



Galileo Energy Services

Unit A6, M4 Business Park,
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www.galileoenergy.ie

**KILMACANOGUE NATIONAL SCHOOL
KILMACANOGUE,
BRAY,
CO. WICKLOW.
A98 N602**

ROLL NUMBER: 18365Q

ELECTRICAL SERVICES SPECIFICATION

VOLUME 1

PARTICULAR SPECIFICATION FOR THE ELECTRICAL INSTALLATION

TENDER ISSUE (T1)

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GENERAL ITEMS

Introduction

The intention of this specification and the drawings issued is to describe and provide for a complete installation. The Contractor is advised that the work to be executed as described in these documents shall be complete in every detail, notwithstanding that every item involved may not be specifically mentioned or described. The Contractor shall be held to allow for all materials and labour necessary for an entire and complete installation and shall not avail of any unmentioned error or omission should such exist.

The works entails the construction of a new extension building to Kilmacanogue National School, Kilmacanogue, Bray, Co. Wicklow. The works includes for the supply and installation of new electrical services in the new extension. Refer to the drawings for further information, layout of the building and services/works required. All works shall be in compliance with all relevant Building Regulations, Irish Standards, British Standards, CIBSE Guidelines and Good Engineering Practices.

The Contractor shall be required to ensure all necessary flexibilities & resources are available to the project to meet the deadlines and programmes. The Contractor shall liaise with the Main Contractor regarding the programme and order of works and any concerns he may have over the completion date should be raised prior to the awarding of the contract.

The Contractor shall take all reasonable care to ensure all site workers and visitors are not endangered by any element of their works. The Contractor must ensure that the works are completed as soon as possible and/or within the agreed program time frame.

The Contractor shall also review all Architects and Structural Engineers drawings to familiarise themselves with the proposed development and scope of works involved. It is the Contractor's responsibility to raise any concerns over the proposed works with the Engineer prior to commencement of works. Failure to inform the Engineer of any such concerns will be deemed that the contractor has accepted the design and scope of works to be fault free.

This specification will set out in general terms the design drawings and data to be used by the Contractor in order to submit a tender bid for the electrical services installation and the works associated with the installation. The procurement, delivery, supply, handling, erection, installation and commissioning of the services as there under described as may be seen or inferred from the enclosed drawings and documents from the Consulting Engineer.



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The Contractor shall satisfy himself that the installation is in accordance with all codes and standards. All works described shall comply with:

- i) The Safety, Health and Welfare Act, 1989.
- ii) Requirements of the Health and Safety Authority / SI 138.
- iii) Requirements of the Fire Officer.
- iv) All Irish Building Regulations including Building Control (Amendment) Regulations (BC(A)R), S.I. 9 of 2014.
- v) Factories Act / Statutory Instruments.
- vi) Client Safety Protocol.
- vii) Client Specifications.
- viii) Chartered Institute of Building Services Engineers.
- ix) The Tender Drawings.
- x) The Contract Preliminaries.
- xi) All relevant Irish, British and European Standards and Codes of Practice.
- xii) I.S. 3218:2013+A1:2019 – Fire Alarm Systems
- xiii) I.S. 3217:2013+A1:2017 - Emergency Lighting
- xiv) EN12464 - The Lighting of Workplaces

Please note that 'The Contractor' in this specification refers to the Electrical Contractor.

The Contractor shall familiarise himself with the above and the obligations therein.

For any queries relating to this specification or related drawings, the Contractor shall contact the following:

*Mr. Johnny O'Sullivan,
Galileo Energy Services,
Unit A6,
M4 Business Park,
Celbridge,
Co. Kildare.
Tel: 01-6274103
E-mail: johnny@galileoenergy.ie
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Site visit prior to tender submission

The Contractor shall be deemed to have carried out a site visit of the site prior to the completion of his tender to ascertain for themselves the full extent and nature of the works.



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The Contractor shall ensure that all factors, site conditions, and items are taken account and what items are necessary in order to complete the installation and to leave same in a complete working condition to the satisfaction of the Employer's Representative. No extras or variations shall be allowed for additional work that could have been ascertained by visiting the site. The Contractor shall contact the Main Contractor to arrange an appropriate appointment to visit the site during the tender period.

Tendering contractors MUST NOT arrive to site without prior appointment.

Tenderers shall note that no claim in respect of lack of knowledge of prevailing site conditions, builders work or existing services can be considered.

The tender drawings are based on the best information available at the time of preparation and by visiting the site the contractor shall satisfy himself of the exact extent and nature of works involved.

Standard and code of practice

Unless specifically stated otherwise, or approved by the Engineer, installation, materials and equipment shall be in accordance with the relevant Irish, European International and British Standards and Codes of Practice and CIBSE Guidelines, whether indicated in this Specification or not.

Where stated in this document the British Standard Reference numbers shall be compatible with the I.E.C. reference numbers or vice versa.

Acts and regulations

The installation(s) shall comply with all Acts, relevant Statutory Instruments and Regulations including any special Regulations issued by the electricity, gas and/or water authorities. The tender shall be based on the Acts and Regulations current on the date for return of tenders. If these Acts and/or Regulations are amended or new Acts and/or Regulations are enacted after that date the Electrical Contractor shall inform the Engineer immediately.

Specified equipment

The Contractor shall refer to the rear of this document for a schedule of the specified equipment on which The Company's price is based. The Tenderer may offer an alternative manufacturer, providing the equipment offered is equal in all aspects, i.e. aesthetic appearance, classification and performance.

Alternative equipment proposed to that specified shall only be accepted/installed with the expressed approval of the Engineers in writing prior to the completion of the tender documents.



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Plant warranties

Where a manufacturer's warranty applies, the warranties on plant and equipment shall commence from the date of commissioning and acceptance of plant by the Engineers.

Form of tender

The Contractor will pay particular attention to the proper completion of the Form of Tender. Completion of the Form of Tender must be as per the item numbers listed and should note that any section heading may apply to one or more of the items listed in the Summary of Prices.

The Contractor shall include in his tender under additional headings if necessary, and irrespective of the items indicated for all work specified or implied by the drawings or specification.

The tenderer shall be deemed to have full knowledge of the Specification and Drawings supplied to him and to have made himself fully acquainted with all requirements and to have obtained clarification on any matter or detail, which may be obscure to him.

Should any matter arise which in the opinion of the tenderer is obscure, he shall submit the details for clarification in writing to the Employer's Representative Engineer within 7 days of expiration of the tender period. The Employer's Representative shall circulate a reply to all Tenderers before the tender period expires.

The tender price is to be based on the works being carried out at rates of pay during working hours and under conditions of labour not less favourable than those established for the trade or industry in the district where the works are to be carried out. Any non-productive time associated with the recruitment of additional staff by the Contractor during the execution of the contract shall be deemed to be included in the tender price.

Installation and setting out of works

The Contractor shall set out the whole of the works and be responsible for the correctness of the positions, levels and dimensions of the several works. All openings, plinths, bases and holes to be cut in the structure shall be positioned and marked by the Contractor.

The tender drawings are diagrammatic only and the Contractor shall allow for a practical installation allowing for the setting around obstructions and other minor modifications which may or may not be apparent from the Architectural, Engineering, Structural, or services drawings.



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The exact courses and positions of all pipes, ducts, flues, cabling, conduit, trunking etc. and other items of equipment shall be duly laid out and marked on the job by the Contractor and approved before execution as the best possible course and position, having regard to all considerations including temperature and the proximity to other services plant.

The Contractor shall make good any incorrectly set out works and shall be liable for costs of making good any work incorrectly carried out. The Contractor shall furnish all materials, labour and instruments necessary to enable the setting out to be checked.

Conflict between drawings and specifications

In the event of there being a conflict between drawings and specification, the tenderer shall obtain clarification before submitting his tender. Failure to do so will be deemed to imply that the most onerous requirements have been included for.

In the event that an apparent contradiction exists between any of the specification or between any of the specification and the drawings, this shall be addressed in writing to the Engineer during the tender period for clarification. If an apparent contradiction is not identified during the tender process, then it shall be at the discretion of the engineer to identify which document or clause takes precedence. Claims raised post-tender in relation to apparent contradictions shall not be entertained and the onus shall remain with the contractor to highlight any such issues during the tendering period. This in no way over rides the order of precedence of information as defined within the contract.

Contract drawings and specifications

Refer to the 'Document Issue' sheet issued with this pack as this document highlights all the contract drawings and specifications.

Details of the complete installation are indicated on the contract drawings and described within this specification. The exact locations of all equipment shall be agreed on site with the Consulting Engineers prior to installation where any doubt or potential conflict with other installations is perceived. Plant and equipment which is installed and which conflicts with existing work or installations will be removed and reinstalled without expense to the client by the Contractor.



Materials and workmanship

All materials used in the works shall be fit for the use for which they are intended and for the conditions in which they are to be used in and includes materials which:

- a) Bear a CE mark in accordance with the provisions of the Construction Products Directive (89/106/EEC)
- b) Comply with an appropriate harmonized standard, European technical approval or national technical specification as defined in article 4(2) of the Construction Products Directive (89/106/EEC)
- c) Comply with an appropriate Irish Standard or Irish Agreement Board Certificate or with an alternative national technical specification of any member state of the European community, which provides in use an equivalent level of safety and suitability.

The installation shall be carried out and maintained in the best and most substantial and workmanlike manner. Workmanship shall comply with British or Irish Standards and the relevant codes of practice.

Only fully qualified and competent tradesman and helpers shall be employed on the works. Work shall not be sub-let or done by any other Contractors without the Employer's Representative permission.

No work shall be covered up prior to inspection by the Employer's Representative.

Wherever a proprietary name is used to specify a material or process it shall be deemed to have the term '**or equivalent**' appended to it.

Where a material or process is described by reference to its propriety name the name is used to indicate the standard of construction, appearance, ease of maintenance and durability acceptable to the Employer's Representative. The Employer's Representative will approve the use of alternatives where such alternatives are shown to equal or surpass the qualities of the product or process specified. Accordingly proprietary names wherever mentioned in the Specification, schedule of Rates or on the drawings shall be deemed to mean the provision of the named product or process or an approved alternative.

Notwithstanding the above no items shall be used for the works except those as specified in the contract documents except with the permission of the Employer's Representative. Any points, which differ in the contract documents to the Contractors normal practice, may receive consideration at tender stage if referred to the Employer's Representative. If no reference is made at tender stage it will be assumed that the Contractor will proceed exactly according to this specification.



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Improper materials

The Employer's Representative shall have the power to order during the progress of the works the removal from site of any material, which in his opinion is not in accordance with this contract, the substitution of proper materials, and the removal and proper re-execution of any work, which in respect of materials and workmanship is not in accordance with the contract. This condition is not withstanding any previous tests or interim payments.

Liability for defects

Works showing defects or damage, whether caused by or as a consequence of negligence on behalf of the Contractor or not and regardless of whether the defects are discovered during the progress of the works or upon completion of the works, and regardless of whether the works have been approved or fully certified, the Contractor shall make good, at his own expense, such damage or defects discovered. On refusal to do so the Employer shall be entitled to carry out the work necessary and recover the expenses associated with such work.

Allow for maintaining the works in perfect condition for 12 months after the issue of the Employer's Representative's Certificate of Substantial Completion in accordance with the Conditions of Contract.

Conditions of building and site

The Contractor shall be responsible for making good any damage caused to the fabric or decor of the building or site by, or as a result of, his negligence or the negligence of his employees or contractors or others unnamed or otherwise. All rubble and waste shall be removed as it arises. Upon completion of the works, the site and building shall be thoroughly cleaned to the satisfaction of the Employer.

The Contractor shall pad ladders or similar equipment so that the building structure or finishes are not damaged in anyway. He shall also ensure that oil, grease or similar goods do not cause damage to the structure during the execution of the works.

Local authorities

The Contractor shall observe and comply with the requirements of all Statutes and Byelaws and serve notice on the Authorities or Owners of water, gas, electricity or any other items, which may be affected in any way by the execution of the works.



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Plant

The Contractor shall supply all necessary slings, tackles, scaffolding, haulage, instruments, materials, apparatus, tools and labour for delivery and erection of the works, and for the completion and testing of the works to the entire satisfaction of the Employer's Representative.

Loss, theft, damage and injury

The Employer or Employer's Representative shall not bear any responsibility for the loss, theft or damage of equipment or materials associated with the works either during delivery or at any time during the execution of the works. All plant, equipment, tools, workmanship and materials shall comply with the relevant safety standards. The Contractor shall bear responsibility for the safety of his employees and agents throughout the execution of the works.

Copyright

Copyright is reserved on the Consulting Engineers' documents, which include all drawings, specifications, sketches and the like. These documents may only be used in relation to the works as outlined in this contract. Photocopying of documents is not permitted without prior permission of the Consultant Engineer. Any copies of documents made during the execution of the works shall be returned to the Consulting Engineer prior to final payment

Contractors drawings

The Contractor shall prepare if requested by the Employer's Representative any working drawings necessary for proper completion of the Contract. Two copies of each drawing shall initially be submitted to the Employer's Representative and upon approval the Contractor shall provide 6 no. copies of said drawings for distribution.

Working drawings shall show the final arrangement of all items of plant and their associated connections, all control assemblies and panels, as well as the routing of all pipework and ductwork. The Contractor shall consult with all relevant parties and in the preparation of his working drawings so as to ensure there is no conflict between the Mechanical, Electrical and other services, Architectural or structural elements.

Variations, extras and omissions

No variation shall vitiate this Contract or save as hereinafter provided or give rise to any claim for compensation.



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Where an extra, variation, omission is required the Contractor shall submit a price for such variation, omission or extra to the Employer's Representative in writing within seven days of the request for such a price.

He shall not proceed with such alteration, variation or extra until such a time as he has received a Variation Order in writing from the Employer's Representative.

No payment shall be made whatsoever to the Contractor for any variation, alteration, addition or extra unless a Variation Order is produced. Variations shall be priced at the rates submitted by the Contractor with his tender where such are applicable.

Pricing

Un-priced items

Any item left un-priced shall be deemed to be included for in the tender and the cost of the item shall be deemed to be spread across and included in the rates generally.

Currency

All prices and rates shall be deemed to be denominated in Euros (€).

Electricity supply, electric wiring and equipment

All electrical equipment is to be suitable for the standard ESB supply of 400/230V @ 50hz AC.

Where starters or controls are provided with any equipment included under the mechanical services contract, they shall be handed over to the Electrical Contractor together with their wiring diagrams, for erection and commissioning by him.

Electrical sub-systems certification

All electrical subsystems shall be certified as having been carried out in compliance with the requirements of the ETCI Wiring Regulations.

Copies of the ETCI Subsystems certificates, accompanied by the relevant test results, shall be included with the ETCI Completion Certificate in the Health and Safety File for the project.

In the event of the Contractor failing to secure subsystem certificates for all items of equipment then the Contractor shall be liable for the cost of having the system tested, remedied as necessary and certified.



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The tender figure shall be deemed to include for all costs incurred by the Contractor in providing the appropriate documentation.

Proprietary names

Wherever a proprietary name is used to specify a material or process it shall be deemed to have the term 'or equivalent' appended to it. If applicable, if the Contractor proposes an alternative material or equipment, this material or equipment shall be approved by the Employer's Representative prior the end of the tendering period.

Where a material or process is described by reference to its proprietary name, the name is used to indicate the standard of construction, appearance, ease of maintenance and durability acceptable to the Client / Employer's Representative. The Client / Employer's Representative will approve the use of alternatives where such alternatives are shown to equal or surpass the qualities of the product or process specified. Accordingly proprietary names wherever mentioned in the Specification, Schedule of Rates or on the drawings shall be deemed to mean the provision of the named product or process or an approved alternative

'Safepass' accreditation

The Contractor shall comply with the requirements of the construction industry's safety accreditation scheme, known as the 'Safepass' scheme.

Decision of the Employers Representative

The decision of the Employer's Representative on all questions relating to the execution of the works, the meaning of the Drawings and Specification, the manner of the execution of the works or the quality of the materials, the nature, quality of the works executed or what amount was included in the Contract shall be final, conclusive and binding.

Works outside the contract

The contractor should note that claims for additional works will not be entertained unless specifically requested in writing by the Employer's Representative.

Waste management

The site shall at all times be kept as clean and tidy as possible and the contractor shall be responsible for removing debris and rubbish on a regular basis. Removal of waste from site shall comply with the statutory waste management requirements



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Damage

External:

The Contractor shall note that any damage to the existing yards, main entrance, grassed areas, access roads or paved areas that may arise during construction stage of the project and caused by the construction works or by the Contractor's vehicles or staff, is to be made good by him at no extra cost to the Client.

The Contractor should provide all necessary protection to existing paved, grassed and landscaped areas around the site and shall make good any damage caused by lack of such protection at no extra cost to the Client.

The work is not to interfere in any way with the public roads. In particular, the Contractor is to ensure that these areas are to be left free of all dirt and debris and builder's materials and parking of construction vehicles, etc and the roadways are to be thoroughly cleaned as and when required. Any damage caused to the surrounding public roadways shall be made good to the satisfaction of the Local Authority at the Contractor's expense. Any damage caused to the surrounding barracks roadways shall be made good to the satisfaction of the Client at the Contractor's expense.

Internal:

The Contractor shall note that any damage to the existing walls, windows, floor coverings, ceilings, doors, etc. that may arise during construction stage of the project and caused by the construction works or by the Contractor's plant or staff, is to be made good by him at no extra cost to the Client. Any damage caused to the internal building as listed above shall be made good to the satisfaction of the Client at the Contractor's expense.

