appropriate removal tools provided by the manufacturer of the sensors. Sensor removal tools are to be handed over on completion of the contract as part of the spare parts profile.

The following types of analogue sensors will be available as standard:

Optical/Heat sensor
Optical/Heat sensor with integral sounder
Heat sensor
Heat sensor with integral sounder
Beam sensor (transmitter and receiver)
Duct sensor

All of the above shall be compatible with the aforementioned base providing inter-changeability between sensor heads, without the requirement for switch settings.

Each sensor will possess an integral LED giving a flashing indication for a fire signal or a continuous indication for certain fault indications. For remote locations, each sensor shall be capable of connection to an addressable slave LED powered directly from the loop or from the associated sensor by means of a 2core wire connection.

Sensors will be white in colour and manufactured from ABS plastic. All electronics and associated sensing elements will be housed within this unit, these components being hermetically sealed to prevent their operation from being impaired by dust, dirt and humidity.

The sensitivity of all sensors will be adjustable from the control panel. This may be carried out manually or on an automatic basis using the system clock. Adjustment to sensor sensitivity will not be carried out locally to specific sensors.

All sensors shall be provided with a plastic removable dust cover for protection during site construction.

A semi-flush recessing kit for analogue sensors shall be available for each sensor type incorporating the standard sensor base

Optical/Heat Sensors - Analogue Addressable System

This device will combine two individual sensing elements to provide excellent cover for both "types" of fires. (Slow smouldering and fast free burning).

Optical Sensing:

It will be carried out by means of an Infra-red LED transmitting a pulse of light across an obtuse angled chamber.

Manual Call Points - Analogue Addressable System

The manual initiation devices shall be electrically compatible with all of the aforementioned sensor types. Each MCP shall contain its own microprocessor giving a 1 second response time from initiation.

It also handles all communication to the control panel. All electronic devices contained within the MCP shall be hermetically sealed so as to prevent damage from hostile environment

conditions: i.e. dust, up to a rating of IP32. For additional protection from environmental conditions a weatherproof version of the MCP shall be available to provide a rating of IP54.

The MCP will be available for either semi-flush or surface fixing. Semi-flush flanges shall be available in black.

Frangible glass will be utilised, allowing for complete removal upon operation. All inscriptions text and marks will be screened onto the glass.

The device can be tested functionally without the need to either remove the front cover and/or breaking the glass, with a special test key (supplied as standard). The key shall insert the underside of the MCP ensuring easy access of the key at all times.

Upon operation of the break glass the integral LED will flash to denote operation, this being cancelled upon the operation of a reset procedure.

The system must not allow a "Fire" reset to take place until a new glass has been correctly inserted. Shall a "Fire" reset be operated with a MCP still being in the operated mode, the panel will inform the user of the situation i.e.

"Call Point not reset properly. Please investigate and try again"

Sound Signals - Analogue Addressable System

Electronic sounders, combined sounder/strobe and standalone strobes for direct connection to the 2core detection loop shall be electrically compatible with all initiation devices. These units shall be available in red or white and suitable for both indoor and outdoor applications with an ingress protection rating of IP31 and IP65 respectively.

All sounder devices shall comply with the requirements of BS EN54 pt3: 2001 grades A&B.

The electronic sounders and combined sounder/strobe shall include an infra-red receiver within the device to enable communication to a handheld remote-control unit.

The remote-control unit shall have the ability to turn on the sounder and adjust the volume of the device from maximum to minimum range. Once the required audible level is achieved, the remote-control unit can then be used to silence the sound output of the alarm device.

All electronic sounders, sounder/strobe and strobe only versions shall have alarm signals synchronised across all the detection loops of the fire alarm control panel.

All alarm devices shall have a short circuit isolation device provided as an integral component of the device.

All sounders shall have their volume controlled from the fire alarm panel allowing low to high volume output.

System Sounders - Analogue Addressable System

System sounders shall be capable of providing a minimum sound level of 103dBA $\pm$ 2 dBA @ 1 meter.

The sounder shall be capable of providing 3 different sound signals, which are selected /configured via the main control panel. Configuration of sounder patterns will not be carried out locally at individual sounders.

Each sounder shall include its own microprocessor to handle loop communications and monitoring of the internal sound element during an alarm condition. This shall allow faulty devices to be automatically identified during the weekly test procedure.

All associated electronic components shall be hermetically sealed to provide protection from hostile operating environments.

These devices shall be available in a 2-way configuration allowing for direct connection to the detection loop.

Electronic Strobe - Analogue Addressable System

The electronic strobe shall be suitable for direct connection to the 2-core detection loop. The device shall have a matrix of high brightness LED's providing a light output equivalent to a 3W xenon strobe.

The frequency of the electronic strobe light output shall be 0.5Hz (Alert) and 1Hz (Evacuate).

The electronic strobe shall have an ingress protection rating of IP65.

The unit shall be manufactured from ABS plastic with a polycarbonate lens. Body and lens colour options shall be as follows:

1. Red body / red lens
2. White body / red lens
3. White body / amber lens
4. Red body / white lens

Each electronic strobe shall include its own microprocessor to handle loop communications and monitoring of the internal strobe element for faults in both the quiescent and alarm conditions. The internal circuit assembly and all other associated electronic components shall be hermetically sealed to provide protection from hostile operating environments.

These devices will be available in a 2-way configuration allowing for direct connection to the detection loop.

Combined Electronic Sounder and Strobe – Analogue Addressable System

A combined electronic sounder and strobe shall be capable of providing a minimum sound level of 100dBA $\pm$ 2 dBA @ 1 meter.

The sounder shall be capable of providing 3 different sound signals, which are selected/configured via the main control panel. Configuration of sounder patterns shall not be carried out locally at individual sounders.

The unit shall have its own microprocessor to handle loop communications and monitoring of the internal strobe element for faults in both the quiescent and alarm conditions. The microprocessor shall also monitor the sound producing element during an alarm condition to ensure that faulty devices can be automatically identified during the weekly test procedure.

All associated electronic components shall be hermetically sealed to provide protection from hostile operating environments.

The electronic strobe element of the unit shall form part of the sounder horn of the device and shall have a matrix of high brightness LED's providing a light output equivalent to a 3W xenon strobe.

The frequency of the electronic strobe light output shall be 0.5Hz (Alert) and 1Hz (Evacuate). The unit shall be manufactured from ABS plastic with a polycarbonate lens. Body and lens colour options shall be as follows:

1. Red body / red lens
2. White body / red lens
3. White body / amber lens
4. Red body / white lens

Positioning of Equipment

All equipment shall be positioned as agreed with the client.

Commissioning on Completion

Upon completion of the final testing and commissioning the manufacturer shall issue the relevant compliance certificates and documentation to the Electrical Services Installer.

System Demonstration

Upon completion of the installation and commissioning the specialist installer shall carry out a complete co-ordinated demonstration of the system to the Client.

The demonstration shall be carried out at a convenient time as determined and agreed by the client

The Electrical Services Contractor shall make available an electrician familiar with the fire alarm system to assist the manufacturer throughout the commissioning period.

Workmanship, Installation and Commissioning

The workmanship, installation and commissioning of all fire alarm systems shall conform in all respects with IS3218:2024 and in particular a certificate of installation and commissioning as indicated shall be produced.

The contractor shall include for fire alarm detection as specified on the drawings. In addition to this, the contractor shall include in their tender for additional devices that will be required due to fire officer requirements, architectural changes and client modifications.

Smoke Detectors: 15 no.

Break Glass Units: 15 no.

Sirens: 15 no.

E.14 DATA INSTALLATION – CAT 6A STANDARD

E.14.1 STANDARDS

The whole of the work detailed in this section shall be carried out in compliance with following standards.

Standard	Title
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ET10101	Requirements for Electrical Installations. Wiring Regulations
IS EN 50173-1	Information technology. Generic cabling systems. General requirements
IS EN 50173-2	Information technology. Generic cabling systems. Office premises
IS EN 50173-3	Information technology. Generic cabling systems. Industrial
IS EN 50173-4	Information technology. Generic cabling systems. Residential
IS EN 50173-5	Information technology. Generic cabling systems. Data centres
IS EN 50173-6	Information technology. Generic cabling systems. Distributed building services
IS EN 50174-1	Information technology. Cabling installation. Installation specification and quality assurance
IS EN 50174-2	Information technology. Cabling installation. Installation planning and practices inside buildings
IS EN 50174-3	Information technology. Cabling installation. Installation planning and practices outside buildings
IS EN 50310	Application of equipotential bonding and earthing in buildings with information technology equipment
IS EN 60825-1	Safety of Laser Products. Equipment Classification, Requirements and User's Guide
IS EN 50600-1	Information technology. Data centre facilities and infrastructures. General concepts
ISO/IEC 11801:2002 + amendments 1 & 2	For Class EA channel and permanent link performance respectively
IS EN 50600-2-4	Information technology. Data centre facilities and infrastructures. Telecommunications cabling infrastructure
ISO / IEC 14763-3	Information technology. Implementation and operation of customer premises cabling. Testing of optical fibre cabling
IS EN 50600-1	Information technology. Data centre facilities and infrastructures. General concepts
IS EN 50600-2-4	Information technology. Data centre facilities and infrastructures. Telecommunications cabling infrastructure
ISO / IEC 14763-3	Information technology. Implementation and operation of customer premises cabling. Testing of optical fibre cabling

The Contractor shall supply and install a data system as detailed in the drawings, specifications and detailed estimate.

In the installation of Cat-6A U/UTP networks all equipment supplied shall be from a single manufacturer i.e. cables (copper & fibre), patch panels, jacks, patch cords, ports, outlets etc.

Cables shall be installed in accordance with this specification, manufacturer's recommendations and best industry practices.

The entire installation shall be carried out using Cat 6A system and fibre The installation shall be carried out by an approved installer for the specific system used. The installer shall be trained and certified in the installation, termination and testing of fibre optic and copper cables.

A manufacturer's 25-year system performance warranty shall be provided. The warranty shall include parts, labour & applications.

The Installation is to be carried out in accordance with the following standards including all current amendments and addendums.

The Structured Cabling System (SCS) shall be manufactured by one supplier and the mixing of components from multiple suppliers shall not be permitted.

The SCS shall be a Cat6a UTP Cat6a Plus system as per ISO Class E.

The horizontal cabling shall all be Cat6a U/ UTP. Each horizontal run to the outlet should not exceed a link distance of 90m.

Cables shall only be 23AWG U/UTP Euroclass CcA.

The contractor must also as part of his works properly ground and bond all installed apparatus, equipment and components to ensure equal potential is maintained through his installation in accordance with IS EN50174 & IS EN50310.

Only the pre-approved Cat 6A solution will be accepted. Tenders returned with alternative solutions will be rejected at tender stage.

Cable runs should be concealed where possible and only run on the surface in areas where user access is restricted. Where cables or conduits are installed in plaster or concrete liable to damp conditions, precautions should be taken against corrosion.

Cables should be labelled at any point where they enter or leave concealment. Cable routes should always be parallel with or perpendicular to walls.

Where cables must pass through walls the holes should be sleeved and the cables must enter and exit these holes at 90 degrees.

All cable runs must follow pre-defined routes.

All cable runs must be free from tension along the entire cable length. Where cable runs must bear some stress, supports must be used to distribute the strain. Where a number of cables need to be run on the surface, trunking or conduit should be installed. At no point shall cable(s) rest on acoustic ceiling grids or panels.

Excess slack may be neatly coiled and stored in the ceiling above each drop location when there is not enough space present in the outlet box to store slack cable.

Cables shall be dressed and terminated in accordance with manufacturer's recommendations and/or best industry practices.

Voice jacks, unless otherwise noted in drawings, shall be located in the bottom position(s) of each faceplate. Voice jacks in horizontally oriented faceplates shall occupy the right-most position(s). Modem jacks shall be considered the last voice jack in the sequence. Data jacks shall occupy the top position(s) on the faceplate. Data jacks in horizontally oriented faceplates shall occupy the left-most position(s).

Cables shall be installed in accordance with manufacturer's recommendations and best industry practices.

Cables shall not be installed in damp conditions and until such time as the building is properly weathered. Any cable exposed to water shall be replaced by the contractor prior to final acceptance at no cost to the client.

Cable raceways shall not be filled greater than the IS EN 50174 maximum fill for the particular raceway type; generally, do not exceed 60% of the capacity of a raceway. Cable bundles should not exceed the height of the sidewalls of the tray or basket. Cable bundles shall be a maximum of 24 cables.

Cables shall be installed in continuous lengths from origin to destination. All cable runs must be free from bridges, taps and splices unless specifically addressed in the tender documents. Where cable splices are allowed, they shall be in accessible locations and housed in an enclosure intended and suitable for the purpose.

The cabling system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the contractor prior to final acceptance at no cost to the CLIENT. Cable runs are on the basis that no cable length shall exceed 85 meters outlet to patch panel; if it likely that 85 meters shall be exceeded then the contractor shall inform the CLIENT in time to take corrective action.

Cables shall be identified by a self-adhesive label in accordance with section T08.5 "Labelling". The cable label shall be applied to the cable behind the faceplate on a section of cable that can be accessed by removing the cover plate. Pulling tension on 4-pair UTP cables shall not exceed 110 Newtons for a single cable or cable bundle.

The Structured Cabling system should include for some or all of the following.

- Telecommunications links
- Satellite backbone links
- Internal backbone links
- Horizontal cabling
- Radial cables
- CCTV cabling (CCTV Cabling shall have a yellow outer jacket)
- Door Access Cabling
- Harness links
- Optional enclosed Hot-aisle solution
- Cabinets
- Open Racks with Vertical Managers
- Patch-panels
- UPS
- Device leads and patch leads.
- Labelling
- Bonding and protection

Cables shall not be exposed to humidity levels or temperatures outside their specified limits; this includes localised effects such as those from hot air blowers or gas burners.

The installation process shall not degrade the intended environmental performance of the raceway/cable management system.

Where there is a risk of water ingress during installation, the cable ends shall be sealed.

Where cables have been left to lying in water, they shall be removed and rewired at the contractor's expense.

The environmental conditions under which cabling components, inspection and test equipment are stored shall be compatible with the manufacturer's/ supplier's specification.

The cables should be firmly fixed to the surface at a minimum distance of every 300mm.

On vertical cable runs the cables should be firmly fixed to the surface at a minimum distance of every 400mm.

All surface cable runs should use cable tray, lined basket or trunking where possible.

If cable routes are on rough or uneven surfaces the above fixing distances should be reduced. All cables shall be secured using Velcro tie wraps.