Interpretation of this specification and drawings

This specification has been written using simple, direct language wherever possible. Imperative terms such as 'provide' and 'submit' mean that the Electrical Contractor shall 'provide' or 'submit' the relevant samples, documentation or information.

If any discrepancies exist or there is any doubt about the interpretation of the Documents, obtain clarification from the Project Manager.



Declaration of Performance/CE markings

General:

The Contractor shall be aware of the Construction Products Regulation (CPR), which entered into force on 1 July 2013 and requires mandatory CE MARKING of construction products covered by Harmonised European Standards (HENS), when products are placed on the EU market. The purpose of the CPR and CE Marking of construction products is to facilitate the free circulation of construction products across the EU market. In doing so, the CPR has established a common technical language for declaring, specifying and setting requirements for construction products.

All CE MARKED construction products must have a Declaration of Performance (DoP), drawn up by the manufacturer. The DoP provides information on the performance of the construction product in relation to technical essential characteristics e.g. compressive strength, durability etc.

It is important that the electrical contractor uses only CE MARKED construction products within this installation and obtains a DoP for each product to ensure the product is fit for the use for which it is intended and for the conditions in which it is to be used. Furthermore, it is the Contractor's responsibility to ensure all works should be carried out using "proper materials...which are fit for the use for which they are intended and for the conditions in which they are to be used" in order to demonstrate compliance with the requirements under Building Regulations.

All materials, equipment and plant used in the works shall be fit for the use for which they are intended and for the conditions in which they are to be used in.

All materials, equipment and plant shall adhere to the following:

- Shall bear a CE mark in accordance with the provisions of the Construction Products Directive (89/106/EEC)
- Shall comply with an appropriate harmonized standard, European technical approval or national technical specification as defined in article 4(2) of the Construction Products Directive (89/106/EEC)
- Shall comply with an appropriate Irish Standard or Irish Agreement Board Certificate or with an alternative national technical specification of any member state of the European community, which provides in use an equivalent level of safety and suitability.

The Contractor shall provide a Declaration of Performances (DOP's) cert for all materials, equipment and plant used in the works.



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Evidence:

The Contractor shall provide evidence of Declaration of Performances(DOP's) and CE markings for all equipment, plant and material used in this project upon request by the Employers Representative. This is also mandatory for B(C)ar compliance sign off.

BREXIT implications for CE Marking and deployment of products for contracts with the EU member states including the Republic of Ireland:

As the UK has recently left the EU on the 31st January 2020. Contractors shall be aware of the implications and non-compliance risks for them or any of their sub specialists to install products which are CE marked under UK notified bodies. Post Brexit, UK notified bodies used for certification of conformity for 'CE' marking proposes will lose their status as EU Notified bodies and will be removed from the EU Nando website. In such instances the manufacturer of the product will need to obtain alternatives for certification of conformity for 'CE' marking.

Trade union rates and agreements

The Contractor must be in compliance with all Trade Agreements and the Contractor shall pay all employee's connected with the project to current trade union rates. If the Contractor appoints Sub-Contractor's to complete work then they too shall be compliant with current trade union agreements.

This will be monitored on site to ensure that all the Contractors employees and subsequent Sub-Contractors are in compliance with all Trade Agreements and that all are paid current union rates.

All employee's and Sub-Contractors employed by the Contractor for the duration of the works shall have their union cards on them at all times.

NZEB/BER Compliance

This building needs to be NZEB compliant.

An NZEB compliance report and calculation has been carried out for this project and the building is NZEB compliant based on all the plant, equipment, materials, etc. as specified below in the specification document.

The Contractor shall ensure that all items specified within this specification is installed as a preliminary NZEB/BER calculation has been carried out based on this specification.



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If the Contractor is to deviate from the specified items within this specification and propose alternatives, the Contractor must ensure that these items match the specified criteria within this specification.

If in any case the Contractor takes the onus to install any item that isn't an equivalent to the specified items or isn't formally approved by the Engineer, then the Contractor shall be asked to carry out an individual NZEB/BER assessment to ensure it meets the desired NZEB/BER criteria. This shall be carried out at the Contractors expense and any cost implications for this shall be at the expense of the Contractor.

Timescale, working hours, payment, etc.

Refer to the Main Contractor for specific details on these requirements.



BUILDING CONTROL REGULATIONS

General:

All works shall be carried out to the new Building Control (Amendment) Regulations (BC(A)R), S.I. 9 of 2014.

Therefore, the Contractor shall allow for the following over the following stages of the contract:

Commencement Stage:

- Familiarise themselves with the drawings, specifications and documents lodged with the Commencement Notice.
- Ensure a competent person is assigned to oversee the Construction works.

During Construction:

- Install the services and construct the building in accordance with the plans and specifications.
- Ensure that the workmanship complies with the requirements of the Building Regulations.
- Ensure that materials which they select and for which they are responsible comply with the requirements of the Building Regulations.
- Co-operate with the design team, the Assigned Certifier and other certifiers.
- Co-operate with the Assigned Certifier for the implementation of the site inspection plan.

Upon Completion:

- Sign the Certificate of Compliance (completion).
- Provide to the Assigned Certifier, such documents for which they are responsible, as may assist the Assigned Certifier to collate particulars for the purposes of handover and certification, and/or for further submissions to the Building Control Authority.
- We will require Certificate of Compliance with the Building Regulations and relevant standards and manufacturers requirements at this stage.
- Ensure the coordination and provision of all test certificates and confirmations to the satisfaction of the Assigned Certifier or other designated inspectors or certifiers providing Ancillary Certificates;
- Maintain records.



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Inspections during the Construction Process:

The Contractor shall allow the following for inspections during the Construction Phase:

- Contractor to give the Engineer at least 5 days notice to carry out a necessary inspection.
- All services that are to be hidden or concealed shall be left exposed until inspected.
- Prior to closing up services in walls, ground, attics, etc., all tests shall be completed and sign off sheets shall be signed and witness signed. Test sheet to contain the name of the tested, name of the witness, type of test, duration of test and results recorded.
- No cost variations will be accepted for time delays or opening up for inspections if these procedures are not followed.

BUILDERS WORK

General:

All Builders work associated with the execution of this Contract shall be carried out under the main contract by the Main Contractor. The Contractor shall liaise with the Main Contractor on all builders work requirements relating to their installations and shall prepare detailed builders work drawings for the Main Contractor.

The Contractor shall prepare any working drawings if necessary, agree all details with the Employer's Representative, mark out and be responsible for correctness, and the cost of any unnecessary work due to the Contractor failing to comply with this condition shall be the Contractors responsibility. The Contractor shall ensure that cutting away and general attendance is reduced to a minimum and must not impede or delay the carrying out or completion of this work. The permission of the Employer's Representative shall be secured before cutting or chasing is commenced.

The Contractor shall be responsible for the preparation of the following:

- Builders work drawings, including all necessary opes for installation
- Technical submittals, for all items of plant and equipment that vary from the specified equipment herein.
- Ensuring that all services/installation details are completely integrated with all aspects of the building elements, to the satisfaction of the Client.



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Opes through Fire Barrier Membrane:

All services through fire barriers, fire walls or floor slabs shall be sleeved either side of the fire barrier/wall/slab. All opes shall be filled in and fire proofed by the Main Contractor after services is installed and commissioned. Allow for all necessary works. Liaise with Main Contractor in ensure that all opes for services are fire-proofed.

CO-ORDINATION

The Electrical Contractor shall allow for liaising with all other trades in relation to coordination. Before any works are started on site, the Electrical Contractor shall hold a meeting with the Mechanical Contractor to co-ordinate the M&E installations in the building. The co-ordination of the mechanical installations shall be the responsibility of the Mechanical Contractor but the Electrical Contractor shall allow for co-ordinating the electrical installation with the Mechanical Contractor.

The Electrical Contractor shall provide all information necessary and on time to the Main Contractor for the proper discharge of this responsibility. The Electrical Contractor shall agree all methods, sequences timing and all relevant details of the works within his contract with the Main Contractor in advance and shall not deviate from this agreement unless otherwise agreed in writing with the Contractor. No adjustments will be made to the electrical contract sum where additional work is required due to poor co-ordination or where the Employer's Representative has not been informed in good time of a co-ordination difficulty that could have been resolved by a design decision had the issue and its full implications been advised to the Employer's Representative in good time. The Electrical Contractor shall liaise with all other trades when co-ordinating their works.

The Electrical Contractor shall mark out opes and holes on all floor and wall surfaces as required to the satisfaction of Services Engineer, Structural Engineer and Main Contractor in sufficient time to allow the Main Contractor complete his works to programme.

DECOMMISSIONING OF THE EXISTING SERVICES

The Contractor shall include for the decommissioning of the following where the new extension shall be installed on-site:

- Decommissioning, stripping out and removal from site of the existing light fittings and associated cabling, etc. in the location as indicated on the drawings. Refer to drawing 63(E001) for further details.



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- Any other electrical services that shall disrupt the new extension at the back of the building.

The Contractor shall determine the exact scope of decommissioning works by visiting the site prior to submission of tenders. The Contractor shall ensure that any other attendances or modifications required to the existing installation in order to leave the whole of the completed installation in a satisfactory condition are included in his tender. The Contractor shall ensure that any other attendances or modifications required to the existing installation in order to leave the whole of the completed installation in a satisfactory condition are included in his tender.



(6-) ELECTRICAL WORKS

General

The Contractor shall be responsible for all electrical works and shall ensure that the full price for this work is included in the tender price. This section of the Specification outlines the electrical services installation and describes the particular requirements of the electrical services to be installed. This section is intended to be read in conjunction with all other technical and non-technical sections of the specification and with the tender drawings. Where this section is at variance with any other sections of the tender documents, the tenderer shall obtain clarification from the Employers Representative before tendering. Failure to do so will be deemed to imply that the most onerous requirements have been included for.

60.0 ELECTRICAL SITE SERVICES

Non-Applicable.

61.0 ELECTRICITY CENTRE

Refer to 'Section 62.0' for further information.



62.0 POWER DISTRIBUTION SERVICES

62.01 Decommissioning and removal from site of the existing main distribution electrical board in the building

The existing main distribution electrical board for the building shall be decommissioned and removed.

A new main distribution electrical board shall be installed in place of the existing main distribution electrical board.

The Contractor shall allow for the following works:

- Decommissioning, stripping out and removal from site of the existing main distribution electrical board in the building.
- Decommissioning, stripping out and removal from site of the existing cabling, containment, etc. to the existing main distribution electrical board.
- The building is currently served by four ESB meters. It is proposed to decommission and replace these meters with one new ESB meter that shall be incorporated into the new main distribution electrical board.

See image below of the existing main distribution electrical board and the ESB meters.





62.02 Detailed survey of the existing main electrical board in the building

Survey by the Contractor:

The Contractor shall carry include for a detailed survey of the existing main-distribution electrical board and existing electrical installation in the building.

On this survey, the Contractor shall complete the following works:

- Note the locations of all existing wiring, sub-mains cabling, etc. to and from the board.
- Carry out a load test to see what the electrical load that the building is currently pulling.
- Measure total load per phase by means of load monitor for one week continuous.
- Note the quantity of circuit breakers, MCB's, RCB's, switch fuses, etc. in the existing main distribution electrical board that will need to be allowed for in the new main distribution electrical board.
- Carry out a survey on the existing electrical installation in the building.
- Identify the best location for the main distribution electrical board on the wall where the existing main distribution electrical board is located.
- Any other works deemed necessary.

Site visit and survey by the Contractors proposed board manufacturer:

The manufacturer of the new main distribution electrical board will need to visit the site with the Contractor to survey the proposed location and layout of the new main distribution electrical board.

As highlighted above, the Contractor is to carry out a detailed survey of the existing main distribution electrical board and this shall be carried out in conjunction with the Contractors proposed board manufacturer.

A site visit and survey by the board manufacturer is required as they will advise on the specific arrangement and layout of the new main distribution electrical board.

62.03 New main distribution electrical board

General:

As indicated in Section 62.01 above, the existing main distribution electrical board shall be decommissioned, stripped out and removed from site. A new main distribution electrical board shall be installed in place of the existing main distribution electrical board.



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The new main distribution electrical board shall be installed in the same location as the existing main distribution electrical board as the some of the existing cabling that was in place to the existing main distribution electrical board is being retained and connected to the new main distribution electrical board.

The Contractor shall allow for the supply, installation and wiring of the new main distribution electrical board as indicated on the drawings.

Refer to the electrical schematic drawing for details on the new main distribution electrical board to be supplied and installed.

New main-distribution electrical board:

The Contractor shall supply, install, connect, test and commission a new main distribution electrical board in place of the existing main distribution electrical board. Refer to the electrical schematic drawing for details on the new main distribution electrical board to be supplied and installed.

The assembly of the new main distribution electrical board shall adhere to the following specifications and shall have the following specifications:

- Wall mounted.
- Sheet steel cubicle with MCCB type cubical construction. The enclosure framework shall be of sheet steel construction, minimum of 2.5mm thickness, sprayed and stove enamelled. Doors and panels shall also be of sheet steel construction and be 1.5mm minimum thickness.
- The protection rating of the enclosure shall be minimum IP40 in accordance with IEC144.
- Board shall be supplied with a moulded case circuit breaker incomer.
- Type tested assembly.
- 630A rated busbar.
- The board shall be extensible at both ends and shall be of MCCB type wall mounted cubical construction.
- All panel sections providing direct access to live assemblies shall be openable only with a special tool
- All panel sections accessing shrouded MCBs shall be provided with a handle for opening.
- The board shall be manufactured to 'Form 3A' separation in accordance with IS EN 60439.
- The board shall be compliant with I.S. 10101:2020.
- Shall be suitable for a voltage of 630/230V (3 phase)
- Electronic surge protection shall be provided on the incoming mains as detailed in item '62.11'.

The Contractor shall provide with his tender the manufacturer's name and the overall dimensions of the new main distribution electrical board they propose to



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supply and install. Detailed schematics shall be approved by Employer's Representative, prior to ordering of boards.

The Contractor shall not make site alterations unless authorised by the Employer's Representative. Where site modifications to assemblies are authorised, they are to be carried out in accordance with manufacturer's certified drawings and instructions. Ensure that modifications made comply with type test certificate obtained for arrangement of components.

Site visit and survey by the Contractors proposed board manufacturer:

The manufacturer of the new main distribution electrical board will need to visit the site with the Contractor to survey the proposed location and layout of the new main distribution electrical board. As highlighted in Section 62.02 above, the Contractor is to carry out a detailed survey of the existing main distribution electrical board and this shall be carried out in conjunction with the Contractors proposed board manufacturer.

The new main distribution electrical board shall be installed in the same location as the existing main distribution electrical board as some of the existing cabling that was in place to the existing main distribution electrical board is being retained and connected to the new main distribution electrical board.

A site visit and survey by the board manufacturer is required as they will advise on the specific arrangement and layout of the new main distribution electrical board to suit the existing cabling that is in place for the existing main distribution electrical board.

Location:

The new main distribution electrical board shall be installed in the same location as the existing main distribution electrical board as some of the existing cabling that was in place to the existing main distribution electrical board is being retained and connected to the new main distribution electrical board.

The space is restricted so the dimensions and location of the board will need to be discussed in detail between the Contractor and their board manufacturer.

Existing cabling/wiring:

The Contractor shall allow for decommissioning and removing the majority of the existing wiring of all existing devices to the existing main distribution electrical board and replacing with new cabling.



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ESB meter:

The building is currently served by four ESB meters. It is proposed to decommission and replace these meters with one new meter that shall be installed in external ESB cabinet. Refer for Section 62.06 for further information.

The new ESB meter for the existing building shall be incorporated into the new main electrical distribution board as indicated on the drawings. The Contractor shall include for incorporating the new ESB meter and cut-out into the new electrical board. All works shall be in compliance with ESB Networks 'National Code of Practice for the Customer Interface'.

The Contractor shall include for all provisions in respect of the above, whether explicitly stated or not, regarding sealable chambers and trunkings for ESB cut-outs, meters, etc. and no claims for extras, resulting from lack of sufficient information at tender stage, will be entertained at a later date.

New Supply Cables:

The Contractor shall supply, install, connect, test and commission the new supply cables from the board. Cables shall be XLPE/EPR and of the size indicated on the drawings. The Contractor shall provide all cable supports and cable glands necessary for correct installation and termination of the cables.

A separate CPC shall be installed with every sub-mains feed and should be of the size detailed in the distribution drawings. The amount of the cable should also be bonded at both ends to the distribution equipment by means of a nut and bolt through a tab linked to the earth bar.

New Incoming Supply Cables:

The Contractor shall supply, install, connect, test and commission the new incoming supply cables from the new sub-distribution boards, etc. to the new main distribution electrical board as indicated on the drawings.

Cables shall be XLPE/EPR and of the size indicated on the drawings. The Contractor shall provide all cable supports and cable glands necessary for correct installation and termination of the cables.

A separate CPC shall be installed with every new sub-mains feed and should be of the size detailed in the distribution drawings. The amount of the cable should also be bonded at both ends to the distribution equipment by means of a nut and bolt through a tab linked to the earth bar.



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New Incoming and Outgoing Sub-Mains Cables:

The Electrical Contractor shall supply, install, connect, test and commission the new incoming and outgoing sub-mains cabling to and from the new main-distribution electrical board as indicated

Refer to the electrical schematic for details and sizes on all sub-mains cabling. Refer to the electrical drawings for lengths required and proposed routes of all sub-mains cabling.