Where cable bundles run in a raised floor environment, they should be run on cable tray or in lined basket wherever possible.

- Max. 24 cables to the bundle.
- Adhere to power segregation distances.
- Ensure cable bundles are properly supported and sleeved when passing through-holes in walls/floors/ceilings.
- Any tray or metallic trunking used must be earthed.
- All cables shall be secured using Velcro tie wraps

Ceiling Distribution - Cable Bundles

- Within a suspended ceiling cable bundles should be properly suspended.
- Do not lay cables direct onto the ceiling tiles.
- Do not tie cable bundles to the ceiling suspension wires.
- Cables should be suspended on a catenary wire if not tray or other supports.
- Max. 24 cables to the bundle.
- Cables shall not be attached to ceiling grid or lighting support wires. Where light support for drop cable legs are required, the contractor shall install clips to support the cabling. All cables shall be secured using Velcro tie wraps (No cable ties allowed)

Trunking and Conduit

- All metallic conduit or trunking used must be earthed/bonded.
- Bushes should be used at all cable exit points.
- The ends of all conduit and trunking must be capped or sealed.
- Enough space should be left in any trunking or conduit for the addition of new cables.

Bend radius

As a general rule the following bend radius apply;

For UTP use 4 times cable diameter Installed & 8 times the cable diameter at installation.

For Fibre Optic, 50 Pair and greater telephone cables, use 10 times cable diameter. These radii should be adhered to when there is no specific information available about a particular cable, but, where they exist, manufacturer's specifications should always be followed.

Fire Barriers

Where any cables pass through a fire barrier the requirements of IS 10101 must be adhered to. Separating distances can be reduced where cables pass through fire barriers as long as it is for no more than 0.5m either side of the barrier. When cables pass through fire barriers in this way, power and communications cables should be installed in separate metal trunking or conduit.

Products

Manufacturer should have a minimum of 5 Authorised Installers in Ireland.
Conductors must be 23 AWG as a minimum.
Manufacturer must have Five similar reference site in the last year to be visited by the client before approval.
Full labour and applications warranty
Mandatory face to face training; online training not accepted. Must be validated within 2-year period
Site audits of products >500 pts by manufacturer
The product must be independently tested for full connectivity and cable, as well as certification for link and channel.
Toolbox talks for installers on site
Tool-less jacks should have independent certification for POE applications.
All cables should have CE classification compliant with national guidelines on Construction Products Regulation.
No distributor brands will be accepted

Installers

The installers shall be in the Structured Cabling business for a period of at least 5 years and have experience with Category 6A products.

The installer must be an official partner of the specified product manufacturer for at least the last 3 years and must produce evidence that they have the continuous training with that manufacturer for those 3 years.

The AI shall be able to demonstrate that they have carried out at least 3 similar size installations with his proposed product within the last 2 years.

Copper and Fibre training must be verified.

Training must be recognized by Industry Body.
The Manufacturer should clarify date the AI joined the program together with current Installer certificate.
The installer should display proof of ownership of test equipment.

The installer should provide full details of test equipment together with up-to-date calibration certificates. A guide to company policy on testing on copper and fibre would be preferred.

Horizontal Cabling

The Horizontal structured cabling system selected is Cat 6A Class Ea system.

The SCS must be installed by an Approved installer according to the manufacturer's instructions.

Valid Certification shall be provided with all bids and prior to any works commencing.

The Horizontal structured cabling system shall provide in strict accordance to tender drawings.

The system will be used to connect voice and data services, WLAN, CCTV, and Access Control devices to the network. The drawings showing telecommunications outlets shall be used to identify the precise quantity of MER/SERs to which each outlet must be connected to maintain cable length restrictions in the use of Category 6a U/UTP cabling Euroclass Cca.

The performance of the SCS Contractors Horizontal structured system being provided shall meet IS EN 50173-1, IS EN50310 standards operating at frequencies up to 500Mhz, supporting Voice, Data & Video applications at data rates of up to 10Gbit/s to full 100m channel requirements. Cable.

The cabling must be four-pair 100 Ohm Category 6a (AC6U-Cca). The cable must have current independent third-party approval status at component level and include specification references.

Category 6a / Class Ea cable shall be constructed of 23 AWG copper conductors with Euroclass Cca. The copper conductors shall be twisted in pairs and separated by a cross-divider.

- 23 AWG solid annealed copper wire
- Polyolefin core insulation
- Central cross filler – for increased internal crosstalk performance
- 4 unshielded twisted pairs cabled together
- Designed to support all class E protocols including Gigabit Ethernet
- Supports Power over Ethernet (PoE) and Power over Ethernet Plus (PoE+) applications
- HFFR-LS* material enables the cable to meet the requirements of the Construction Products Regulation (CPR) EuroClass C_{ca}
- Green *†* coloured jacket to identify EuroClass level C_{ca}
- *Halogen Free Flame Retardant – Low Smoke*
- Reaction to Fire Classification: Standard: EN 13501-6, Rating: C_{ca} s1a d1 a1
- Dielectric Strength: 1000 Vdc / 1 min
- Temperature (*Operation*): -20°C to +60°C
- Max Tensile Load (*Installation*): 10kg per simplex cable

Patch panels

- As a minimum the Patch Panels must be 1U rack mountable, in exact multiples of 1U in height.
- Angled all metal 24 port modular patch panel (MMCPNLX24SIJ2MAN)
- Shall accept all Cat6a UTP Modules (AC6CJAKU002)
- Cat6a modules shall be tool-less
- Front connectors to be RJ45 style
- Multiple colour options
- Outlets shall have independent POE certification
- Lifetime Product Warranty
- Black finish
- Front connectors to be RJ45 style
- Rear cable presentation to be 180 degrees

Outlets

- Category 6A / Class Ea 8-position, UTP jack module shall terminate 4-pair, 100 ohm UTP
- Modules shall be tool-less
- Patented Retention Force Technology® (RFT)
- Modules shall be tool-less
- Connector style to be RJ45
- 100W POE Rated
- Coloured Options (13)
- Connector style to be RJ45
- Lifetime Product Warranty
- Must have current independent third-party approval status at component.

Horizontal Category 6a U/UTP Patch Leads

Category 6a Component Compliant Patch leads. Category 6a/Class Ea, UTP, small diameter patch cords shall be constructed of 23 AWG, unshielded, twisted pair, solid copper (dual-rated CM/LSZH) cable with high performance modular plugs (C6CPCUXXX-YYY).

Each patch lead shall be complete with strain relief boot and RJ45 connector. The patch leads must have current independent third-party approval status at component level and include specification references.

These items shall be available from stock within 1,2,3,5 and 10 metre lengths. Bespoke lengths and colours should be available, but it is understood they will be subject to a longer lead time for delivery.

Patch leads to be available for the Patching Fields, these are supplied in standard lengths.

The Client's standards shall be confirmed prior to tender response and shall include up to eight different colours.

The installation shall include patch leads for 50% of the capacity of the patch panels (The patch leads submittal shall form part of the contractors data submittal for approval).

Comms Cabinets

All Comms Cabinets, unless other specified, shall be Environ Cabinet P/N 540-555WT 19" free standing 800mm wide by 1000mm deep 47U high, metal powder coated black and shall each be equipped with the following:

- Secure lockable front perforated steel front door. Door hinging shall be easily reversed to function as either left hand side or right hand side opening.
- Metal perforated rear door and lift off (lockable) metal side panels.
- 1u height marking on 19" mounting profiles
- Adjustable front and rear 19" mounting profiles
- Open base for cable access. Full height vertical cable management with full height cable management system channels 2No – one each side adjacent to the front mounting profiles
- Sliding Shelves for servers (4 No Per Cabinet) etc
- 1 U Horizontal Cable Management for every 2U of patch panels
- Cable tidy panels, baying kit, castors , earth straps etc
- All cables shall be secured using Velcro tie wraps
- All comms cabinets are to be earth bonded in accordance with the Manufacturer's requirements and the ETCI wiring rules.
- Facilitate an Internal equipment mounting depth of 890mm min front to rear
- Jacking Feet (50-80mm) & Transit Castors
- Internal Vertical Tray (300mm) mounted left and right and side sides for cable management – Tray shall be metal and powder coated black
- Roof mounted fans unit.
- Blanking Plates
- Cage Nuts and Bolts
- Static Load rating 1100kG minimum.

Each comms cabinet shall be provided with 2 No 32 amp single phase power distribution unit (PDU). Each PDU shall:

Have 12 No IEC C13 and 2 no C19 outlets and shall be rated to 30amp 240V / AC.

Be fed from the comms room distribution board or UPS (please refer to particular specification or drawings).

Be fed from a separate circuit, no other outlets/equipment shall be fed from this circuit. Only one phase shall be present in each comms cabinet unless otherwise stated.

Be vertically mounted within the comms cabinet.

Have local input current monitoring with LCD display (Voltage, Amps ,Watts)

Be rated to max operating temperature of 60 deg C

The PDU shall be wired to a 32amp , 230V single phase commando plug

Environ part number 600-332

All equipment racks shall be augmented with horizontal and vertical management hardware to properly dress all cables and patch cords. Patch panels shall be wired to T568B. The front of each module shall be capable of accepting labels. Each port shall be capable of accepting an icon to indicate its function.

This regulation (EU) No 305/2011 of the European Parliament was passed by council on 9 March 2011 and extended to indoor cables on 12th June 2016.

All cable supplied shall conform to the EU Construction Product Regulation, IS EN 13501-6:2014 and shall be CE marked to the appropriate EU Classification as detailed below. The manufacturer shall supply a Declaration of Performance as part of the response.

The EU Classifications range through several increasing levels of performance with A_{CA} being the highest through B1_{CA}, B2_{CA}, C_{CA}, D_{CA}, E_{CA} and F_{CA} With A being outside the scope of data cables and F being outside buildings only.

The cables shall be a minimum of is C_{CA} S_{1b} a₂ d₂.

Separation of Data/Voice and Power Cables

The following instructions should be followed when installing data, voice and power as per IS EN50174 for cabling installation.

The final separation distance (A) shall be calculated by the product of basic cabling distance (S) and power cabling factor (P).

$$A = S \times P$$

Basic Separation Table (S)

Type of installation	Without divider or non-metallic divider	Open Metallic divider	Perforated metallic divide
Screened Cat7/7a	10 mm	8 mm	5 mm
Screened Cat6/6a	50 mm	38 mm	25 mm
Unscreened Cat6/6a	100 mm	75 mm	50 mm
RG co-axial	300 mm	225 mm	150 mm

The upper surface of installed cables shall be at least 10mm below the top of barrier

Power Cabling Factor (P)

Electrical circuit type	Quantity of circuits	Power cabling factor P
20A 230V 1-phase	1 to 3	.2
	4 to 6	.4
	7 to 9	.6
	10 to 12	.8
	13 to 15	1.0
	16 to 30	2
	31 to 45	3
	46 to 60	4
	61 to 75	5
	>75	6
3-phase shall be treated as 3 off 1-phase cables More than 20A shall be treated as multiples of 20A		

Wireless Data Points

Twin Cat 6A outlets at ceiling level will service a wireless access point.

General Network - When the primary network connection is wired and a wireless connection is required to support additional applications.

High density environment- When wireless access is required to serve a number of users located in close proximity.

In a higher density environment, data points must be distributed directly above the user group in the ceiling and must be easily accessible.

Access points can be mounted on suspended ceilings, walls and plasterboard

Fibre Optic Cabling

The selected Fibre Optic Cabling System is manufactured by the pre-approved list. Performance objectives of backbone fibre optic infrastructure shall be to support error free signal transmission between MER and SERs throughout the campus. The performance of the installed fibre optic cable plant shall support bandwidth-intensive applications including 1Gbit/s through 10Gbit/s and beyond as defined in IEEE 802.3z, 802.3ae, 802.3aq and 802.3ak Standards. Designated media shall consist of multi core Multi-Mode / Single-mode cabling compliant with ISO 11801 standards.

All fibre shall be OM4 24 core Central Dry Tube Cca Glass Yarn Armoured.

Fibre Patch panels

Fibre panels shall be 12 Duplex LC panel allowing future expansion capacity. Suitable for mounting in 19" frames within termination closets. Fixed using securing bolts and captive nuts at either side.

Connectors & Fibre Patch Leads

The following shall be provided in accordance with the number of data outlets associated with the project.

Patch Cords of 1M length. – 1 per number of data outlets (50% Blue & 50% Red)

Patch Cords of 2M length. – Quantity based on 50% of the number of data outlets – (50% Blue & 50% Red)

Patch Cords of 1M and 3M length. – 1 per number of CCTV outlets (Yellow)

Optical fibre cables shall be terminated LC-Duplex connectors that conform to IS EN 186000 Part 1, by means of fusion splicing using factory terminated pigtails.

The average loss for all connector pairs shall be less than 0.3dB, including the loss due to splicing.

The fibre leads shall be OM4 (HOPLCOM4XXXLC273) and violet in colour.

Fibre optic pigtails shall be made from the same fibre type as the fixed cabling. Pigtails shall be kept slack when the cable is terminated. Pigtails shall be OM4 (HOTLCOM4001)

Splices shall be retained within a protective sleeve by either friction or adhesive bonds to the optical fibre and additional strain relief for the completed joint shall be provided. All splice, joints and their

strain relief shall be fixed within the optical fibre management system of the enclosure. The insertion loss through any splice shall not be greater than 0.15dB.

Containment

Horizontal cabling must be fully supported, contained and managed along its entire length. Cabling must be routed and secured, fixed or positioned upon designated 'Communication Containment' provided by the Electrical subcontractor.

The SCS Contractor shall ensure the containment system is suitable and adequate under the standards of this specification and against those set by the manufacturer of the structured cabling system.

Uninterrupted Power Supplies

- The UPS shall be APC for as the following:
- APC KW UPS with autonomy
- R-SK-SK (..... kW for 20mins) APC KW UPS with autonomy
- UPS (with battery modules disconnected)
- Smart-UPS RT User Manuals CD
- PowerChuteTM software CD
- Models: conversion faceplate for accommodating a Network Management Card
- Network Management Card documentation
- APC 3-year maintenance agreement at the time of installation
- Battery build
- UPS delivery and positioning
- UPS Solutions, up to 99% Efficiency.
- UPS Maintenance and Repair.
- Battery testing and Replacement.
- Battery Monitoring Systems.
- EcoStruxure IT monitoring systems.
- Power Factor Correction

Testing

The installer shall test 100% of the Category 6A horizontal cabling over the permanent link to confirm cable plant performance characteristics as stated in the current editions of IS EN50173 Class Ea.