Refer the sections 62.20 below for details on the sub-mains cabling required internally and externally.

Miniature Circuit Breakers (MCB's):

The Contractor shall supply, install, connect, test and commission all the main circuit breakers as indicated for the new electrical board.

All circuit breakers shall generally be Type B rated to at least 10kA, unless highlighted otherwise. They shall conform to BS 3871 Part 1 and be of the sizes indicated in the drawings or accompanying schedules and be suitable for DIN rail mounting.

Circuit breakers shall be Type B, C and D to ISEN60898 to the following table:

MCB'S SHALL BE TYPE B,C,D TO ISEN 60898 TO THE FOLLOWING TABLE		
TYPE	INSTANTANEOUS TRIP CURRENT	APPLICATION
B	$5 \times I_n$	RESISTIVE LOADS
C	$10 \times I_n$	DISCHARGE LIGHTING, SMALL MOTORS ETC.
D	$20 \times I_n$	LARGE INDUCTIVE LOADS, LARGE MOTORS, WELDING PLANT, ETC.

NOTE: SIZES OF EARTHS TO CONFORM WITH THE FOLLOWING TABLE	
CROSS SECTIONAL AREA OF CONDUCTOR, S sqmm	CROSS SECTIONAL AREA OF CORRESPONDING PROTECTIVE CONDUCTOR.
$S \leq 16$	S
$16 < S \leq 35$	16
$S > 35$	$0.5S$

Where the prospective short circuit current exceeds the breaking capacity of the circuit breaker, back up protection by means of fuses shall be provided in accordance with Manufacturer's Recommendations.

Where possible, circuit breakers shall be of plug-in type, to allow replacement without undue difficulty.



Residual Current Breakers with Over-Current (RCBO's):

The Contractor shall supply, install, connect, test and commission all the RCBO's as indicated for the new electrical board.

Combined MCB/RCD units shall be of the same manufacturer as the MCB's as identified above. They shall be double pole operated and protect against, overload, short circuit and earth leakage currents.

The RCBO shall be electro-magnetically operated and comply with all relevant sections of BS 4293 and BS 3871. RCBO's shall operate at 30mA.

Moulded Case Circuit Breaker (MCCB's):

The Contractor shall supply, install, connect, test and commission all the moulded case circuit breakers as indicated for the new electrical board.

MCCBs shall comply fully with IS EN 60947-2:2006 or equal and approved. The internal trip unit for the Main Incomer shall be electronic. Their contacts shall be capable of inspection.

When used as a main incoming device, MCCB's shall have a rated prospective short circuit current of not less than 40 kA at a power factor of 0.2, the internal trip unit for the Main Incomer shall be electronic and shall be tested to P2 category IEC157-1.

Load Break Switches

The Contractor shall supply, install, connect, test and commission all the load break switches as indicated for the new electrical board.

Load break switches shall be of the rotary air-break type and shall comply fully with IEC 408 or equal and approved.

Their prospective short circuit current rating shall be adequate for their duty. (For guidance see below) They shall have on/off indication and be complete with door interlock to prevent inadvertent contact with live parts and must be lockable in the off position.

- Switch Current Rating (Rated Current)
- Symmetrical Withstand
- Current (RMS – 1s)
- Up to 63 Amp 2.5kA
- Up to 100 Amp 4.0kA
- Up to 160 Amp 9.0kA
- Up to 250 Amp 13.0kA
- Up to 400 Amp 13.0kA



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Contactors:

Contactors shall comply fully with IEC158-1 or equal and approved.

They shall be rated for AC3 Category and shall have at least 1 N/O and 1 N/C spare auxiliary contacts.

Motor Starters:

Starters shall comply fully with IEC292-1 or equal and approved. They shall incorporate the following protection features: -

- Thermally delayed over-current release on all poles set to trip at 120% full load in two hours and incorporating temperature compensation.
- Positive protection against single phasing in the form of an extra differential tripping bar or similar approved device.
- Manual reset with protection against premature re-closing.

Push Buttons and Control Switches:

Push buttons shall be in accordance with IEC337 and IEC144 and have a protection rating of IP65. They shall be colour coded as follows:

- Start/On -Green.
- Stop/Off -Red.
- Reset -Yellow/Black.

Pilot Lights and Indicators:

Pilot lights shall be LED Type and in accordance with IEC337 and IEC144 and have a protection rating of IP65. Their maximum Voltage shall be 230V Volt but where possible they shall be of either 110 Volt or 24Volt, as specified. Neon indicators shall not be used.

Pilot lights shall either be of LED, Transformer type or Series Resistor type.

Time Switches:

Time switches shall be digital 7-day, 24-hour type, complete with day omission and 36 hour spring reserve.

Instrumentation:

Instruments shall be provided where indicated and shall comply with IEC473 in all respects. They shall be of minimum 96mm x 96mm unless agreed otherwise with the Engineer and contain a modbus communication modual. Instrument



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Transformers shall comply in terms of rated Current, rated Voltage, limits of error etc., with VDE 0414 and IEC 185.

Terminals:

Terminals shall be provided at top or bottom of cubicle as specified and shall comply with IEC 61032:1997.

All items of equipment shall be wired to these terminals and they shall be capable of accepting the incoming cable sizes as specified. They shall be of PVC grade and be identified by means of terminal numbers. The Manufacturer shall provide a terminal list, or numbered Drawing. Push-in type terminals are not acceptable.

Labelling:

All MCCB's, circuits and devices in the new electrical board shall be provided with engraved plastic circuit labels.

A main label to be provided in accordance with IEC 439, which gives details of voltage rating, current rating, class of equipment, fault rating and serial number.

Labels shall be provided on all chambers inside and outside the panel, indicating the function of every item. Labels shall be 'Traffolyte', black on white, screw on type, and shall be subject to the Engineer's approval.

Every control centre sub-circuit shall be labelled to indicate its function and rating and shall be suitably indicated on heat sealed chart.

Construction:

Busbars - To be manufactured from HDHC Copper and housed in separate compartments. Secondary busbars are considered a part of the main busbar system. All busbars shall have bolted joints. Phase and neutral busbars shall be fully rated throughout the length of the assembly.

Connections - To be HDHC Copper.

The structure is to be manufactured from sheet steel formed or folded to give an inherently rigid design.

Fuse Switches, MCCBs, Motor Starters and similar devices shall be designed on a common modular dimension and shall be dimensionally interchangeable.

Segregation shall be provided between devices.



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Finish - All main steelwork to be epoxy powder finish. Nuts, bolts and fasteners to have zinc plated finish. Main steelwork to be finished Light Grey (or otherwise approved).

Cabling:

Glands and Sockets - To be provided by the installation Contractor and not by the switchgear manufacturer. Gland plates which shall be provided by the switchgear supplier, to be steel for multi-core cables and brass for single-core cables.

Load cables to ESB whole current meters or CT's must be of stranded copper conductor and not multi-stranded flexible cable. If multi-stranded flexible cables must be used they must be fitted with suitable copper ferrules.

Earthing:

Earth Continuity - The main structure together with devices shall be provided with earth continuity in the form of copper bonding tape or cable connected to the earth busbar. Earth Busbar - A copper shall run the length of the FBA.

A main HDHC Earth Busbar shall run the full length of the switchboard and all metalwork shall be bonded to this. Doors shall be bonded by 1.5 sq.mm cross section minimum size flexible cable.

The size of the busbars shall be in accordance with the Switchgear COP and ETCI Wiring Regulations.

Digital electrical check meter:

An electricity check meter shall be installed in the new main distribution electrical board as indicated on the electrical schematic drawing.

Refer to section 62.12 below for further information on the digital check meter to be installed.

62.04 New ESB meter to be installed in the new electrical board

The building is currently served by four ESB meters. It is proposed to decommission and replace these meters with one new meter that shall be installed in external ESB cabinet.

The new ESB meter for the existing building shall be incorporated into the new main electrical distribution board as indicated on the drawings. The Contractor shall include for incorporating the new ESB meter and cut-out into the new electrical board. All works shall be in compliance with ESB Networks 'National Code of Practice for the Customer Interface'.



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The Contractor shall include for all provisions in respect of the above, whether explicitly stated or not, regarding sealable chambers and trunkings for ESB cut-outs, meters, etc. and no claims for extras, resulting from lack of sufficient information at tender stage, will be entertained at a later date.

ESB Networks will require a number of items to be completed so the Contractor shall allow for completing the following:

- Obtaining the ESB's approval of the main distribution electrical board and in particular the ESB meter location and cut-out location.
- ESB Networks will require at least 1000mm to the top of their cut-out which does not include the header trunking. ESB Meter cabinet supplier to allow for this.
- ESB Networks will only be supplying the cut-out and the ESB meter. All switchfuses, isolators, trunking, tails, etc. in the cabinet shall be supplied and installed by the Contractor. The Contractor shall allow for the supply and installation of these items.
- After the cut-out, the Electrical Contractor shall allow for the supply and installation of one main switch fuse (sealable) so that they can turn the power off to the building.
- The Contractor shall include for all provisions in respect of the above, whether explicitly stated or not, regarding sealable chambers, switchfuses, trunkings, etc. for ESB current transformers, meters, etc.

62.05 PC Sum for ESB Capital Contribution

A PC sum of €2,000 shall be included in the tender costs for the cost of the ESB capital contribution. This cost is indicated on the tender return document under section 62.06. This cost will be confirmed with ESB Networks during the construction phase.

62.06 Attendances to ESB Networks

As highlighted in section 62.07 above, the building is currently served by four ESB meters and it is proposed to decommission and replace these meters with one new meter that shall be installed in external ESB cabinet.

The new ESB meter for the existing building shall be incorporated into the new main electrical distribution board as indicated on the drawings. The Contractor shall include for incorporating the new ESB meter and cut-out into the new electrical board. All works shall be in compliance with ESB Networks 'National Code of Practice for the Customer Interface'.



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Therefore, as a result, ESB Networks will need to carry out the following works:

- Decommission and remove the existing 4no internal ESB meters.
- Supply and installation of a new ESB meter for the building in the new main distribution electrical board.
- All necessary cabling and attendances to the new ESB supply.

The Contractor shall allow for liaising with ESB Networks to get all the above works completed in order to get a new ESB meter for the building.

The Contractor shall include for all provisions in respect of the above, whether explicitly stated or not. No claims for extras, resulting from lack of sufficient information at tender stage, will be entertained at a later date.

The Contractor shall be responsible for liaising with ESB Networks on getting the new ESB supply to the new ESB meter for the building. The Contractor shall be responsible for completing the following tasks in order to get the new ESB meter installed for the building:

- On appointment to liaise with the ESB on getting the existing ESB meters decommissioned and the new ESB meter installed.
- To liaise with the ESB in order to ensure any capital contributions due are paid in good time so as not to delay the completion of the project.
- Liaise with ESB Networks on all required works.
- Liaise with the Employer's Representative to sign any paperwork required and forward all of same to the ESB.
- Provide for all necessary liaisons and attendances to ESB staff.
- Arrange for the ESB meter to be installed.
- Provide ETCI completion certificate to the ESB in sufficient time to enable the electrical supply to be obtained in accordance with the programme.

62.07 New sub-distribution electrical board for the new extension building

General:

The Electrical Contractor shall allow for the supply and installation of a new sub-distribution electrical board (NSDB-01) for the new extension building. The new sub-distribution electrical board shall be located in the classroom in the new extension building as indicated on the drawings.

See electrical schematic on drawing 61(E001) for details on the electrical board required.



New sub-distribution electrical board:

See drawings for location of the new sub-distribution electrical board and the electrical schematic for the type of board required. The Electrical Contractor shall supply, install, connect, test and commission the new sub-distribution electrical board (NSDB-01) as indicated on the drawings.

The assembly of the board shall adhere to the following specifications and shall have the following specifications:

- Wall mounted.
- Sheet steel cubicle with MCCB type cubical construction. The enclosure framework shall be of sheet steel construction, minimum of 2.5mm thickness, sprayed and stove enamelled. Doors and panels shall also be of sheet steel construction and be 1.5mm minimum thickness.
- The protection rating of the enclosure shall be minimum IP40 in accordance with IEC144.
- Board shall be supplied with a moulded case circuit breaker incomer.
- Type tested assembly.
- 630A rated busbar.
- Incoming cables shall be bottom entry and outgoing cables shall be top exit.
- The board shall be extensible at both ends and shall be of MCCB type wall mounted cubical construction.
- All panel sections providing direct access to live assemblies shall be openable only with a special tool.
- All panel sections accessing shrouded MCBs shall be provided with a handle for opening.
- The main board shall be manufactured to 'Form 3A' separation in accordance with IS EN 60439.
- The board shall be compliant with I.S. 10101:2020.
- Shall be suitable for a voltage of 630/230V (3 phase).
- Electronic surge protection shall be provided on the incoming mains and other incoming services to the electrical board as detailed in item '62.04'.

The Electrical Contractor shall provide with his tender the manufacturer's name and the overall dimensions of the new sub-distribution electrical board he/she proposes to supply and install. Detailed schematics shall be approved by Employer's Representative, prior to ordering of boards.

The Electrical Contractor shall not make site alterations unless authorised by the Employer's Representative. Where site modifications to assemblies are authorised, they are to be carried out in accordance with manufacturer's certified drawings and instructions. Ensure that modifications made comply with type test certificate obtained for arrangement of components.



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Acceptable board manufacturers are ABB, Davenham Engineering, LV Engineering or Jackson Switchgear, or equivalent.

Testing of new electrical board:

The new electrical board shall go through a rigorous pre-test check list and a thorough testing procedure to ensure that the product reaches the expected standards and safety expected. Test certificates shall be completed for all switchgear involved in this project and shall be signed off by both the switchboard technician that built the switchboard and the test engineer before final signoff by the director of the company. All test certification, copies of test sheets records and results associated with this project shall be submitted both in hard copy to form part of the O&M manual and electronic copy.

Miniature Circuit Breakers (MCB's):

The Electrical Contractor shall supply, install, connect, test and commission all the main circuit breakers as indicated for the new electrical board.

All circuit breakers shall generally be 'Type B' rated to at least 10kA, unless highlighted otherwise.

They shall conform to BS 3871 Part 1 and be of the sizes indicated in the drawings or accompanying schedules and be suitable for DIN rail mounting.

Where the prospective short circuit current exceeds the breaking capacity of the circuit breaker, back up protection by means of fuses shall be provided in accordance with Manufacturer's Recommendations.

Where possible, circuit breakers shall be of plug-in type, to allow replacement without undue difficulty.

Circuit breakers shall be Type B, C and D to ISEN60898 to the following table:

MCB'S SHALL BE TYPE B,C,D TO ISEN 60898 TO THE FOLLOWING TABLE		
TYPE	INSTANTANEOUS TRIP CURRENT	APPLICATION
B	5 x In	RESISTIVE LOADS
C	10 x In	DISCHARGE LIGHTING, SMALL MOTORS ETC.
D	20 x In	LARGE INDUCTIVE LOADS, LARGE MOTORS, WELDING PLANT, ETC.

NOTE: SIZES OF EARTHS TO CONFORM WITH THE FOLLOWING TABLE	
CROSS SECTIONAL AREA OF CONDUCTOR: S sqmm	CROSS SECTIONAL AREA OF CORRESPONDING PROTECTIVE CONDUCTOR.
S < 16	S
16 ≤ S < 35	16
S ≥ 35	0.5S



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Residual Current Breakers with Over-Current (RCBO's):

Combined MCB/RCD units shall be of the same manufacturer as the MCB's as identified above. They shall be double pole operated and protect against, overload, short circuit and earth leakage currents.

The RCD shall be electro-magnetically operated and comply with all relevant sections of BS 4293 and BS 3871. RCD's shall operate at 30mA.

Moulded Case Circuit Breaker (MCCB's):

The Electrical Contractor shall supply, install, connect, test and commission all the moulded case circuit breakers as indicated for the new sub electrical board.

MCCBs shall comply fully with IS EN 60947-2:2006 or equal and approved. The internal trip unit for the Main Incomer shall be electronic. Their contacts shall be capable of inspection.

When used as a main incoming device, MCCB's shall have a rated prospective short circuit current of not less than 40 kA at a power factor of 0.2, the internal trip unit for the Main Incomer shall be electronic and shall be tested to P2 category IEC157-1.

Load Break Switches

The Electrical Contractor shall supply, install, connect, test and commission all the load break switches as indicated for the new sub electrical board.

Load break switches shall be of the rotary air-break type and shall comply fully with IEC 408 or equal and approved.

Their prospective short circuit current rating shall be adequate for their duty. (For guidance see below) They shall have on/off indication and be complete with door interlock to prevent inadvertent contact with live parts and must be lockable in the off position.

- Switch Current Rating (Rated Current)
- Symmetrical Withstand
- Current (RMS – 1s)
- Up to 63 Amp 2.5kA
- Up to 100 Amp 4.0kA
- Up to 160 Amp 9.0kA
- Up to 250 Amp 13.0kA
- Up to 400 Amp 13.0kA



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Contactors:

Contactors shall comply fully with IEC158-1 or equal and approved.

They shall be rated for AC3 Category and shall have at least 1 N/O and 1 N/C spare auxiliary contacts.

Motor Starters:

Starters shall comply fully with IEC292-1 or equal and approved. They shall incorporate the following protection features: -

- Thermally delayed over-current release on all poles set to trip at 120% full load in two hours and incorporating temperature compensation.
- Positive protection against single phasing in the form of an extra differential tripping bar or similar approved device.
- Manual reset with protection against premature re-closing.

Push Buttons and Control Switches:

Push buttons shall be in accordance with IEC337 and IEC144 and have a protection rating of IP65. They shall be colour coded as follows:

- Start/On -Green.
- Stop/Off -Red.
- Reset -Yellow/Black.

Pilot Lights and Indicators:

Pilot lights shall be LED Type and in accordance with IEC337 and IEC144 and have a protection rating of IP65. Their maximum Voltage shall be 230V Volt but where possible they shall be of either 110 Volt or 24Volt, as specified. Neon indicators shall not be used. Pilot lights shall either be of LED, Transformer type or Series Resistor type.

Time Switches:

Time switches shall be digital 7-day, 24-hour type, complete with day omission and 36 hour spring reserve.

Instrumentation:

Instruments shall be provided where indicated and shall comply with IEC473 in all respects. They shall be of minimum 96mm x 96mm unless agreed otherwise with the Engineer and contain a modbus communication module. Instrument



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Transformers shall comply in terms of rated Current, rated Voltage, limits of error etc., with VDE 0414 and IEC 185.

Terminals:

Terminals shall be provided at top or bottom of cubicle as specified and shall comply with IEC 61032:1997.

All items of equipment shall be wired to these terminals and they shall be capable of accepting the incoming cable sizes as specified. They shall be of PVC grade and be identified by means of terminal numbers. The Manufacturer shall provide a terminal list, or numbered Drawing. Push-in type terminals are not acceptable.

Labelling:

All MCCB's, circuits and devices shall be provided with engraved plastic circuit labels. A main label to be provided in accordance with IEC 439, which gives details of voltage rating, current rating, class of equipment, fault rating and serial number.

Labels shall be provided on all chambers inside and outside the panel, indicating the function of every item. Labels shall be 'Traffolyte', black on white, screw on type, and shall be subject to the Engineer's approval.

Every control centre sub-circuit shall be labelled to indicate its function and rating and shall be suitably indicated on heat sealed chart.

Construction:

Busbars - To be manufactured from HDHC Copper and housed in separate compartments. Secondary busbars are considered a part of the main busbar system. All busbars shall have bolted joints. Phase and neutral busbars shall be fully rated throughout the length of the assembly.

Connections - To be HDHC Copper.

The structure is to be manufactured from sheet steel formed or folded to give an inherently rigid design.

Fuse Switches, MCCBs, Motor Starters and similar devices shall be designed on a common modular dimension and shall be dimensionally interchangeable. Segregation shall be provided between devices.

Finish - All main steelwork to be epoxy powder finish. Nuts, bolts and fasteners to have zinc plated finish. Main steelwork to be finished Light Grey (or otherwise approved).



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Cabling:

Glands and Sockets - To be provided by the installation Contractor and not by the switchgear manufacturer. Gland plates which shall be provided by the switchgear supplier, to be steel for multi-core cables and brass for single-core cables.

Load cables to ESB whole current meters or CT's must be of stranded copper conductor and not multi-stranded flexible cable. If multi-stranded flexible cables must be used they must be fitted with suitable copper ferrules.

Earthing:

Earth Continuity - The main structure together with devices shall be provided with earth continuity in the form of copper bonding tape or cable connected to the earth busbar. Earth Busbar - A copper shall run the length of the FBA.

A main HDHC Earth Busbar shall run the full length of the switchboard and all metalwork shall be bonded to this. Doors shall be bonded by 1.5 sq.mm cross section minimum size flexible cable.

The size of the busbars shall be in accordance with the Switchgear COP and I.S. 10101:2020.

New Incoming and Outgoing Sub-Mains Cables:

The Electrical Contractor shall supply, install, connect, test and commission the new incoming and outgoing sub-mains cabling to and from the new sub-distribution electrical board as indicated. Refer to the electrical schematic for details and sizes on all sub-mains cabling. Refer to the electrical drawings for lengths required and proposed routes of all sub-mains cabling.

Refer the sections 62.06 below for details on the sub-mains cabling required internally and externally.

Connection to the existing main-distribution electrical board in the existing school building:

Refer the sections 62.08 below for details on connecting the new sub-distribution electrical board in the new extension building to the existing main distribution electrical board in the existing school building.



62.08 Connection of new sub-distribution electrical board to the new main-distribution electrical board in the existing school building

The Electrical Contractor shall allow for connecting the following new electrical boards to the new main-distribution electrical distribution board in the existing building (NMDB-01):

- Allow for connecting the new sub-distribution electrical board (NSDB-01) for the new extension building to the new main-distribution electrical distribution board for the existing building (NMDB-01). Allow for connecting the new sub-mains cable from the new sub-distribution electrical board in the new extension to the circuit breaker in the new main-distribution electrical board in the existing school building. Refer to 62.01 for details on the new electrical board.

Allow for all sub-mains cabling, cable containment, labour, materials, etc. in connecting the new sub-mains cable for the new sub-distribution electrical boards to the existing main distribution electrical board in the existing building.

See schematic for size, type and length of cable required to the board. See drawings for locations of all new and existing electrical boards.

The Electrical Contractor shall carry include for a detailed survey of the existing main electrical board and circuits on their site visit to ensure that all the necessary works and wiring have been included for in their tender price.

62.09 Cable carrier LV and ELV in the new extension building

General:

The Electrical Contractor shall allow for supplying and installing new cable containment and cable carrier system for the new electrical services in the new extension as indicated on the drawings.

Trunking and Tray:

The primary trunking and cable tray routes for the new extension are as indicated on the drawings but these primary electrical routes are to be finalised and decided by the Electrical Contractor in conjunction with the Engineer.

All power, lightings, circuit wiring, etc. in the new extension of the building shall be installed in metal conduit, trunking, tray, etc. as described below. All sub-mains cabling in the new extension shall be installed on suitably sized tray as described below. The new containment routes on the drawings are indicative only. The Electrical Contractor shall allow for all necessary bends, offsets,



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crossovers, additional labour, etc. in installing the new cable containment in conjunction with the Mechanical Services.

The Electrical Contractor shall allow for visiting the site during the tendering period to review all necessary works that are involved in supplying and installing the necessary cable containment for the new electrical services.

The Electrical Contractor shall allow for all necessary brackets, unistrut, threaded rod, etc. in hanging the cable containment. Cable containment shall be properly aligned and securely fixed at regular intervals at 1000mm on straight runs. Where bends, angles or offsets occur, additional fixings shall be supplied at a distance not exceeding 150mm on each side of the accessory.

A space factor of minimum 40% must be allowed in all carrier systems. Overloading and under sizing of the cable carrier system will not be permitted.

Where trunking or cable tray systems pass through fire compartment boundaries, the Contractor is responsible for the internal fire stopping with a suitable approved material, and also the provision of a lid to cover cable tray at such points.

Before setting to work, the Contractor shall confirm with the Engineer the exact routes for conduits and final location of all wall-mounted devices. Particular care shall be taken to co-ordinate all services on site with the Consulting Engineer before commencing work.

A system of galvanised steel cable tray and trunking shall be installed to distribute sub mains, general and emergency lighting, power, fire alarm, public address and mechanical services control wiring throughout the new extension. Separate trunking shall be provided for data. Separate systems shall be segregated in accordance with the ETCI National Rules for Electrical Installations.

Cable containment shall be Uni-trunk or equivalent.

Information and communication technology cables shall be run on a separate cable tray system generally following the same service routes and they shall be separated from power distribution cables. Where crossovers are required, they shall be at 90° to the power cable route.

Cable capacities of conduit and trunking systems shall not exceed the requirements of the ETCI Specifications. It is the responsibility of the Electrical Contractor to verify that the trunking system as designed satisfies these regulations.



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If cables exceed the trunking capacities, the Electrical Contractor must bring this to the attention of the Engineer prior to order or installation of the trunking system.

Trunking and cable tray systems shall be free of sharp corners, edges or burrs, where cable insulation could be damaged. Cables shall be installed in a manner that will not damage or put undue physical strain on them.



Conduits:

All of the electrical installation below the ceiling in the new extension shall be surface mounted and as a result, all conduits shall be surface mounted throughout the extension. All surface mounted conduit to be installed in the new extension shall be steel conduit. Location of all surface mounted conduits to be discussed on site.

All conduits shall be galvanised welded steel to BSS 31 Class E for heavy gauge tubing as manufactured by ASCM or approved equal. 16mm outside diameter is the minimum size to be used. All inlet boxes, conduits shall be plugged or capped whilst waiting for further items to be attached.

The ends of every fitting, tube length or nipple are to be reamed and all threads to be coated with aluminium paint after assembly.

All fittings shall be installed so as to facilitate easy re-wiring. Inspection fittings shall be fitted at all bends, tees and elbows. Back entry elbows or tees shall be used, if necessary, to enable easy of accessibility without disturbing any plasterwork.

Inspection fittings shall be flush with the plasterwork and floorboards over conduit fittings shall be screwed in position. The complete conduit installation shall be finished before any wiring is pulled through. Allow for all junction boxes for jointing of conduits.



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The minimum spacing of conduit supports shall be as follows:

<u>Nominal Conduit Size</u>	<u>Spacing of Supports</u>
25 mm. and less	1.75 metres
25 mm. to 40 mm.	2.00 metres
Exceeding 40 mm.	2.50 metres



Conduit Fixing and Fittings

Surface conduit, where used, shall be run parallel to building elements and shall be fixed to the structure by means of galvanised spacing saddles affording a clearance of 3mm min. and spaced at 100mm min. Saddles shall be fixed with wooden plugs or rawl plugs as the surface permits. Where conduit is to be concealed in plasterwork, it shall be fitted using galvanised pipe hooks. Conduit boxes shall be fitted using brass round head screws.

Where conduits are fixed under flooring, which is supported on joists, cutting away shall be kept to an absolute minimum. The approval of the Employer's Representative must be sought prior to any notching.

Hanging of cable containment from ceiling:

The Electrical Contractor shall allow for hanging the new cable containment for the new extension shall be from the steel supports and installing suitable supports in order for the tray/trunking to be installed.

The cable containment shall be installed at approximately 3300mm above finished floor level in the attic space. Main runs of cable containment shall be installed in the attic space. Refer to drawings for the size, quantity, layout and routes of the cable containment.

In order to install the cable containment at high level in the attic space, the Electrical Contractor shall allow for the following:



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Containment within attic space:

- Dropping 10mm threaded rod from the ceiling slab at 1000mm distances over the length of the containment run. Allow for a drop of approximately 500mm.
- The threaded rod shall be hung from the steel structure via 10mm G-Clamps or supports shall be drilled into the ceiling for supports.
- The base supports for the cable containment shall be 41mm double channel unistrut. Supports shall be placed at 1000mm distances over the length of the containment run. Allow for a drop of approximately 500mm.
- Allow for connecting the threaded rods to the double-channel unistrut.

Containment within pitched ceiling:

- Dropping 10mm threaded rod from the ceiling slab at 500mm distances over the length of the containment run. Allow for a drop of approximately 80mm.
- The threaded rod shall be hung from the steel structure via 10mm G-Clamps or supports shall be drilled into the ceiling for supports.
- The base supports for the cable containment shall be 41mm double channel unistrut. Supports shall be placed at 500mm distances over the length of the containment run. Allow for a drop of approximately 500mm.
- Allow for connecting the threaded rods to the double-channel unistrut.

62.10 Cable carrier LV and ELV in the existing building

General:

The Electrical Contractor shall also allow for installing new cable containment and cable carrier system in the existing building for new electrical services to the new extension as indicated on the drawings.

The Electrical Contractor will need to connect to new electrical services for the new extension to a number of electrical systems and the new main electrical board in the existing school building. As a result, some new cable containment shall be required in the existing school building to cater for these new supplies.

The Electrical Contractor shall connect to the existing cable containment within the existing building in the locations as indicated.

Trunking and Tray:

The primary trunking and cable tray routes in the existing building are as indicated on the drawings but these primary electrical routes are to be finalised and decided by the Electrical Contractor in conjunction with the Engineer.



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All new cabling in the existing building shall be installed in metal conduit, trunking, tray, etc. as described below. All new sub-mains cabling in the existing building shall be installed on suitably sized tray as described below. Separate systems shall be segregated in accordance with the ETCI National Rules for Electrical Installations. Cable containment shall be Uni-trunk or equivalent.

The new containment routes on the drawings for the existing school building are indicative only. The Electrical Contractor shall allow for all necessary bends, offsets, crossovers, additional labour, etc. in installing the new cable containment in conjunction with the existing services and existing layout of the building.

The Electrical Contractor shall allow for visiting the site during the tendering period to review all necessary works that are involved in supplying and installing the necessary cable containment in the existing building as indicated.

The Electrical Contractor shall allow for all necessary brackets, unistrut, threaded rod, etc. in hanging the cable containment. Cable containment shall be properly aligned and securely fixed at regular intervals at 1000mm on straight runs. Where bends, angles or offsets occur, additional fixings shall be supplied at a distance not exceeding 150mm on each side of the accessory.

A space factor of minimum 40% must be allowed in all carrier systems. Overloading and under sizing of the cable carrier system will not be permitted.

Where trunking or cable tray systems pass through fire compartment boundaries, the Contractor is responsible for the internal fire stopping with a suitable approved material, and also the provision of a lid to cover cable tray at such points.

Before setting to work, the Contractor shall confirm with the Engineer the exact routes for conduits and final location of all wall-mounted devices. Particular care shall be taken to co-ordinate all services on site with the Consulting Engineer before commencing work.

Information and communication technology cables shall be run on a separate cable tray system generally following the same service routes and they shall be separated from power distribution cables. Where crossovers are required, they shall be at 90° to the power cable route.

Cable capacities of conduit and trunking systems shall not exceed the requirements of the ETCI Specifications. It is the responsibility of the Electrical Contractor to verify that the trunking system as designed satisfies these regulations. If cables exceed the trunking capacities, the Electrical Contractor must bring this to the attention of the Engineer prior to order or installation of the trunking system.



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Trunking and cable tray systems shall be free of sharp corners, edges or burrs, where cable insulation could be damaged. Cables shall be installed in a manner that will not damage or put undue physical strain on them.



Conduits:

All of the electrical installation below the ceiling in the existing building shall be surface mounted and as a result, all conduits shall be surface mounted throughout the building. All surface mounted conduit to be installed in the existing building shall be steel conduit. Location of all surface mounted conduits to be discussed on site.

All conduits shall be galvanised welded steel to BSS 31 Class E for heavy gauge tubing as manufactured by ASCM or approved equal. 16mm outside diameter is the minimum size to be used. All inlet boxes, conduits shall be plugged or capped whilst waiting for further items to be attached.

The ends of every fitting, tube length or nipple are to be reamed and all threads to be coated with aluminium paint after assembly.

All fittings shall be installed so as to facilitate easy re-wiring. Inspection fittings shall be fitted at all bends, tees and elbows. Back entry elbows or tees shall be used, if necessary, to enable easy of accessibility without disturbing any plasterwork.

Inspection fittings shall be flush with the plasterwork and floorboards over conduit fittings shall be screwed in position. The complete conduit installation shall be finished before any wiring is pulled through.

Allow for all junction boxes for jointing of conduits.

The minimum spacing of conduit supports shall be as follows:



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<u>Nominal Conduit Size</u>	<u>Spacing of Supports</u>
25 mm. and less	1.75 metres
25 mm. to 40 mm.	2.00 metres
Exceeding 40 mm.	2.50 metres



Conduit Fixing and Fittings

Surface conduit, where used, shall be run parallel to building elements and shall be fixed to the structure by means of galvanised spacing saddles affording a clearance of 3mm min. and spaced at 100mm min. Saddles shall be fixed with wooden plugs or raw plugs as the surface permits. Where conduit is to be concealed in plasterwork, it shall be fitted using galvanised pipe hooks. Conduit boxes shall be fitted using brass round head screws.

Where conduits are fixed under flooring, which is supported on joists, cutting away shall be kept to an absolute minimum. The approval of the Employer's Representative must be sought prior to any notching.

Hanging of cable containment from ceiling:

The Electrical Contractor shall allow for hanging the new cable containment for the Ground Floor concrete slab and installing suitable supports in order for the tray/trunking to be installed.

The cable containment shall be installed at approximately 3000mm above finished floor level in the existing building.

Main runs of cable containment shall be installed in the ceiling void. Refer to drawings for the size, quantity, layout and routes of the cable containment.

In order to install the cable containment at high level in the ceiling void of the existing building, the Electrical Contractor shall allow for the following:

- Dropping 10mm threaded rod from the ceiling slab at 1000mm distances over the length of the containment run. Allow for a drop of approximately 500mm.



- The threaded rod shall be hung from the ceiling slab via 10mm G-Clamps or supports shall be drilled into the ceiling for supports.
- The base supports for the cable containment shall be 41mm double channel unistrut. Supports shall be placed at 1000mm distances over the length of the containment run. Allow for a drop of approximately 500mm.
- Allow for connecting the threaded rods to the double-channel unistrut.

62.11 Sub-mains cables internally

General:

The Electrical Contractor shall supply, install, connect, test and commission all new sub-mains distribution cables for the building. Refer to drawing 61(E001) for the information on the type and size of all sub-mains cabling to be provided from the electrical boards to the different items in the building.

For reference, the Electrical Contractor shall allow for the supply and installation of the following sub-mains cabling in the building:

- 3core 10mm² sub-mains cable incl. earth (sub-mains cable as specified below) from the new sub electrical board in the extension of the building to the inverter for the PV panels in the attic of the extension. Refer to the drawings for route and size of cable required.
- 3core 25mm² sub-mains cable and 25mm² earth (sub-mains cable as specified below) from the existing new main electrical board in the existing building to the new sub electrical board in the extension. Refer to the drawings for route and size of cable required.