In all high-performance data transmission environments and in environments where Power Over Ethernet (POE) may be deployed, the Test Limit selection shall include 'PLUS ALL'.

This selection adds essential balance measurements which confirm the cable's suitability for these applications:

DC Resistance Unbalance within a pair,
DC Resistance between pairs,
TCL (Transverse Convergence Loss),
ELTCTL (Equal Level Transverse Conversion Transfer Loss)
CDNEXT (Common Mode to Differential Mode Near-End Crosstalk)
CMRL (Common Mode Return Loss)
POE test for all cables.

Calibration:

Fluke networked DSX5000 Cable tester, which shall have a current calibration certificate issued by the manufacturer, and within the manufacturer's (Fluke Networks) recommended calibration periodicity.

Computed test results that indicate that some part of the result is closer to the limit than the tolerance of the test equipment may be noted as 'PASS*' or 'FAIL*'. A 'PASS*' test result shall not be accepted and shall be treated in the same way as a 'FAIL'.

Fibre

Single and Multi-mode backbone links shall be tested at both cardinal wavelengths and in both directions in accordance with IEC 14763-3. Testing of the fibre optic cabling using the One Jumper Reference Method using Light Source and Power Meter with reference grade test cords and couplers. All Multimode links shall be tested using the "Encircled Flux" methodology with the relevant Test Reference Cords (TRCs).

The one-jumper reference shall be supported within the test results by AT LEAST one Test Reference Cord (TRC) verification result per session. TRC Verification is part of the reference process and is supported in Certifier Pro by the Reference wizard.

All results should be capable of being stored within the test equipment for future submission electronically as part of the warranty application.

The length of each fibre shall be recorded.

Paired duplex fibres in multi-fibre cables shall be tested to verify polarity.

The polarity of the paired duplex fibres shall be verified using a Power source and light meter in accordance with IS/EN 50174-1.

Witness Testing

The consultant reserves the right to attend site to witness cable plant tests and complete random sample testing upon completion of test. Witness testing and random sample testing will be agreed with the PCI prior to commencement of site testing and will be no more than 10% of the total number of outlets. Any further testing will be chargeable at an agreed hourly rate prior to the testing.

Acceptance

For acceptance of the SCS Physical Infrastructure the AI shall complete the following:

- All labelling (At both termination points & both ends of each cable)
- All installation of SCS Physical Infrastructure (to the correct standards).
- All cabling test results showing positive results (to the correct standards).
- All documentation.
- All tests shall be a full pass (No star passes shall be accepted)

Site Audits

Site audits should be made available by the manufacturer. The individual's responsible for audits should be identified together with their qualifications. The Installer should demonstrate qualifications from Industry Certifications such as BICSI RCDD or CNIDP CNET

Labelling

The installer shall draw up full details of the cable plant labelling scheme for every cable, patch panel, wiring closets, termination frames, and telecommunication outlets and agree the format with the Main Contractor prior to installation.

- Typeface Labels shall have an agreed typeface size and font. Hand-written labels will not be accepted, except on a temporary basis during installation and will not be acceptable for cable plant testing purposes.
- All labels shall be permanently fixed. Legible, durable and robust.
- All labels shall be fixed horizontally on fixed equipment or longitudinally along the line of cables.
- Positions The following positions at which labels are fixed shall apply as a minimum:
- Cable terminations shall be labelled at patch panel outlets.
- Cable shall be labelled at telecommunication outlets.
- Cables shall be labelled at the entry/exit points of rooms and buildings.
- Cables shall be labelled at all access chamber; cable turning chambers and draw pits.
- Warranty
- Results shall be documented as per labelling. The AI shall all results in Fluke Linkware. This should be forwarded to the manufacture, who will issue a 25-year warranty upon correct installation and application package.
- The warranty shall cover;
- Guarantee from manufacturer to end-used for defined time period
- Lifetime applications
- Covers all copper and fibre cabling & components. (All copper & fibre shall be from the one manufacturer)
- Full cost of replacement (Labour and parts)
- Fully compliant with latest International and European standards
- CPR rating Cca as a minimum

Warranty shall be issued prior to the completion of the O&M manuals

A hard copy and an electronic copy of the manufacturer's system performance warranty shall form part of the O&M manuals.

The client will only accept handover of a project based on the manufacturer's warranty and certification otherwise the project will be deemed to be incomplete.

The Warranty must be issued by a Manufacturer and not a Contractor or a Distributor.

End-to-end warranty should be from the manufacture of the equipment, which it is not if distributors who often rebrand various equipment are used, all fibre and copper cabling shall be included in the one warranty.

All of the equipment needs to have the relevant CE markings, declaration of performance, CPR rating, meets the requirements set out in the TGD's and Works Requirements and offer a 25-year end-to-end warranty.

E.15 ELECTRIC VEHICLE CHARGING POINTS

An Electric Charging point should be installed for use by electric plug-in vehicles where indicated on the drawings.

These Electric Vehicle Chargers, known from here on as EVC's, should be model EV Box Business Line and have a minimum set of technical requirements as set out below:

- Designed to IEC 61851-1 (2010) & IEC 61851-22 (2002)
- Mode 3 Z.E. Ready 3.7kW to 22kW
- Single or Dual Type 2 IEC62196 sockets (compatible with all electrical vehicle types)
- Minimum IP54 rated and IK09 Vandal Resistant
- OCPP compliance allowing cross vendor compatibility
- Available in Wall or Pole mounted Business Line options
- BackOffice Cloud based, web accessed back office capable of processing payments, analyzing data and offer remote upgrades for firmware as and when required
- Connectivity should be Via UMTS/3G technology with no LAN Connection for increased local security
- Smart Charging capable to allow for Card Administration, Load Management and Power Usage monitoring.
- Payment processing capable with added service bolt on
- Minimum 3 year parts warranty, upgradeable to 5 years.
- MID-certified kWh meter

The units should be available in the following formats:

- As a single or double connector
- Optional fixed Type 1 or Type 2 charging cable
- Automatic tracking and settlement of charging costs with inclusive MID-certified kWh meter
- Easy and efficient management of multiple charging stations with the Hub / Satellite configuration
- Energy-efficient distribution of the available power with Smart Charging solutions
- Adjustable charging rates
- Remote maintenance and software/firmware updates
- Available in 3 standard colours or any RAL colour of preference
- Vandal proof, non flammable and discolouration proof
- Robust and modular build with UV resistant material.

E.16 LIGHTNING PROTECTION

General

The workmanship, installation, and testing of the lightning protection system shall conform in all respects with BS EN 62305.

Exposed Air Termination Networks

The air termination network shall consist of either aluminum or copper material with a minimum cross section area of 50mm² and may consist of vertical or horizontal conductors or combinations of both as located and indicated on the drawings and in the Specification Document.

Concealed Air Termination Networks

The air termination network at the roof ridge shall consist of solid metallic conductors, aluminum or copper of minimum cross-sectional area of 50mm², and shall be concealed within the roof void underneath the roofing felt and securely fixed every 100mm.

Air finials at the ridge position shall be a minimum size of 10mm diameter located at distances recommended by BS EN 62305:2006 and project above the crest/ridge tile by a distance of not less than 300mm. They shall be fixed with an appropriate terminal base and pass through the Crest / ridge tile at the appropriate point and to connect the general network within the roof space.