Sub-mains cable specification:

Cables shall be of type and size indicated on the drawings and shall be laid on cable trays or run in pipe ducts over the entire length of the cable run. The Electrical Contractor shall provide all cable supports and cable glands necessary for correct installation and termination of the cables.

Sub-mains cable shall adhere to the following specifications:

- **Composition:** Manufactured to BS 6724 Table 6 (2 Core) Table 8 (3 Core) Table 10 (4 Core) Table 13 (5 Core)
- **Type:** Plain Annealed Copper Conductor / XLPE Insulated / LSNH Bedded / Galvanised Steel Wire Armour / LSNH Sheathed. 600/1000V
- **Conductor:** Plain Annealed Copper Class 2 Stranded to BS EN 60228



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- Insulation: Thermosetting XLPE Type GP8 to BS 7655-1.3
- Bedding: Compatible LSNH Polymeric Material (LSNH)
- Steel Wire Armour: Galvanised Steel Wire
- Sheathing: LSNH Type LTS1 to BS 7655-6.1
- Current Ratings: For current ratings refer to table 4E4A of BS7671 IEE Wiring Regulations Seventeenth Edition.

Sub-mains cables and sub-distribution cables shall be 4 Core Cu-PVC XLPE SWA with separate CPC's for cables over 16.0 sq.mm, and 5 Core Cu-PVC SWA for cables of 16.0sq.mm or less. Cables shall be sized as scheduled on the electrical drawings.

Internal sub-mains cables and sub-distribution cables shall be fixed to cable tray. Cable tray shall be perforated type, galvanised medium gauge sheet steel. Sub-mains cables and sub-distribution cables shall be installed on cable trays at a spacing of twice the diameter of the larger adjoining cable with nylon cable ties. Sub-mains cable distribution within the building shall be XLPE insulated, steel wire armoured, LSNH sheathed cable that shall be installed directly on steel cable tray.

A separate CPC shall be installed with every sub-mains feed and should be of the size detailed in the distribution drawings. The armour of the cable should also be bonded at both ends to the distribution equipment by means of a nut and bolt through a tab linked to the earth bar.

The objective of the system is to provide an efficient and effective system for the distribution and support of small power requirements.

The design parameters are defined within the ETCI National Rules for Electrical Installations.

All cables shall have stranded or flexible copper conductors and LSF or heat resisting insulation to suit the particular application.

Cable carriers for incoming mains cables must be complete with lid. Under no circumstances will exposed cables be acceptable in any location throughout the building.

Information and communication technology cables shall be run on a separate cable tray system generally following the same service routes and they shall be separated from power distribution cables. Where crossovers are required, they shall be at 90° to the power cable route.



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Segregation, Concealment and Re-Wiring:

The Electrical Services Specialist shall comply with ET101 when wiring installations. Circuits shall be segregated as indicated. Draw wires shall be left within empty conduits for use of specialist installers. Draw wires comprising nylon tapes with fitted eyelets shall be used by the Electrical Contractor.

For concealed conduit the Electrical Contractor shall ensure that the system is installed to enable re-wiring to be carried out from boxes for fittings or accessories only.

Draw-in boxes will only be permitted with prior permission in writing. The Electrical Contractor shall not use tallow or any other substances to facilitate drawing-in of cables.

Cable containment:

Suitable cable tray shall be supplied and installed for all new sub-mains cabling in the new extension of the building and the existing switch room building.

Refer to section 62.09 and 62.10 for further information.

62.12 Internal sockets and spurs

Standalone internal sockets:

The Electrical Contractor shall allow for the supply and installation of all new standalone internal sockets as indicated on the drawings. See drawings for quantities and the locations of the new power and general services that are to be installed for the building.

Sockets that are to be installed on dado trunking are highlighted in 62.13 below.

The Electrical Contractor shall supply, install, connect, test and commission the standalone general service socket outlets installation as indicated on the drawings for the areas.

General services wall/floor mounted outlets shall be single or twin switched 13A 3 pin type mounted on suitable conduit boxes. Sockets are to be located 450mm generally above finished floor level and 200mm above worktops. The main earth terminal on all sockets shall be connected to the earth terminal in the conduit box.

All conduits below the ceiling throughout the new extension shall be exposed and surface mounted. Therefore, all standalone electrical sockets, spurs, isolators, etc. shall be surface mounted.



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Wiring to the sockets shall be as highlighted below.

The new electrical distribution system shall be installed in a steel conduit/trunking system throughout.

Surface mounted switched socket outlets shall be from the MK Albany Plus (Brushed Stainless Steel) range as K2958 BSS (1 gang) or MK Albany Plus K2947 BSS (2 gang), or equivalent. Mounting boxes to be K829 ALM (1 gang) or K830 ALM (2 gang), or equivalent.

Please note that all sockets shall adhere to Building Regulations Part M. Therefore, all sockets shall adhere to the following specification:

- Single socket shall be as K2958 BSS, or equivalent.
- Double socket shall be as K2947 BSS, or equivalent.
- All sockets shall be of brushed stainless steel finish.
- Surface mounting box for single socket shall be as K829 ALM, or equivalent. Mounting box to be supplied without knockouts.
- Surface mounting box for double socket shall be as K830 ALM, or equivalent. Mounting box to be supplied without knockouts.
- All double sockets shall have outboard rocker switches as highlighted in image below.
- All rocker switches shall have neon indicators in the switch rockers to indicate that they are on.
- The rockers on the socket shall contrast with the colour on the socket.



Sockets below counters:

Where sockets are to be located below counters and in presses, the Electrical Contractor shall include for the supply and installation of a double pole isolation switch for each socket above the counter and connection of that switch to the socket for isolation.

All isolators shall be as manufactured by MK Albany Plus and finished in brushed stainless steel, or equivalent.

Wiring to the sockets shall be as highlighted below.

All double pole isolation switch shall adhere to the following:



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- Isolation switch shall be as K961 BSS, or equivalent. All switches shall be of brushed stainless steel finish.
- Supplied with 13amp fuse with fuse holder.
- Isolation switch shall have a neon indicator in the switch rocker to indicate that they are on.
- Surface mounting box for single switch shall be as K829 ALM, or equivalent. Mounting box to be supplied without knockouts.



Unswitched fused spur outlets:

The Electrical Contractor shall include for the supply, erection and wiring of all new unswitched fused spur outlets for connection to electrical control/equipment panels throughout the new extension.

All spur outlets shall be as manufactured by MK Albany Plus and finished in brushed stainless steel, or equivalent.

All unswitched fused spur outlets shall adhere to the following:

- Spur outlet shall be as K978BSS, or equivalent. All spur outlets shall be of brushed stainless steel finish.
- Supplied with 13amp fuse with fuse holder.
- Supplied with flex outlet.
- Fused spur outlet shall have a neon indicator to indicate that they are on.
- Surface mounting box for single switch shall be as K829 ALM, or equivalent. Mounting box to be supplied without knockouts.

Connection to all equipment shall be by fixed spur outlet, mounted in line with the equipment on the drawings. Wiring to the fused spurs shall be as highlighted below.





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Switched fused spur outlets:

The Electrical Contractor shall include for the supply, erection and wiring of all new switched fused spur outlets for connection to electrical control/equipment panels throughout the new extension.

All spur outlets shall be as manufactured by MK Albany Plus and finished in brushed stainless steel, or equivalent.

All spur outlets shall adhere to the following:

- Spur outlet shall be as K961 BSS, or equivalent. All outlets shall be of brushed stainless steel finish.
- Supplied with 13amp fuse with fuse holder.
- Isolation switch shall have a neon indicator in the switch rocker to indicate that they are on.
- Surface mounting box for single switch shall be as K829 ALM, or equivalent. Mounting box to be supplied without knockouts.



Connection to all equipment shall be by fixed spur outlet, mounted in line with the equipment on the drawings. Wiring to the fused spurs shall be as highlighted below.

Isolators

A number of single phase and three phase isolators shall be installed in the building as indicated on the drawings. The Electrical Contractor shall allow for the supply, installation and cabling of these isolators as indicated on the drawings.

All three-phase and single-phase isolators shall have a red lockable switch on a yellow enclosure. The isolators shall also have an on/off indicator. The housing shall be ABS enclosure and shall be flame retardant. Isolators shall be as Santon, or equivalent.

Refer to the drawings for the size and fuse rating of the isolators.



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Wiring:

Wiring shall be carried out in radial circuits. Refer to section 62.19 for details on the cabling and wiring required.

All final sub-circuit cables for power shall be single core low smoke and zero halogen (LSZH) insulated type cable.

Circuiting shall be as indicated on the drawings and each circuit shall be protected by a 20A RCBO. The maximum no. of sockets shall be 6no. twin sockets per final circuit. All wiring shall be carried out to current standards and regulations.

All final circuit wiring for internal sockets shall be completely enclosed in surface-mounted conduit or in dedicated mains only trunking system.

Cable sizes shall be as follows:

- 16amp radial circuits: 4.0mm²/4.0mm² CPC
- 20amp radial circuits: 4.0mm²/4.0mm² CPC
- 32amp radial circuits: (non cooker) 6.0mm²/6.0mm² CPC

Power outlets to fans, air-conditioning units, water boilers and cookers shall be switched with neon indicator.

The Electrical Contractor shall co-ordinate fully to ensure no sockets are located behind radiators or cupboards.

All general power circuits shall be provided with combined MCB/RCDs giving distinction between MCB and RCD tripping. All circuits supplying socket outlets shall be individually protected by a 30 mA RCD.



62.13 Power installation on dado trunking

General:

The Electrical Contractor shall supply, install and fit the dado trunking installation as indicated on the drawings. All dado trunking shall be 3-compartment dado trunking arrangement. Refer to the drawings for quantity, locations, drops, etc. for the dado trunking arrangement in the new extension.

Dado trunking shall generally be wall mounted which shall be mounted and fixed directly to the wall. Allow for dado trunking drop from ceiling void to low level dado trunking.

The Electrical Contractor shall allow for the dado trunking arrangement at the teaching wall in the classroom as indicated on the drawings. Refer to the details on drawing 62(E001) for layout and arrangement of the dado trunking at the teaching wall.

Where dado trunking is to be installed above desks, the bottom of the dado trunking shall be 150mm above desk height.

Dado trunking:

The Electrical Contractor shall allow for the supply and installation of all dado trunking as indicated on the drawings. Dado trunking shall adhere to the following specifications:

- Wall mounted dado trunking shall be MK 'Prestige 3D Compact' (or equivalent).
- 3-compartment dado trunking.
- 140mm x 45mm.
- Dado trunking shall complete with all necessary corner pieces, stop ends, couplers etc.
- Allow for all additional lengths of vertical trunking required to route cabling to ceiling level to distribution board.





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Sockets on dado trunking:

The Electrical Contractor shall supply, install, connect, test and commission the general service socket outlets on the dado trunking as indicated on the drawings and schedules. Refer to the drawings for quantities, locations and types of sockets required on the dado trunking.

All double sockets shall have outboard rocker switches as highlighted in image below.

Please note that all sockets shall adhere to Building Regulations Part M.

Therefore, all sockets shall adhere to the following specification:

- Single socket shall be as MK Logic Plus K2757 WHI, or equivalent.
- Double socket shall be as MK Logic Plus K2746 WHI, or equivalent.
- All sockets shall be recessed into the dado trunking.
- All sockets shall be of white finish.
- Mounting frames/boxes shall be VCT-121 WHI (1 gang) or VCT-121 WHI (2 gang), or equivalent.
- All double sockets shall have outboard rocker switches as highlighted in image below.
- All rocker switches shall have indicators in the switch rockers to indicate that they are on.



IT points on dado trunking:

A number of IT and telephone points shall be installed and recessed in the dado trunking as indicated on the drawings. The Electrical Contractor shall allow for installing all required back boxes, face plates, RJ45 outlets, etc. Refer to the drawings for quantities, locations and types of sockets required on the dado trunking.

Allow for supplying and installation all mounting frames/boxes for all new IT points on the dado trunking. Mounting frames/boxes shall be VCT-121 WHI (1 gang) or VCT-121 WHI (2 gang), or equivalent.



Refer to section 64.01 for information on the cabling and faceplates for the IT installation.

62.14 CO2 monitor

General:

The Electrical Contractor shall allow for the supply and installation of a CO2 monitor in the classroom as indicated on the drawings.

The teaching space shall be fitted with a CO2 monitor that shall include an LED display. The single wall mounted self-contained unit shall consist of a CO2 sensor enclosure and a LED display and all associated electronics.

The unit shall be located at the teaching wall facing the body of the classroom. The display colour will be capable of changing from Green to Amber and Red to indicate CO2 levels, thus providing easy visual indication as well as specific readings.

The LED colour indicator should be capable of being easily identifiable from the rear of the classroom.

The system will enable the teaching space users to be aware when the desired levels are breached so that the necessary intervention via opening windows for ventilation can take place to maintain the comfort levels and air quality.

A laminated A4 size label (screwed at the four corners to the wall) incorporating clear and simple advice and instructions on how the teaching space can be operated efficiently with regard to heating, lighting and ventilation during school hours shall be located in a suitable location near the door of the teaching space.

It is paramount that all staff are provided with full user training and demonstration of these systems as part of the handover requirements.

The parameters and sensor settings should be as follows;



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Carbon Dioxide (CO₂) Traffic Light Display Indicator Ranges

Optimum Range <1500ppm

Green	Amber	Red
<1500ppm	1500 to 2000ppm	>2000ppm

Equipment:

The Electrical Contractor shall allow for supplying and installing a CO₂ monitor in each classroom in the location as indicated on the drawings. Each CO₂ monitor shall be as Honeywell 'IAQPoint2Touch', or equivalent.

Honeywell



IAQPoint2™ SPECIFICATIONS

Touchscreen Indoor Air Quality Monitor

Model	IAQPoint2 with CO ₂ Sensor	IAQPoint2 with VOC Sensor
Gases	CO ₂	Volatile Organic Compounds (VOC)
Detection Method	Non-dispersive Infrared (NDIR) with ABC automatic background calibration algorithm	Metal oxide semiconductor (MOS)
Range	0-2,000 ppm 0-5,000 ppm	0-100 (400-2,000 ppm CO ₂ Equivalent)
Accuracy*	±30 ppm +3% of reading @ 25°C for 0-2000 ppm; ±30 ppm +5% of reading @ 25°C from 2000 to 5000 ppm	
Response Time	T ₉₀ < 60 seconds	T ₉₀ < 60 seconds
Calibration	No Calibration Required	No Calibration Required
Temperature Sensor		
Detection Method	Band Gap	
Accuracy	±0.5°C at 25°C and 50% rh	
Humidity Sensor		
Detection Method	Capacitive Type	
Range	0-95% rh	
Accuracy	±5% at 25°C and 50% rh	
System Operation		
Temperature	32" to 122°F (0" to 50°C), 32" to 104°F (0" to 40°C) for VOC Wall mount configurations	
Humidity	0 to 95% rh, Non-condensing	
Power In	20 to 30 VAC, 10 to 20 VDC	
Consumption	200 mA @ 24 VDC	
Dimensions	3.0 (w) x 4.6 (h) x 1.5 (d) in (11.8 x 7.7 x 3.7 cm)	
Weight	44 lbs (20 kg)	
Enclosure	ABS	
Display	TFT, Multicolor graphical touch screen display: 1.9 (w) x 2.6 (h) in (4.9 x 6.5 cm) (Optional with Analog units)	
Languages	English, French for first release	
Outputs		
Analog	4-20 mA, 2-10 VDC fixed	
Digital	Modbus RTU, BACnet MS/TP, BTL listed, LonWorks, LonMark certified	
Relay	3 Amps, 250 VAC resistive, and 30 VDC SPDT, Field configurable set point & hysteresis	
Override	Selectable on Display Units	
Mounting Options		
Wall Mount	P22	
Duct Mount	P54	
Certifications		
US	ANSI/UL 61010-1	
Canada	CAN/CSA C22.2 No. 61010-1	
Europe	CE	
Warranty	1 year	



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62.15 Attendances to mechanical ventilation

General:

The Electrical Contractor shall allow for the wiring of all extract fans and associated controls as indicated on the drawings. All extract fans and associated controls shall be supplied and fitted by the Mechanical Contractor. The Electrical Contractor shall allow for the wiring of all extract fans and associated controls.

Extract fans for toilets:

The Electrical Contractor shall allow for the wiring of all extract fans for the toilets as indicated on the drawings, which shall be supplied and fitted by the Mechanical Contractor. In total there are 6no extract fans to be supplied and fitted by the Mechanical Contractor in the toilets. Extract fans and incorporated PIR sensor shall be installed in the following toilets:

- Toilet Cubicles.

The Electrical Contractor shall allow for the following attendances in wiring each fan in each toilet:

- The extract fan shall be supplied and installed by the Mechanical Contractor. However, the Electrical Contractor shall allow for the wiring of all the extract fan as indicated on the drawings. Electrical power supplies to each fan shall be 230VAC 50 Hz c/w 13amp spur and shall be supplied as part of the electrical contract.
- Allow for the power supply to all extract fans from the new sub electrical board in the extension of the building. Wiring to each extract fan shall be carried out using 4.0mm² in LSOH. Wiring shall be exactly to supplier's instructions. Refer to section 62.19 for details on cabling.
- All wiring from each fused spur to each extract fan shall be installed in steel conduit. Refer to section 62.12 for details on spur outlets.
- Any other works deemed necessary for the wiring of the fans and the PIR sensors.