Where penetration of the crest/ridge tile takes place, permanent and effective waterproofing shall be made with a silicon mastic or equivalent material.

Air terminals at the eaves position shall be 55mm x 55mm square tape clamps, of the correct material to match the air termination network, fixed to the external face of the roof material by means of a cavity fixing bolt (e.g. raw nut 5250).

Alternatively, if a metal (i.e. aluminum) perimeter roof gutter is to be installed by the Main Contractor, and then this may be used to form the strike point at the eaves position. If the metal gutter is to be used in this way then the Lightning Protection Installer must ensure that it is effectively bonded at all connection points.

Where indicated, metal framed or metal clad roofs or metal copings, which form part, or all of an air termination, shall be bonded across joints between constituent parts. The bonding may be carried out by the specialist roofing contractor but where this is not the case the bonds shall be made as indicated; no drilling of roofing or coping shall be done without the approval of the Consulting Engineer.

Metalwork of structures, chimneys, pipes, cowlings, plant, walkways, handrails and similar components of the building that are exposed at or above roof level shall be bonded to the nearest air termination.

Where a signal aerial is mounted on the structure it shall be protected as bonded to the nearest cross tape.

Down Conductors

The type and location of down conductors shall be as indicated on the Contract Drawings. No aluminum conductor shall be buried in the ground.

Down conductors shall be of aluminum or copper, strip or rod of minimum cross-sectional area 50mm² and where installed externally shall be provided with a PVC sheath, the colour of which shall match the finish of the building.

Where the down conductors are to be dropped internally, they shall be enclosed in a suitable void or duct, which shall be provided by the Main Contractor.

The exact fixing method of all down conductors shall be stated in the Specification Document.

The appropriate size, colour and type of fixing clip shall be used, and all down tapes shall be so positioned as to form a neat appearance.

Where a copper air termination network is utilized, the down conductor shall be terminated in a test clamp, located 500mm above the external damp proof course, the final connection to the earth rod being made in sheathed copper tape of 50mm² minimum cross-sectional area.

Where an aluminum air termination network is utilized, the down conductor shall be terminated in a bimetallic connector with test clamp fitted below, located 500mm above the external damp proof course, the final connection to the earth rod being made in sheathed copper tape of 50mm² minimum cross sectional area.

Where the profile of the building would cause an overhang or re-entrant loop to be formed in a down conductor the Consulting Engineer shall be informed.

Where the reinforcement of a concrete structure forms the down conductors, welding of the reinforcement will be carried out by the Main Contractor, but the Electrical Services Contractor shall carry out all testing to ensure acceptability in accordance with BS EN 62305:2006.

Connections from down conductors formed by reinforcing steel or concrete clad steel frames shall be made by the Main Contractor. They shall comprise stainless steel tape, not less than 20mm x 3mm, welded onto the steelwork. The Main Contractor shall agree with the engineer the length of tail to be left for subsequent connection.

Joints

Joints in conductors shall be kept to a minimum.

All contact surfaces shall be thoroughly cleaned and coated with an anti-corrosive electrical jointing compound suitable for the conductor material. For bi-metallic joints a separate abrasive shall be used to clean each metal.

Joints between conductors of the same metal, other than at test points, shall be made by the termite welding process or by riveting and sweating. Overlap of conductors shall be not less than 100mm.

Where an aluminum conductor is jointed to a copper conductor, one of the following methods shall be used.

- a. a bi-metal connector formed by friction welding high purity copper and aluminium.
- b. the copper conductor shall be completely sheathed for at least 100mm of its length with metal strip electrolytically compatible with copper and aluminium, and then clamped to the aluminium conductor.

Bi-metal joints shall not be made at test points or between the test point and earth electrode.

Earth Electrodes

Earth electrodes shall consist of 16mm diameter copper bonded rods with appropriate couplings, if required, and be in accordance with BS EN62305.

The top of each earth electrode shall be housed in a concrete pit to facilitate inspection and be complete with lid and installed flush with the finished ground level. The concrete pits are to be handed to the Main Contractor at an appropriate time who will locate the units and ensure that they are firmly fixed in the ground by surrounding it with concrete and aggregate mixture.

Where more than one earth rod per down conductor has to be installed, then they shall be, where practical, equally spaced in a line parallel to the structure at horizontal distances equal to the length of the rods or 3600mm whichever is the greater.

Extraneous Metalwork

Where extraneous metalwork occurs, it will be securely bonded to the air termination network with appropriate conductors and clamps. Metalwork on or in the structure, which is within the recommended safe distance as defined in BS EN 62305:2006, shall be bonded to the lightning protection system using appropriate conductors and clamps.

Cross Bonding

Where a service belongs to a Public Statutory Undertaker the permission of the Undertaker shall be obtained before connection is made.

The lightning protection system shall be bonded to the main earth terminal of the electrical installation with an 8mm diameter copper rod, or similar sized stranded cable, at the nearest down conductor, above the test clamp and shall be labeled as ;

"SAFETY BONDING CONNECTION, LIGHTNING PROTECTION SYSTEM"

Lift Installation Metalwork

Lift installation metalwork, together with all extended metalwork on the inside and outside of the lift shaft, including ladders and handrails should be bonded to the lightning protection system and to any adjacent structural steel work not only at the top and bottom of the lift shaft but at regular vertical intervals not exceeding 20m.

Test Joints

A mechanical test clamp, of the circular screw down type, shall be provided in each down conductor; it shall be located 1m above ground level unless otherwise indicated. Test clamps shall be of cast gunmetal.

Test Results

A test certificate, including a drawing showing the location of the earth electrodes numbered in sequence, indicating the resistance of each electrode shall be provided to the Consulting Engineer.

E.17 EARTHING AND BONDING – GENERAL

All earthing and bonding shall be carried out in accordance with the requirements of:

ETCI Regulations – IS10101

Any conditions indicated elsewhere in the Specification or on the drawings.

Provide a complete and effective system of earthing for the LV electrical installation. The System of earthing shall comply with the ETCI Wiring Rules and the recommendations stated in CP 1013, except where detailed otherwise in this Specification and the drawings.

Where the ETCI Wiring Rules and CP1013 differ, then the former shall take precedence.

Metallic services including gas mains, water mains, dry risers, etc. entering or leaving the building or structure shall be effectively bonded to the main earthing terminal at their point of entry or exit. Connections shall be made to the services with purpose-made earthing clamps to BS951.

Where the building is comprised of a steel framed structure or has metallic cladding then these shall be effectively bonded to the main earthing terminal.

The cross-sectional area of all earthing, bonding and protective conductors shall be as indicated on the drawings. Except where detailed otherwise in this Specification or on the drawings all conductors for earthing shall be copper, manufactured in accordance with BS 1432, for strip and BS 4109, for cables.

Single-core cables forming part of the earthing system shall be of stranded copper, insulated to 450/750V standards with green/yellow PVC. These cables shall comply with BS6004,

Mechanical joints between aluminium and copper shall have the joint faces lightly coated with a suitable compound to prevent corrosion, before the connection is made.

Where conduits, or small glands for mineral insulated or armoured cables, terminate on switchgear, distribution boards, starter panels or other apparatus then brass compression washers shall be used to ensure an effective earth connection.

Sections of cable tray shall be thoroughly cleaned before overlapping and securing with a minimum of two screwed fixings. The remote ends of the cable tray shall be effectively bonded to the earthing system.