62.16 Attendances to the two-port valves and local room stats

The Electrical Contractor shall allow for the wiring of all two-port valves and associated wall stats in the room as indicated on the drawings.

Allow power supplies to all valves/thermostats and control wiring between all valves/thermostat. See drawings for the quantities and locations of all two-port valves and thermostats.

The Electrical Contractor shall include for the following electrical attendances to each 2-port valve and thermostat arrangement in the rooms as indicated (see drawings for quantities):

- 230V power supply via a 13 amp unswitched spur for the 2-port valve which shall be installed at high level in the ceiling void. Final location of spur to be confirmed with the system installer. Refer to section 62.12 for information on spur required.
- 3-core 4.0mm² LSZH cable from the wall mounted thermostat to the 2-port valve in the ceiling void. The thermostat shall be located at 1100mm above finished floor level. Refer to the drawings for the location of the thermostat and the length of cabling required.
- Wiring installed in steel conduit from the 2-port valve to the thermostat. Include for all necessary cable containment.
- Wiring shall be taken from the new electrical boards in the building which are indicated on the drawings.

Wiring shall be by the Electrical Contractor and shall be exactly to supplier's instructions. The Electrical Contractor shall liaise with the supplier regarding installation of equipment.

62.17 Supply and installation of the Photovoltaic Panels (PV)

General:

The Electrical Contractor shall allow for the supply and installation of photovoltaic panels (PV panels) on the roof of the new extension for supplementary electrical supply to the building. Refer to the drawings for further information on the location of the PV panels on the roof.

The Electrical Contractor shall employ a specialist PV installer to install the PV panel array as indicated on the drawings.

The PV installer shall be a SEAI registered installer for the supply and installation of the PV Panels.



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PV Installation:

The PV panel specialist shall be procured by the Electrical Contractor to allow for the supply and installation of the 6no PV Panel array and all associated works.

The PV panel specialist shall include for the following works:

- Supply and installation of 6no PV panels on the roof of the new extension as indicated on the drawings. Refer to the specification for the type of inverter required.
- Supply and installation of a suitably sized inverter for the PV panel array.
- Supply and installation of the necessary roof mounting system, cable containment, bracing, structure, etc. on the roof to cater for the 6no PV panel arrangement.
- An emergency isolation point for the isolation of the PV panels.
- Include for all mounting rails and support structure for the installation of the 6no PV panels.
- Include for liaising with the Main Contractor on the installation of the panels on the roof.
- Allow for the design and installation of the system for the building.
- Allow for all sub-mains cabling between the panels.
- Allow for all sub-mains cabling to the existing main electrical board in the building.
- Allow for the connection of the PV panel system to the existing main electrical board and electrical system in the building.
- Include of all scaffolding, cherry pickers, lifting equipment, etc. for the installation of the PV panels on the roof.

PV Arrangement:

The Electrical Contractor shall allow for the supply and installation of 6no photovoltaic panels (PV panels) on the roof of the building for supplementary electrical supply to the building.

The PV panels shall be located on the roof of the new extension of the building as indicated on the drawing 66(E002).

The PV panels shall be installed on the roof in a south facing orientation.

The Electrical Contractor shall allow for the supply and installation of the 6no PV panels and they shall be installed in 1no row with 6no PV panels in the row.

The Contractor shall allow for the supply and installation of the necessary roof mounting system, cable containment, bracing, structure, etc. on the roof to cater for the 6no PV panel arrangement.



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Survey:

The PV panel specialist shall allow for carrying out a site survey and investigation of the building before any PV panels or equipment are ordered.

PV Panels Specification:

PV Panel Performance & Design:

The PV panels shall be a high-performance solar module. The PV panels shall have a performance output of up to 370Wp and shall have a static front load of up to 6,000Pa.

The Electrical Contractor shall also require that the panels shall have a warranty of 25 years.

The Electrical Contractor shall ensure that the busbars on the panels are located on the rear of the cells and this will ensure that the front of the cells are fully exposed to light. This shall also allow for additional busbars to be installed on each module instead of the busbar being installed on the front of the PV panels.

As highlighted above, the Electrical Contractor shall allow for the supply and installation of 6no PV panels on the roof as indicated on the drawings.

Each PV panel shall adhere to the following specification:

Mechanical Properties of PV panel:

• <u>Quantity:</u>	6no
• <u>Cells:</u>	6 x 10
• <u>Cell Vendor:</u>	LG
• <u>Cell type:</u>	Monocrystalline/N-type
• <u>Cell dimensions:</u>	161.7mm x 161.7mm
• <u>No. of busbars:</u>	30 (Multi Ribbon Busbar)
• <u>Dimensions:</u>	1700mm x 1016mm x 40mm
• <u>Front Load:</u>	6,000Pa
• <u>Rear Load:</u>	5,400Pa
• <u>Weight:</u>	18.5kg
• <u>Connector Type:</u>	MC4, 05-8
• <u>Junction Box:</u>	IP68 with 3 Bypass Diodes
• <u>Cables:</u>	1,000mm x 2ea
• <u>Frame:</u>	Anodized Aluminium
• <u>Glass:</u>	High transmission tempered glass



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Electrical Properties of PV Panel:

• <u>Model:</u>	LG370Q1C-A5
• <u>Maximum Power (PMax):</u>	370W
• <u>MPP Voltage (Vmpp):</u>	37.0V
• <u>MPP Current (Impp):</u>	10.01A
• <u>Open circuit current (Voc):</u>	42.8V
• <u>Short circuit current (Isc):</u>	10.82A
• <u>Module Efficiency:</u>	21.4%
• <u>Operating temperature:</u>	-40~+90
• <u>Maximum system voltage:</u>	1,000V
• <u>Maximum series fuse rating:</u>	20A
• <u>Power tolerance:</u>	0~+3

Certification:

- IEC61730 safety rated for high wind pressure, hail impact, snow load and fire. Certified against Salt mist corrosion for coastal areas.
- Certified against Ammonia corrosion for agricultural installations.
- CE Marked.
- Fire safety certified.

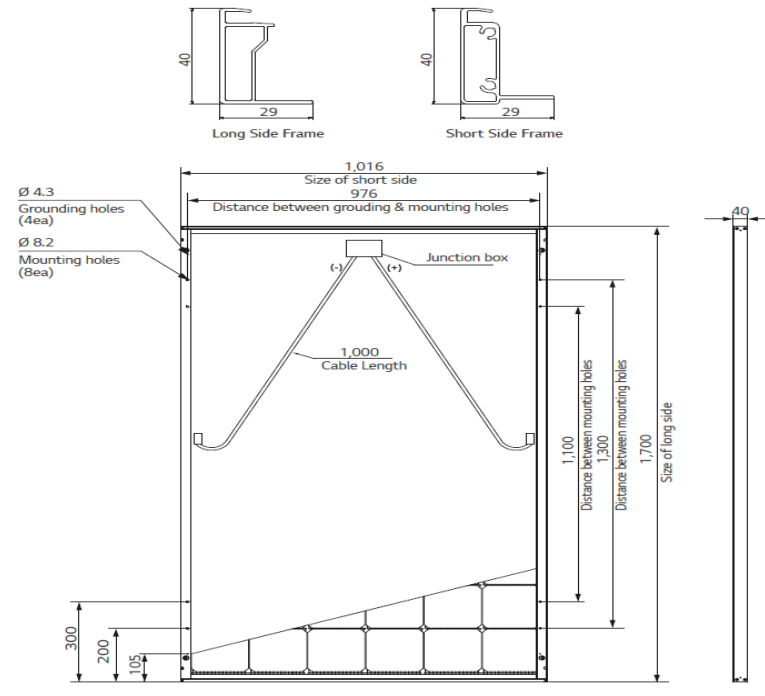




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PV Panel Dimensions:



Inverter for PV Panels:

The PV specialist shall allow for the supply and installation of an inverter for the PV panel system. The inverter is located as indicated on the drawings.

The inverter shall be a three-phase inverter and shall be supplied as part of the PV package. The inverter shall meet the following criteria which is as follows:

Inverter Output:

- Rated AC power output: 8000 VA
- Maximum AC power output: 8000 VA
- AC output Voltage – Line to Line: 380/220 ; 400/230 Vac
- AC output power – Line to Neutral: 184 – 264.5 Vac
- AC Frequency: 50/60 $\pm$ 5 Hz
- Maximum continuous output current: 13A
- Grids supported – Three phase: 3/N/PE (WYE with Neutral)
- Utility Monitoring Islanding protection: Yes



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Inverter Input:

- Maximum DC power (Module STC): 10800W
- Transformer-less Ungrounded: Yes
- Maximum Input Voltage: 900 Vdc
- Nominal DC Input Voltage: 750 Vdc
- Maximum input current: 13.5 Adc
- Reverse-Polarity protection: Yes
- Ground-Fault isolation detection: 700k Ω Sensitivity
- Maximum Inverter Efficiency: 98%
- European Weighted Efficiency: 97.6%
- Nighttime power consumption: < 2.5 W

Additional Features:

- Supported communication Interfaces: RS485, Ethernet, Wi-Fi (requires antenna), ZigBee (Optional),
- Smart Energy Management: Export Limitation, Home Energy Management (Device Control).
- Inverter Commissioning: With the setup mobile application using built-in Wi-Fi access point for local connection.

Standard compliance for Inverter:

- Safety: IEC-62103 (EN50178), IEC-62109
- Grid Connection Standards: VDE 0126-1-1
VDE-AR-N-4105
AS-4777
G83/G59
- Emissions: IEC61000-6-2
IEC61000-3-11
IEC61000-3-12
FCC part15 class B
- RoHS: Yes



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Inverter Installation Specification:

• <u>AC Output:</u>	Cable Gland (diameter 15-21 mm)
• <u>DC Input:</u>	2 MC4 pairs
• <u>Dimensions:</u>	540 x 315 x 191 mm
• <u>Weight:</u>	16.4mm
• <u>Operating Temperature Range:</u>	-40 to +60 °C
• <u>Cooling:</u>	Internal Fan
• <u>Noise:</u>	< 40 dBA
• <u>Protection Rating:</u>	IP65
• <u>Mounting:</u>	Brackets Provided

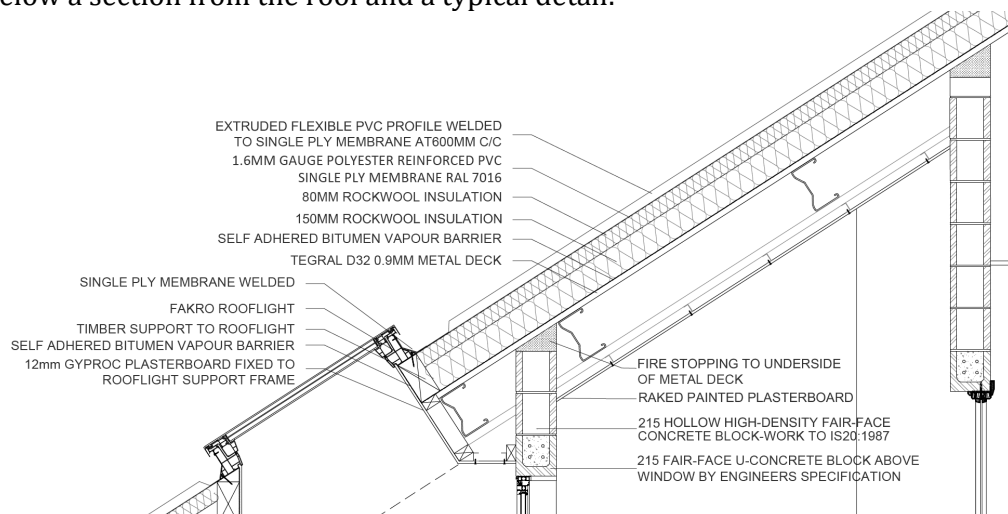
The inverter shall be as specified above as **Solaredge SE8K**, or equivalent.



Roof that the PV panels are to be installed on:

The roof that the PV panels are to be installed on is a single ply metal deck roof.

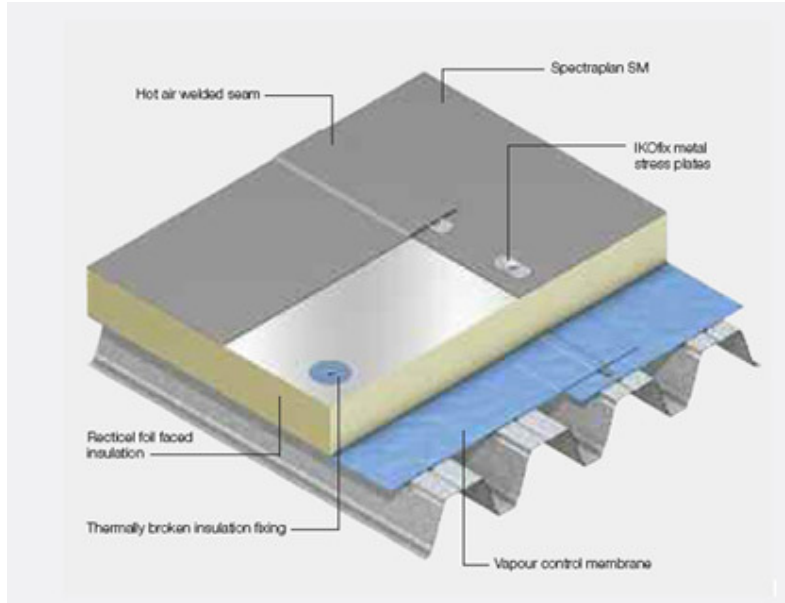
The roof shall consist of a 32mm metal deck on which a vapour control layer shall be installed on. Over this vapour proof layer, insulation shall be installed and to protect the insulation a 1.6mm PVC profile covering shall be installed. See below a section from the roof and a typical detail:





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In order to mount the PV panels on the single ply roof, the bracketing system will need to be secured back to the metal supporting deck.

Bracketing system:

The PV specialist that will be installing the PV panel array on the roof shall allow for installing the PV system on the roof of the new extension. As highlighted above, the panel for the roof is a single ply metal deck roof so special fixing brackets shall be required to fix the panels to the roof.

See details of the roof make-up above. In order to mount the PV panels on the single ply roof, the bracketing system will need to be secured back to the metal supporting deck. The roof specialist suggest using a SUNFIXINGS-Hook-Plate-mounting system or similar in order to mount the panels on the roof. See details below of the system.

Allow for using a fixed frame south facing at a 33° pitch to allow for the installation of the 6no. new PV panels.

Refer to the drawings for further information on location, layout and quantities.

See below images of how the PV panels are fixed to this type of roof.

The PV installer shall include for all brackets, fixings, rails, clamps, etc. in order to install the mounting frame and rails for the PV system.

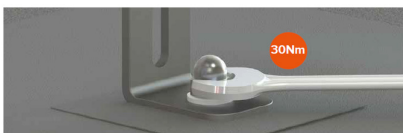
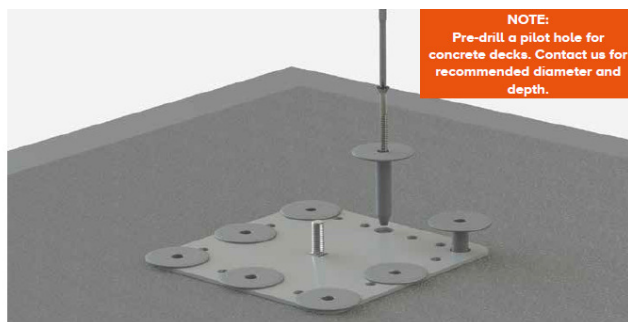
The PV Specialist shall allow for the supply and installation of the 6no PV panels and they shall be installed in 1no row with 6no PV panels in the row.



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HOOK PLATE





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Testing and Commissioning:

The PV panel specialist shall allow for the testing and commissioning of the PV panel system and all associated works for the successful handover of the PV panel system.

62.18 Attendances to the new magnetic door hold open devices

There is a magnetic door hold open device installed in the new extension of the building in the location as indicated on the drawing. This shall be wired from the existing main sub-distribution board in the new extension.

The new magnetic door hold open devices shall be controlled from the fire alarm interface locally that in the event if a fire that the fire alarm interface will disengage power to the door hold open devices. The contractor shall allow for new containment, conduits, wiring etc in order to install all of the new magnetic door hold open devices. See drawings for locations and quantities.

The Electrical Contractor shall allow for the electrical attendances to the magnetic door hold open devices which shall be as follows:

- Supply and installation of a 230V power supply via a 13amp unswitched spur to the magnetic door hold open device at high level at each location at approximately 3200mm above finished floor level as indicated on the drawings. Final location of spur to be confirmed on site. See drawings for locations and quantities. Refer to section 62.06 for further information on the switched fused spur outlets.
- Supply and installation of a 4-core 2.5mm² LSZH cable from the unswitched fused spur at low level for the magnetic door hold open devices at high level (approximately 3000mm above finished floor level) at the main entrance.
- Refer to section 62.15 for details on the cabling and wiring required.
- Refer to section 62.04 for details on the cable containment required. Include for all necessary cable containment.