The armouring of plastic sheathed cables shall terminate in a suitable compression gland fitted with a purpose-made earth tag. A suitable protective conductor shall connect the earth tag with the apparatus earthing terminal. The earth tag shall be manufactured from a high conductivity material compatible with the cable gland.

The armouring of metal sheathed cables shall be securely clamped to the gland at the cable termination with a purpose-made bolted clamp. A protective conductor shall be installed to connect the armour clamp or gland fixing bolts to the apparatus earthing terminal.

For an outdoor termination the armouring shall be suitably protected to prevent corrosion. Metal sheaths and/or armouring of multi-core cables connected to a cubicle type switchboard shall be effectively connected to the switchboard earth bar as described in later clauses.

Where any metal sheathed and/or armoured cables of rating in excess of 100A are terminated on an 'Industrial' type switchboard then a separate protective conductor shall connect the sheath and/or armouring to the switchboard earthing terminal.

Where metal sheathed and/or armoured multi-core cables of rating in excess of 100A are terminated on a unit motor starter panel or local isolator then a separate protective conductor shall connect the incoming and outgoing sheaths and/or armouring to the starter panel or isolator earthing terminal. Similarly the motor frame shall be connected to an earth terminal in the box or enclosure associated with the conduit, trunking or cable.

The earth terminal of all socket outlets shall be connected to the main protective conductor of the final sub-circuit. Where the protective conductor is formed by conduit, trunking or the metal sheath and/or armouring of cables then the earth terminal of the socket outlet shall be connected to an earth terminal in the box or enclosure associated with the conduit, trunking or cable.

Connections between earth bars, equipment frames, etc. and stranded copper cables shall be made with the appropriate compression lug, bolt, washers, nut and lock nut. Contact surfaces shall be thoroughly cleaned and tinned prior to connection.

Connections between earth bars, equipment frames, etc. and strip shall be made with the appropriate bolt, washers, nut and lock nut. Contact surfaces shall be thoroughly cleaned and tinned prior to connection. The washers shall be of sufficient size to prevent any distortion of the copper strip.

The diameter of fixing holes shall not exceed one third the width of the earth bar or strip.

Tests shall be made and recorded on the electrical installation earthing system in accordance with the ETCI Wiring Regulations.

Tests shall be made both during and upon completion of the works. The schedule shall be completed for each final sub-circuit and at each main and sub-main distribution point. Six typed copies of the completed schedules shall be available for inspection within fourteen days of the test completion.

These tests shall also be made on all plant and equipment supplied, installed and connected to the electrical installation under this contract and/or existing plant and equipment connected to the electrical installation provided under this contract.

The contractor shall re-test the earthing system provided under this contract thirty days prior to the end of the Defects Liability Period. The contractor shall give seven days written notice prior to visiting the site to make these tests.

The earthing system shall comply with Electricity Supply board requirements pertaining to the specific areas and the ETCI.

Equipment bonding shall be carried out in accordance with the ETCI Regulations as specified.

Equipotential bonding requires the use of main bonding conductors, and where necessary, local bonding conductors.

Main bonding conductors shall connect the extraneous parts of the main engineering services

(such as pipe-work for gas, water, central heating, or ducting for air conditioning) to the main earthing terminal.

The connections to the incoming services shall be made as close as possible to their point of entry to the building.

Where removal of a gas or water meter would interrupt the electrical continuity of the associated pipework, a bonding conductor shall interconnect the pipework on both sides of the meter. This bonding conductor shall have the same conductivity as that of the main bonding conductor.

Main bonding conductors shall consist of insulated stranded copper conductors with a cross sectional area not less than 4mm².

Local bonding conductors shall, where necessary, connect extraneous conductive parts to the protective conductors.

Local bonding system shall be connected to the protective conductors of all apparatus and of socket outlets in the particular location where it is applied.

The local bonding system shall be connected to the protective conductors of all apparatus and of socket outlets in the particular location where it is applied.

Notwithstanding the requirements of bonding to the protective conductor, it shall not be necessary for metal parts, which on account of their small size and disposition, are unlikely to become live in the event of a fault.

Local bonding conductors shall consist of insulated stranded copper conductors with a cross sectional area not less than 1.5mm².

Bonding conductors shall be installed in accordance with the requirements for protective conductors.

Metallic structures which form a part of bonding connections shall have conductance at least equal to that of the bonding conductors in their vicinity.

Bonding shall include: Sinks, baths and metal work surfaces are generally shown on the Contract Drawings. Where such items are identified, and notwithstanding their individual resistance to earth, and Electrical Services Contractor shall install a 10mm² insulated bonding conductors with earth clamps to BS.951 between all incoming metallic water pipes and all outgoing metallic waste pipes.

The Electrical Services Contractor shall include for testing, during building construction, the resistance, to the installation main earthing terminal, of all extraneous conductive parts such as exposed pipework, radiators, boilers, water tanks, structural and non-structural metalwork.

Where suspended floors form part of the fabric structure the Electrical Services Contractor shall include for supplementary bonding the flooring grid pedestals at multiples of nine tiles in addition to the manufacturer's lay-in contacts.

Where the resistance is greater than 0.5 ohms the Electrical Services Contractor shall install supplementary equipotential conductors as required to meet the required resistance.

E.18 LABELLING

Every switch or circuit breaker shall be labeled to indicate the apparatus or circuit controlled.

The labels shall be ivory or similar non-corrodible material and fixed to the cover of the units with aluminium or brass screws.

Circuit labels, neatly typed and enclosed in a plastic envelope shall indicate the position, number of outlets/luminaires fed, approximate load and size of each fuse or circuit breaker.

Each single-phase distribution board shall be marked to indicate the phase to which it is connected by means of a circular ivory or similar label approximately 15mm in diameter attached to the fuse board by means of a brass screw. The label shall be coloured according to which phase the board is connected to.

The Electrical Services Contractor shall leave in position on all equipment, of which he is not the actual manufacturer, the manufacturer's plate or markings normally attached thereto by the manufacturer of such equipment supplied for the purpose of the contract.

He is, however, at liberty to fix to equipment not manufactured by himself, a plate in the form to be agreed with the Consulting Engineer, having the words 'Supplied by'. Under no circumstances shall equipment not manufactured by the Electrical Services Installer, be devoid of ready means of identification to enable replacement parts to be obtained from the manufacturer.

Each socket outlet, light switch, connection unit etc shall be labeled with its circuit reference e.g. DB1/L1/11, DB1/L2/11 DB1/L3/11 using 3mm black lettering on white traffolyte label permanently fixed to the faceplate.

Connection units or DP switches serving fixed equipment shall be labelled or engraved with the name of the item being used.

F ELECTRICAL SCHEDULES

F.1 SCHEDULE OF DOCUMENTS

Drawings

26.3138 Refer to Drawing Register for list of drawings

Drawing Registers

26.3138 Drawing Register

Technical Specifications

26.3138 Electrical Specification

F.2 SCHEDULE OF LOW VOLTAGE SWITCHGEAR SUPPLIERS

The names of manufacturers and types of equipment stated herein are for the purposes of making clear the nature and quality of equipment that is required. Where no reason is given for the exclusive use of such equipment, the Tenderer is at liberty to offer goods of equal quality, workmanship and design from any other manufacturer, provided that such alternatives are recorded in the 'Schedule of Alternatives'. Tenders must, however, be based on materials of the manufacture and type specified below.