62.19 Cabling, wiring and cable sizes

General installation:

All final sub-circuit cables for lighting, power, etc., shall adhere to the following specifications:

1. All cabling shall be run in metal cable containment and shall be run in conduit, trunking, tray etc. See section 62.04 for further information.
2. All final sub-circuit cables for lighting, power, etc., shall be single core low smoke and zero halogen (LSZH) insulated type, flame retardant to BS



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- 4066, with stranded copper conductors, thermosetting insulation type E1.5 to BS 7655 all complying with BS 7211. All cabling shall be LSZH sheathed cable.
3. Multicore unscreened cables for control and signalling requirements shall be of the unarmoured type with copper conductors, PVC insulation and PVC sheath to BS 7655 all in accordance with BS 6004/BS 6346 (as appropriate).
 4. All cables shall be 450/750 volt rated and no cable less than 2.5mm² in cross section shall be used without the permission in writing of the Engineer.
 5. Only insulated cables shall be installed in conduit and/or trunking and cabling for different services shall not be installed in the same conduit without the permission in writing of the Engineer.
 6. Joints on cables in trunking shall not be permitted. The cables of different circuits run in trunking shall be taped together at not greater than 3 metre centres.
 7. Cables in excess of 10 sq. mm cross sectional area shall not be installed in trunking with smaller cables. In addition MICS LSF or armoured cables shall not be installed in trunking with other cables.

LSZH Cabling:

All final sub-circuit cables for lighting, power, etc., shall be single core low smoke and zero halogen (LSZH) insulated type, flame retardant to BS 4066, with stranded copper conductors, thermosetting insulation type E1.5 to BS 7655 all complying with BS 7211.

All cabling shall be LSZH sheathed cable. All LSZH or LSOH cabling shall adhere to the following specifications:

Product features:

- Flame-retardant according to IEC 60332-1-2 (flame spread on a single cable)
- No flame-propagation according to IEC 60332-3-22 and IEC 60332-3-24 respectively IEC 60332-3-25 (Flame spread on vertical cable or wire bundle)
- Halogen-free according to IEC 60754-1 (amount of halogen acid gas) Corrosiveness of combustion gases according to IEC 60754-2 (degree of acidity)
- Low smoke density according to IEC 61034-2
- UL Cable Flame Test



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References/Approvals:

- UL AWM style 21089
- Based on EN 50525-3-11
- Based on EN 50525-2-51

Product Make-up:

- Fine-wire strand made of bare copper wires
- Core insulation: Halogen-free
- Cores twisted in layers
- Outer sheath: Special halogen-free compound, grey (RAL 7001).

Cable Sizes

All conductors carried in conduits shall be single core LSZH cabling as specified in 'point 2' above. All cable sizes are to be a minimum of 2.5mm². Conduit capacities as set down in Appendix 12 of the I.E.E. regulations latest edition are not to be exceeded. Joints in conductors between terminating points will not be permitted.

Cable sizes shall be as follows:

- Lighting final circuits (1kW max load): 2.5mm²/2.5mm² CPC
- Emergency light fittings: 2.5mm²/2.5mm² CPC
- 20amp radial circuits (6no sockets max): 4.0mm²/4.0mm² CPC
- 20amp radial circuits (general power): 4.0mm²/4.0mm² CPC
- 32amp radial circuits (non-cooker): 6.0mm²/6.0mm² CPC
- Cooker: 16.0mm²/16.0mm² CPC
- 10amp radial circuit (general): 2.5mm²/2.5mm² CPC
- 10amp radial circuit (lighting, facade): 2.5mm²/2.5mm² CPC
- 10/16 amp radial circuit (exterior lighting, columns): 6.0mm²/6.0mm² CPC

See also electrical schematics for specific cable sizes.



Sub-mains cabling:

Refer to section 62.11 above.

Trunking, tray and conduits:

Refer to Section 62.09 and 62.10 above.

62.20 Earthing and bonding

The electrical installation shall be effectively earthed and non-current carrying metalwork shall be bonded, all in accordance with ETCI rules and as described below.

This shall include all conduit, metal clad equipment; fuse board, trunking, service sockets, cable sheath, steel oil tanks etc. or any metal work whatsoever adjacent to the electrical equipment.

All items shall be bonded together and earthed to a main earthing terminal on the new main distribution board.

The objective of the system is to provide an effective system to minimise danger to life and equipment arising from:

- Faults between line conductors and non-current carrying metal work.
- Atmospheric discharges.
- Accumulation of static charges.
- The design parameters are defined within the ETCI National Rules for Electrical Installations.
- The system requirements are as defined on the system drawing.

Bonding cables shall be run in conduit throughout the installation, terminating at the bonding point in surface or flush conduit box. Final connection shall be from a bushed outlet or outlet plate to the bonding point. Main bonding clamps shall be fitted with approved labels. The use of perforated strip is not permitted, use only proprietary bonding clamps.

Main bonding conductors shall be 1 x 95mm² G/Y PVC cable routed from the main earth terminal to mains water and electrical intake points, control panels, main plant and equipment items.

At least 1 no. copper or galvanised iron earth electrode shall be driven vertically at least 1800mm underground, outside the building, adjacent to the main board and the main earth cable shall be connected to this electrode in the ground.



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The earth lead shall be connected to the electrode by means of a substantial non-ferrous clamp to B.S. 951, which shall be protected against corrosion by denso tape. The resistance between any metals to the earth and the main earthing terminal shall not exceed 0.5 ohms. Sufficient electrodes spaced 3600 mm apart shall be used to obtain a satisfactory earth.

The main earth points shall be housed in a concrete surround and fitted with approved inspection covers giving access for disconnection of the earth lead for test purposes. The earth connections shall be fitted with a permanent indelible label engraved; **'SAFETY ELECTRICAL EARTH, DO NOT REMOVE'**. Bell couplings shall be installed where conduit is attached to trunking to ensure proper earth continuity.

62.21 Testing and commissioning

The Electrical Contractor shall test all items of equipment individually and shall commission the full installation as a unified system. All testing and commissioning shall be carried out in the presence of and to the satisfaction of the Employer's Representative.

The Electrical Contractor shall give to the Employer's Representative seven days notice in writing before testing or commissioning is carried out.

62.22 Attendances to the gas detection system in the boilerhouse

General:

A gas detection system shall be installed in the existing boilerhouse and the Contractor shall allow for the wiring and electrical attendances to this new gas detection system in the boilerhouse. The gas detection system shall consist of a solenoid valve within the boilerhouse, control boxes for the system, gas detector, and control cabling as indicated on the drawings.

The gas detection panel shall be located within the boilerhouse and the gas slam shut valve and gas detectors shall be wired directly to this gas detection panel.

The Contractor shall include for the following electrical attendances to the gas detection system:

- 13amp single phase fused spur outlet to the gas detection panel. Location as indicated on the drawings. Power wiring as indicated below. Refer to section 62.12 for information on spur outlets.



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- 13amp single phase fused spur outlet to the gas solenoid valve. Location as indicated on the drawings. Power wiring as indicated below. Refer to section 62.12 for information on spur outlets.
- Control cabling between the gas solenoid valve and the gas detection panel. Location as indicated on the drawings. Cabling as indicated below.
- Control cabling between the gas detector on the ceiling in the boilerhouse room and the gas detection panel. Location as indicated on the drawings. Cabling as indicated below.
- All control and power wiring shall be installed in steel conduit. Include for all necessary cable containment.
- Wiring shall be taken from the new electrical boards in the building which are indicated on the drawings.

All items shall be located in the boilerhouse.

Wiring:

Electrical power supplies to the panel and the valve shall be 230VAC 50 Hz c/w 13amp spur and shall be supplied as part of this contract. Power wiring shall be carried out in 3-core 4.0mm² LSZH cables.

Refer to section 62.12 for information on spur outlets.

Refer to section 62.19 for information on cabling.

Control wiring shall be 3-core 4.0mm² LSZH cabling from the control panel to the valve and the detector. The equipment and wiring details shall be provided by others. See drawings for the quantities and locations of all equipment.

Fire Alarm Wiring:

The new gas detection system in the boilerhouse shall be connected and interfaced to the new fire alarm system in the building. Allow for all necessary conduit, tray etc. and all other accessories to carry out this work.

Refer to section 68.01 for further information on cabling and interfaces required.

62.23 Attendances to the new magnetic door hold open devices

There are a number of magnetic door hold open devices installed in the new extension of the building in the locations as indicated on the drawing. This shall be wired from the new sub-distribution boards in the new extension.

The new magnetic door hold open devices shall be controlled from the fire alarm interface locally that in the event if a fire that the fire alarm interface will disengage power to the door hold open devices. The contractor shall allow for



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new containment, conduits, wiring etc in order to install all of the new magnetic door hold open devices. See drawings for locations and quantities.

The Electrical Contractor shall allow for the electrical attendances to the magnetic door hold open devices which shall be as follows:

- Supply and installation of a 230V power supply via a 13amp unswitched spur to the magnetic door hold open device at high level at each location at approximately 3000mm above finished floor level as indicated on the drawings. Final location of spur to be confirmed on site. See drawings for locations and quantities. Refer to section 62.12 for further information on the switched fused spur outlets.
- Supply and installation of a 4-core 2.5mm² LSZH cable from the unswitched fused spur at low level for the magnetic door hold open devices at high level (approximately 3000mm above finished floor level) at the main entrance.
- Refer to section 62.19 for details on the cabling and wiring required.
- Refer to section 62.09 and 62.10 for details on the cable containment required. Include for all necessary cable containment.

62.24 Attendances to the mechanical installation

Motor Control Centre (MCC):

The existing Motor Control Centre (MCC) shall be retained and extended in the Plantroom/Boilerhouse in the existing main building as indicated on the drawings.

All equipment relating to the MCC panel and controls package in the Plantroom/Boilerhouse shall be supplied by the Mechanical Contractor.

The existing MCC control panels, updates software and related controls shall be supplied, located on site and handed over free issue by the Mechanical Contractor to the Electrical Contractor for wiring.

The Electrical Contractor shall allow for the wiring of the updated controls package and control devices in the existing MCC controls panel. The Electrical Contractor shall supply, install, connect, test and commission all power and control wiring associated with the mechanical installation in accordance with the detailed wiring diagrams supplied by the Mechanical Contractor.

Most of the items relating to the MCC control panels in the Plantroom/Boilerhouse shall be located within the Plantroom/Boilerhouse. These devices are highlighted on the drawings and shall be wired back to the existing MCC controls panel in the existing Plantroom/Boilerhouse.



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The Electrical Contractor shall supply and install all isolators and switched fuse spur outlets as necessary for the correct completion of the installation.

The Electrical Contractor shall include for wiring and connecting up all items handed over free issue by the mechanical Contractor for the extending of the existing MCC controls panel.

Below is a brief summary of all plant and equipment but the Contractor shall include for wiring and connecting up all the relevant mechanical items and control items as indicated and any other items described in this specification or shown on the drawings.

Refer to drawing 51(M001) for information on wiring and connecting up all the relevant mechanical items and control items. The Electrical Contractor shall refer to the Mechanical Services drawings and specifications to ascertain the location of the mechanical plant control devices and equipment, which require electrical services.

The Electrical Contractor shall supply and install all isolators, emergency lock stop push buttons and switched fuse spur outlets as necessary for the correct completion of the installation.

All plant items shall be provided with local and **dedicated labelled isolation at each plant item**. Final connection to all plant items in IP54 isolators and flexible conduit connectors.

Power Wiring:

Refer to drawing 51(M001) for information on wiring and connecting up all the relevant mechanical items and control items.

Refer to section 62.19 for information on cabling to be installed.

62.25 Electronic surge protection

Electronic surge protection shall be installed in the new electrical board to provide surge protection on all incoming lines and devices into the temporary building.

The services in the electrical board in the temporary building will require surge protection devices (SPD's) and the type required are highlighted below:

- TP & N incomer on all the new Sub-Distribution Board (Type 2 combined lightning & SPD).
- SP & N incomer on the new Fire Alarm Panel – (Type 2 combined lightning & SPD).



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- SP & N incomer on the PV Panel supply – (Type 2 combined lightning & SPD).

Surge Protection Devices (SPD's) shall be installed at distribution panels as shown on drawings.

Where equipment/panels are more than 30' from service entrance SPD, additional local protection shall be provided in the form of distribution panel protection.

Distribution branch circuits that feed equipment that generates electrical disturbances shall have additional SPD protection to prevent this noise feeding back onto other circuits. Additionally, SPDs may be used where sensitive electronic equipment is located more than 30' from the closest upstream SPD.

Surge protection devices shall adhere to the following specifications:

- Shall be capable of handling both direct lightning current of 25kA 10/350 μ s per pole and maximum discharge currents of 40kA 8/20 μ s per pole
- Type 2 arresters shall have a maximum discharge current of 40kA 8/20 μ s waveform per pole 160kA 8/20 μ s, TP+N system.
- The arrester shall be fully co-ordinated between lightning and surge currents. The arrester shall be fully energy co-ordinated to work correctly in conjunction with other surge protection devices from the same manufactures range.
- The arresters shall be of the pluggable type to facilitate easy removal and replacement of defective modules. Locking modules with quick easy release button. The unit shall have easy hot-swop replacement cartridges.
- Must have remote interrogation IR.
- The arresters shall have international test approvals either UL or KEMA.
- The arrester shall comply with the Surge Protection Device standard EN 61643-11 and shall be tested for vibration and shock proof characteristics in accordance with EN 60068 – 2.
- The arrester shall have a maximum let through voltage of less than 1.5kV even in the case of direct lightning.
- The arrester shall be able to withstand multiple direct strikes without damage.



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- The arresters shall have visual indication of status. Green - ok. Red – defect.
- The arrester shall have thermo dynamic control which disconnects the device from the supply in case of defect.
- Arresters to be equipped with an optional fault alarm changeover contact to remotely signal device failure.
- To easily distinguish the arrester from circuit breakers and RCD's they shall be coloured red.
- Disconnect fusing shall be installed where required in accordance with the SPD instructions.
- Shall have a UP value of <1500.
- Shall have a 10 year warranty.
- The values for the SPD must follow the definition 3.1.30 of the standard IEC 61643-12 (and also the definition 3.7 of IEC 61643-1), the SPDs protective components may be connected line to line or line to earth or line to neutral or neutral to earth and combination therefore. These paths are referred to as modes of protection. IEC 61643-1.
- Accepted manufacturer's of surge protection are Furse, Dehn & Sohn, or equivalent.



63.0 LIGHTING SERVICES

63.01 Internal and external task lighting

General:

The Electrical Contractor shall, install, connect, test and commission the whole of the new lighting installation in the new extension as shown on the drawings and as described in the specification. See the drawings for the locations in the new extension where new lighting services are to be installed. This includes all light fittings, cabling, cable containment, etc.

The type of luminaire required for each location is specified in the appropriate schedules. The lighting system shall be fed from the new sub electrical board in the new extension of the building as indicated on the drawings. The exact location of each luminaire shall be determined on site in consultation with the Employer's Representative.

The Electrical Contractor shall allow for the supply and installation of all light fittings for the new extension of the building. See the lighting schedule below for further information on all light fittings to be supplied and installed.

The design parameters are those defined in the Chartered Institution of Building Services Engineers lighting code.

Final connections to each light fitting shall be made in heat resistant cable.

All luminaires shall comply with BS4533. Incandescent lamps shall comply with BS1101. All luminaires shall be supplied complete with lamps. All surface mounted luminaires shall be fixed to surface mounted conduit boxes at their rear, unless stated otherwise or recommended by the manufacturer.

The circuit shall be arranged for a loop-in system of wiring. Circuit arrangement shall be based on a maximum of 1kW per circuit. Circuit protection shall be by means of 10A MCB only.

Switching arrangements shall be as indicated on the drawing.

Average working plane illumination levels shall generally be as follows:

- General Classrooms: 300lux at 700mm AFFL
- Circulation: 120lux at 700mm AFFL
- Toilets: 120lux at 700mm AFFL
- Disabled toilet: 200lux at 700mm AFFL



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The Electrical Contractor shall allow for the supply and installation of all new internal and external light fittings as indicated on the drawings. All the new internal and external light fittings for the project shall be supplied and installed by the Electrical Contractor.

The Electrical Contractor shall allow for the supply, installation, cabling and commissioning of all the light fittings listed below. The type of luminaire required for each location is specified in the schedule below.

The Electrical Contractor shall install these luminaires in the locations as shown on the drawings. The lighting system shall be fed from the new sub electrical board in the new extension of the building as indicated on the drawings. The exact location of each luminaire shall be determined on site in consultation with the Employer's Representative.

The proposed schedule of light fittings for the project is as highlighted below.

Samples:

The Electrical Contractor shall ensure that all the luminaires required for the project are placed on order in due time to ensure delivery to suit the project construction programme.

However, approval of the Employer's Representative shall be obtained for final selection of the luminaires before the orders are placed.

A sample of each luminaire shall be erected on site in a suitable location for inspection by the Employer's Representative for this purpose.

The Electrical Contractor shall allow for providing a sample of each proposed light fitting on site so that the Design Team can approve all light fittings prior to ordering. The Electrical Contractor shall allow for factoring the cost of providing samples of the light fittings into his tender costs.

Schedule of light fittings to be provided by the Contractor:

See drawings for quantities and locations of all light fittings.

All light fittings shall be supplied by Thorn Lighting, or equivalent.



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<u>Internal and wall mounted external light fittings</u>	
Type	Description
A  Surface mounted LED light fitting	A high performance, surface mounted, LED luminaire. <u>Light source:</u> LED <u>Output:</u> 33watt <u>Body:</u> White painted steel <u>End caps:</u> White polycarbonate <u>Diffuser:</u> Clear prismatic polycarbonate <u>Dimensions:</u> 1220mm x 217mm x 90mm <u>Luminous flux:</u> 4200lm <u>Lifetime:</u> 50,000hrs L80 at 25°C <u>Dimming:</u> Yes <u>High frequency:</u> Yes <u>Lamp Efficacy:</u> 127 lm/W <u>Colour temp:</u> 4000k <u>IP rating:</u> IP44 <u>Weight:</u> 3.63 kg <u>CE Marked:</u> Yes <u>Warranty:</u> 5 years on all components Light fitting shall be as Thorn College LED4200-840 HF L1200 (or equivalent).