Distribution Boards – Panel Manufactures

Parkmore
Quandri
Powerohm
Alpine

Approved components manufacturers

Eaton
Merlin Gerin
Hager
Siemens
ABB
MEM
Legrand
Socomec
Square D
Crabtree

F.3 SCHEDULE OF CONTAINMENT SUPPLIERS

Steel Cable Containment / Distribution

Cable Tray	Uni-Trunk, Cablofil, Electrix
Cable Trunking	Uni-Trunk, Cablofil, Electrix
Standard Steel Conduit: 20mm- threaded	Uni-Trunk, Cablofil, Electrix

Dado Trunking

3compartment 170mm x 57mm	MK, MEM, Legrand
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F.4 SCHEDULE OF GENERAL ACCESSORIES SUPPLIERS

Switched 13A Socket Outlets, spur outlets, switched fuse connection units, switches, data outlets,

Non-essential supplies shall have graphite finish.

MK
Legrand
Click Mode
or equivalent

Switched 13A Socket Outlets, spur outlets, switched fuse connection units, switches, data outlets

Part M accessories shall be provided in all public areas. Accessories shall have a graphite finish with white inserts.

MK
Legrand
Click Mode
or equivalent

F.5 SCHEDULE OF LIGHT FITTINGS

The names of manufacturers and types of light fittings stated herein are for the purposes of making clear the nature and quality of equipment that is required. Where no reason is given for the exclusive use of such equipment, the Tenderer is at liberty to offer goods of equal quality, workmanship and design from any other manufacturer, provided that such alternatives are recorded in the 'Schedule of Alternatives'. Tenders must, however, be based on materials of the manufacture and type specified below.

Refer to lighting layout drawings for full details of the light fitting schedule.

Approved List of Light Fitting Suppliers:

Thorn
Philips
Eaton
Tegral
Disano
Roxo

Approved list of Emergency Lighting Suppliers:

Profile Lighting
Ventilux
Light Solutions
Eaton Lighting

F.6 SCHEDULE OF IT SYSTEM INSTALLERS

LS0H 4-Pair UTP horizontal distribution cabling to category 6A Standard – 23 AWG CCA Cabling
RG45 Connections
LS0H 150 Cat 6A Patch Cords
1000X1000X2400 Cabinet complete with patch panels and cables terminated.
UPS c/w Bypass Switch

Approved suppliers:

- Brand Rex Leviton
- Excel
- Beldon
- Comscope
- Or equivalent

F.7 SCHEDULE OF FIRE ALARM SYSTEMS

Manual call points
Optical Smoke detectors
Heat detectors
Fire alarm sounder
Xenon flashing unit
Remote indicator for fire alarm detector
Fixed temperature heat detector
External fire alarm sounder
Fire alarm repeater panel
Magnetic door holder
Fire alarm interface units

Approved suppliers:

- IAS Morley
- Notifier
- Gent
- Siemens

G SUMMARY OF PRICES**ELEMENT 1 – CONTRACT PRELIMINARIES**

1. Amount for General Preliminaries	€
2. Amount for compliance with Conditions of Contract:	€
3. Amount for compliance with requirements of Building Regulations:	€
4. Amount for compliance with Health, Safety, Welfare at Work Regulations	€
5. Amount for compliance with Work Safety Protocol (Covid 19)	€
6. Amount for coordinated drawings:	€
7. Amount for "as-installed" drawings:	€
8. Amount for marking out builders works requirements:	€
9. Amount for Labeling and charts	€
10. Amount for all attendances:	€
11. Amount for attendance at site meetings:	€
12. Amount for O&M Manuals:	€
13. Amount for client instruction:	€
TOTAL: (carried forward to Summary of Tender):	€

ELEMENT 2 – POWER DISTRIBUTION/GENERAL SERVICES:

1. Amount for relocating existing electrical board	€
2. Amount for raising existing sockets in high performance gym	€
3. Amount for strip out of existing electrical circuits	€
4. Amount for new submains to outdoor A/C units	€
5. Amount for mods to existing main board to add new circuits	€
6. Amount for small power circuits (sockets & fcu's) and faceplates	€
7. Amount for isolators	€
8. Amount for Dado trunking in office	€
9. Amount for power supplies & control wiring to new A/C units	€
10. Amount for power supplies & control wiring to new Heat Recovery units	€
11. Amount for containment	€
12. Amount for earthing installation	€
13. Amount for testing and commissioning	€
14. Amount for any item not listed (Give details)	€
TOTAL: (carried forward to Summary of Tender):	€

ELEMENT 3 – GENERAL & EMERGENCY LIGHTING:

1. Amount for strip out of existing lighting as indicated	€
2. Amount for new general lighting circuits	€
3. Amount for supply and installation of Type A light fittings	€
4. Amount for supply and installation of Type B light fittings	€
5. Amount for supply and installation of LED Strip light fittings	€
6. Amount for supply and installation of Type E1 light fittings	€
7. Amount for supply and installation of Type E2 light fittings	€
8. Amount for supply and installation of Type E3 light fittings	€
9. Amount for light switches	€
10. Amount for emergency lighting installation ccts. including Contactors	€
11. Amount for testing and commissioning	€
12. Amount for any item not listed (Give details)	€

TOTAL: (carried forward to Summary of Tender): €

ELEMENT 4 – FIRE ALARM

1. Amount for strip out of existing accessories as indicated	€
2. Amount for smoke & heat detectors on ceilings	€
3. Amount for sounders/ flashing beacons	€
4. Amount for fire alarm cabling and interconnections	€
5. Amount for connecting to existing system	€
6. Amount for testing and commissioning	€
7. Amount for any item not listed (Give details)	€

TOTAL: (carried forward to Summary of Tender): €

ELEMENT 5 – DATA INSTALLATION:

1. Amount for raising up existing outlets in high performance gym	€
2. Amount for new Cabling and outlet installation	€
3. Amount for terminating at existing patch panels	€
4. Amount for testing and commissioning	€
5. Amount for any item not listed (Give details)	€

TOTAL: (carried forward to Summary of Tender): €

SUMMARY OF PRICES:

1. Amount for Element 1	€
2. Amount for Element 2	€
3. Amount for Element 3	€
4. Amount for Element 4	€
5. Amount for Element 5	€
 TOTAL (EXCL VAT):	 €

H FORM OF TENDER

Tender for the:
High Performance Gym
T2 Tailteann Building
Mary Immaculate College
Limerick

I/We

.....

Hereby tender and undertake to execute and complete all the Service required to be performed in accordance with the Form of Contract, Contract Conditions, Specifications, instructions for tendering and Instructions to Tenderers, and contained therein and any other documents listed in the Specific Conditions of Contract for the following prices:

Tender Figure exclusive of VAT
(In words)

.....

Tender Figure inclusive of VAT
(In words)

.....

Contractors Signature

.....

Contractor's Address

.....

.....

Date

.....

I DECLARATION OF COMPLIANCE

Tender for the:

**High Performance Gym
T2 Tailteann Building
Mary Immaculate College
Limerick**

I/We

.....
.....

Hereby tender and undertake to execute and complete all the Service required to be performed in accordance with the Form of Contract, Contract Conditions and Specifications, instructions for tendering and Instructions to Tenderers.

In addition to this, we hereby confirm that our tender submission is in accordance and in full compliance with tender documents, including all associated specification and drawings.

Contractors Signature

.....

Contractor's Address

.....
.....

Date

.....