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Type	Description
B  Surface mounted LED light fitting	A high performance, surface mounted, LED luminaire. <u>Light source:</u> LED <u>Output:</u> 23watt <u>Body:</u> White painted steel <u>End caps:</u> White polycarbonate <u>Diffuser:</u> Clear prismatic polycarbonate <u>Dimensions:</u> 1520mm x 217mm x 90mm <u>Luminous flux:</u> 3000lm <u>Lifetime:</u> 50,000hrs L80 at 25°C <u>Dimming:</u> Yes <u>High frequency:</u> Yes <u>Lamp Efficacy:</u> 130 lm/W <u>Colour temp:</u> 4000k <u>IP rating:</u> IP44 <u>Weight:</u> 4.44 kg <u>CE Marked:</u> Yes <u>Warranty:</u> 5 years on all components Light fitting shall be as Thorn College LED2900-840 HF L1500 (or equivalent).



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Type	Description
<u>C</u>  Surface mounted LED light fitting (Wall mounted and Ceiling Mounted)	Slim round wall mounted or ceiling mounted high performance LED luminaire. <u>Light source:</u> LED <u>Output:</u> 16watt <u>Body:</u> White polycarbonate <u>Diffuser:</u> Opal polycarbonate <u>Dimensions:</u> 307mm diameter by 58mm deep <u>Luminous flux:</u> 1950lm <u>Lifetime:</u> 50,000hrs L80 at 25°C <u>Dimming:</u> No <u>High frequency:</u> No <u>Lamp Efficacy:</u> 120 lm/W <u>Colour temp:</u> 4000k <u>IP rating:</u> IP65 <u>Weight:</u> 1 kg <u>CE Marked:</u> Yes <u>Warranty:</u> 5 years on all components Light fitting shall be as Thorn Katona KAT RD 2000-840 HF (or equivalent) c/w integrated PIR sensor.



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Type	Description
X1  IP65 rated external wall mounted LED light fitting	IP65 rated wall mounted external LED luminaire. <u>Light source:</u> LED <u>Output:</u> 15watt <u>Back plate:</u> Die-cast aluminium <u>Body:</u> Anthracite polycarbonate <u>Diffuser:</u> Opal polycarbonate <u>Dimensions:</u> 381mm x 196mm x 305mm <u>Luminous flux:</u> 1844lm <u>Lifetime:</u> 60,000hrs L70 at 25°C <u>Dimming:</u> No <u>High frequency:</u> No <u>Lamp Efficacy:</u> 120 lm/W <u>Colour temp:</u> 4000k <u>IP rating:</u> IP66 <u>Weight:</u> 2.8 kg <u>CE Marked:</u> Yes <u>Warranty:</u> 5 years on all components Light fitting shall be as Thorn Piazza II LED 1690-840 HF P ANT (or equivalent).

63.02 Lighting switches

General:

The Electrical Contractor shall allow for the supply and installation of a number of light switches in the building as indicated on the drawings. The majority of the new light switches to be installed in the new extension shall be 'Push-to-Make' retractive light switches.

Refer to drawings for locations and quantities.

Momentary (Push-To-Make) retractive light switches in the classrooms:

The lighting in the classrooms shall be operated via daylight dimming and absence detection. As a result, the lighting in the room will require momentary (push-to-make) retractive light switches to operate the lighting in the room. All new light switches to be installed in the classrooms of the new extension shall be 'Push-to-Make' retractive light switches. Refer to the drawings for quantities and locations of all momentary (push-to-make) retractive light switches required in new extension of the building.



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All momentary (push-to-make) retractive light switches shall be surface mounted.

Momentary (push-to-make) retractive light switches as required shall be from MK Albany Plus range, or equivalent, and shall have a brushed stainless steel finish. Include for suitable cover plate, grid and surface mounted back box.

Mounting boxes to be supplied without knock outs.

The Electrical Contractor shall allow for the following from the MK Albany Plus range, or equivalent for the momentary (push-to-make) retractive light switch:

- Brushed stainless steel cover plate as K3431BSS for one gang or K3432BSS for two gang, or equivalent.
- Surface mounted back box in metalclad grey as K829ALM, or equivalent. Back box to suit light switch.
- Single pole two-way push switch with 'Press' printed on the switch. The switch shall be finished in white as K4885PWHL, or equivalent.

Lighting switches shall be provided and ganged as indicated on the drawings and shall be either 1-way, 2-way or intermediate as indicated. Switches for internal use shall be of the 15/20 Amp inductive rating grid switch type.



Standard on/off rocker light switches in the new extension:

Standard on/off rocker type light switches shall be installed for the in the new extension as indicated on the drawings. Refer to the drawings for quantities and locations of all standard on/off rocker light switches required in the new extension of the building.

All light switches shall be surface mounted.

Standard on/off rocker type light switches as required shall be from MK Albany Plus range, or equivalent, and shall have a brushed stainless steel finish. Include for suitable cover plate, grid and back box. The Electrical Contractor shall allow for the following from the MK Albany Plus range, or equivalent for each standard on/off light switch:



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- Brushed stainless steel faceplate with module as K4671BSS for one gang or K4672BSS for two gang, or equivalent.
- Surface mounted back box in metalclad grey as K829ALM (1 gang), or equivalent.
- Standard rocker module switch finished in white included with switch.

Lighting switches shall be provided and ganged as indicated on the drawings and shall be either 1-way, 2-way or intermediate as indicated. Switches for internal use shall be of the 15/20 Amp inductive rating grid switch type.

Refer to the drawings for quantities and locations of all standard on/off rocker light switches required in the ASD classroom building.



Mounting heights and cable containment for all light switches:

All new lighting switches installed in the new extension, unless stated otherwise, shall be surface mounted. All lighting switches, unless stated otherwise, shall be located 1100mm generally above finished floor level.

All new cabling to the light switches shall be installed in surface mounted steel conduit. All conduit supplies to the back box for all the surface mounted light switches shall be surface mounted on the wall so ensure for a neat installation.

Refer to section 63.04 below for further information on the conduit and cable containment required.

Wiring:

Refer to section 62.19 for further information on cabling required for the lighting installation.



63.03 Lighting controls

General Classroom area:

General:

Automatic lighting controls shall be installed for all the classroom in the new extension as indicated on the drawings. The controls shall incorporate 3no control elements:

- Manual On/Off control
- Automatic daylight dimming
- Absence Control

The lighting controls in all these rooms in the building shall be based on manual on/off switching, daylight sensing to dim lights as required to "Off" in response to the changes in daylight levels and absence detection to turn off lights.

A momentary action (bell push) rocker type switch shall be installed in all the room for the lighting circuits in these areas (see drawings for quantities).

Absence detection shall be set up so that the sensor in the room will require the lighting 'push-to-make' light switch to turn the lights on and will time out when the area is left unoccupied and will need re-activation again by the light switch.

In rooms (where possible), lighting control shall be set up such that all light fittings are linked to just one detector in the room such that all lights respond in the same manner to the automatic control signals.

A remote daylight dimming/PIR sensor shall be supplied for all the light fittings in the room and the sensor shall be linked to the light fittings in the room for lighting control.

In addition to the retractive 'Push-to-Make' switches provided in the classroom, manual switching shall be provided on the row of light fittings nearest the teaching wall so that the teacher may switch these off where local glare on the whiteboard may be a problem.

Allow for the necessary control wiring between the light fittings and the relevant sensor in each area/room.

Operation of lighting system in areas:

- The user will enter the room/area and to press the 'push-to-make' rocker switch to bring the lights on. The lights shall then turn on to the required light level only if the detectors sense that the room/area is occupied AND



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the photocell senses that there is an inadequate lighting level in the room/area.

- The lights will remain on while the room/area is occupied. There is no time limit to this.
- Once the room/area is vacated, the system will time out and switch the lights off. This timeout period shall be set to 15 minutes.
- If the room/area is entered before the lights have timed out, the system will reset and stay on until once again the room/area is vacated.
- If the room/area is entered after the lights have timed out, the user will have to press the 'push-to-make' rocker switch to bring the lights back on.

The daylight level sensors shall be programmed as follows:

- The average working plane illumination levels in these rooms shall be 300 lux for General Classroom. This lux level shall be constantly maintained.
- The sensor shall adjust the illumination levels of the lights / row of lights connected as required.
- Where day light levels are above the required illumination levels, the light fittings shall not operate. The lighting levels are as follows:
 - If the light level is above the required lux level then the lights/rows of lights will turn off.
 - If the light levels above are achieved, then the light/row of lights will turn off.
 - If the light level is below 100 lux below the required levels, then the light/row of lights will turn on.
 - The light level hysteresis should be set to five minutes to prevent short cycling.

Remote daylight dimming/absence detector for these areas:

The Contractor shall allow for the supply and installation of a recessed mounted remote motion sensor to control the light fittings in these areas as indicated on the drawings. All detectors shall be as follows or equivalent:

- *Type:* Philips Occuswitch LRM1080, or equivalent
- *Accessories:* Include for wireland cable as LCC1070 for each sensor, or equivalent.
- *Colour:* White
- *Mounting:* Recessed into the ceiling
- *Detection range:* 360°
- *Voltage:* 230V AC

See drawings for quantities and locations.



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Toilet\Stores\corridor:

General:

Automatic lighting controls shall be installed for all the light fittings in these areas as indicated on the drawings. The light fittings in these areas shall be controlled via motion detection. The lighting controls in these areas are to be based on motion detection to turn on the lights when motion is sensed and to turn off lights when no presence is detected after 15 minutes. Settings shall be set up as identified above.

There is no requirement to install light switches for these areas as the lights in these areas/rooms shall be switched on by the presence detector and will also be switched off by the presence detector.

A remote sensor or sensor incorporated into the light fitting shall be supplied for all the light fittings in each of these rooms and this sensor shall be linked to the light fittings in the room for lighting control. Allow for the necessary control wiring between the light fittings and the relevant sensor in each area/room.

Refer to the drawings for further information.

Operation of lighting system in these areas:

- The user will enter the room and the lights shall then turn on.
- The lights will remain on while the room is occupied. There is no time limit to this.
- Once the room is vacated, the system will time out and switch the lights off. This timeout period shall be set to 15 minutes.
- If the room is entered before the lights have timed out, the system will reset and stay on until once again the room is vacated.

Remote motion/presence detector for these areas:

The Electrical Contractor shall allow for the supply and installation of a remote sensor to control the light fittings in these areas as indicated on the drawings. Please note that the majority of light fittings for these areas shall have the sensor



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incorporated into the light fitting and shall be supplied with the light fitting. However, some light fittings in these areas will require a remote sensor as indicated on the drawings. Refer to drawings for quantities and locations. Allow for the necessary control wiring between the light fittings and the relevant sensor in each area/room.

Refer to the drawings for further information.

All motion/presence detectors shall be as follows or equivalent:

- *Type:* Philips Occuswitch LRM1080, or equivalent
- *Accessories:* Include for wireland cable as LCC1070 for each sensor, or equivalent.
- *Colour:* White
- *Mounting:* Recessed into the ceiling.
- *Detection range:* 360°
- *Voltage:* 230V AC

See drawings for quantities and locations.



Wiring & Control Wiring:

See detail on drawings for control wiring and mains wiring for lighting controls.

The Electrical Contractor shall include for the following wiring and control cabling:

- All new main wiring from the existing main electrical board to all the new light fittings as indicated on the drawings. Mains wiring for the new internal lighting circuits shall be run in 3core 2.5mm throughout the installation. The Electrical Contractor shall allow for all attendances in completing these works.
- For the rooms where there is absence detection and daylight dimming to be installed, the Electrical Contractor shall allow for the wiring as per detail on the drawings so refer to that. The Electrical Contractor shall include for all mains power supply cabling to the new light fittings in these rooms in 3-core 2.5mm² LSZH cable as indicated. The Electrical



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Contractor shall also include for 3-core 2.5mm² LSZH low voltage cabling from the sensor to all the light fittings in that room.

- For the rooms where there is presence detection installed, the Electrical Contractor shall allow for the wiring as per detail on the drawings so refer to that. The Electrical Contractor shall include for all mains power supply cabling to the new light fittings in these rooms in 3-core 2.5mm² LSZH cable as indicated. The Electrical Contractor shall also include for 3-core 2.5mm² LSZH low voltage cabling from the sensor to all the light fittings in that room.

Refer to section 62.19 for specific details on the cabling required for the lighting system.

The Electrical Contractor shall ensure that the lighting control system selected is compatible with the luminaires selected. This shall include liaising with the lighting control specialist prior to 1st fix, to ensure the light sensor is located in the optimum location within each room.

Commissioning:

The Electrical Contractor shall allow for the testing and commissioning of the lighting systems for the new extension to ensure all lighting control parameters are achieved. The Electrical Contractor shall allow for a 2 hours of commissioning on site to set all light levels and times for the lighting controls in the new extension.

The lighting system in the new extension shall be commissioned, tested, and demonstrated to the Design team and the client.

A testing and commissioning cert for the lighting controls, stating that each and every area has been commissioned to the above parameters shall be provided to the Consultant Engineer prior to handing over the new extension.

63.04 Cable carrier system for lighting installation

See section 62.09 and 62.10 for further information.

63.05 Emergency Lighting

General:

The Electrical Contractor shall supply, install, connect, test and commission a fully comprehensive operational emergency/escape lighting systems for the new extension as indicated on the drawings.



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The emergency lighting installation shall be installed in conjunction with the fire alarm system. All emergency light fittings for the new extension of the building shall be supplied, tested and commissioned by the Electrical Contractor.

The objective of the system is to provide an efficient and effective emergency lighting system meeting the requirements of IS 3217:2013+A1:2017.

The emergency lighting shall consist of standalone and integrated maintained luminaires and exit signs, as indicated on the system drawings. In the event of circuit power failure the emergency fitting or exit sign shall illuminate for a period of 3 hours.

The Electrical Contractor shall supply and install the emergency lighting system and emergency light fittings in compliance with IS 3217:2013+A1:2017, BS EN 50172 and IEC 62034.

All emergency light fittings for the new extension shall be EMC compliant, CE Marked and manufactured to IS EN60598-2-22.

The emergency lighting system shall operate for a period not less than 3 hours following failure of the normal supply.

The system shall include all emergency lights and exit signs, and the Contractor shall take responsibility to ensure that all emergency luminaires are compatible with the chosen system.

Each emergency luminaire shall have a switching unit which shall automatically switch the luminaire to the emergency circuit in the event of local or mains power failure. The installation shall consist of self-contained maintained emergency exit signs with appropriate running man symbol.

Types of luminaires required for the various locations are shown on the drawings and described in the below. The Contractor shall ensure that the luminaires are placed on order to suit the installation programme. However, approval of the Engineer shall be obtained before placing orders.

Containment

A new cable carrier shall be installed for the new cabling for the emergency lighting installation in the new extension of the building. A system of galvanised steel cable trunking shall be installed to distribute the new lighting cabling throughout the new extension.

See section 62.09 and 62.10 above and drawing for further information on containment required.



New Electrical Board:

All the new emergency light fittings shall be wired on the same circuits as the new general lighting in the new extension of the building as indicated on the drawings. All the new general lighting shall be wired from the new sub-distribution electrical board in the extension of the building.

This ensures that the emergency lights will protect not just against a general power cut, but also against the failure of a lighting circuit. If it desired to switch the normal lighting by a contactor; then this is done by the use of suitable multi pole contactors controlled as desired.

The emergency lighting should be connected before the contactors, such that opening of the contactor won't discharge the batteries.

Emergency Lighting Test Units

An emergency lighting test unit shall be provided in the new sub-distribution electrical board in the extension of the building as indicated on the drawings.

The test unit shall be complete with interface units on the lighting MCB board as necessary. Power to the central test unit shall be in 3 x 2.5 mm² cables in conduit from a separate circuit on the lighting MCB board. See item 62.09 and 62.10 for cable carrier details and below for information on type of cabling required.

The emergency lighting test unit shall have the following functions:

- Shall have a timer.
- Shall have pre-set test durations for selection.
- Shall have indicators for 'Test', 'Complete' and 'Elapsed Time'.
- Shall have automatic restoration of mains power.

Facility shall be provided for periodic testing of the emergency lighting luminaires without having to switch off the relevant circuit. Emergency luminaires shall generally be suitable for 3-hour duration. The recharge period for the batteries after full discharge shall not exceed 24 hours.

A full discharge/recharge test must be performed for every luminaire during commissioning procedures. Each emergency luminaire shall have a switching unit which shall automatically switch the luminaire to the emergency circuit in the event of local or mains power failure. The emergency lighting system shall operate for a period not less than 3 hours following failure of the normal supply.

Supplies to emergency sections of signs shall be taken from the interface unit on the lighting MCB board fed from the MCB controlling the adjacent lighting circuit.



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Also, where sustained, a switched supply, taken from the same circuit, shall be run to the sustained section of the fitting together with a permanent supply. The switch for the sustained fittings shall be mounted with the nearby light switch.

Emergency Luminaires

The Electrical Contractor shall supply, test and commission all the emergency light fittings throughout the new extension. Refer to schedule below for further information on all emergency light fittings to be supplied and installed. The Electrical Contractor shall ensure that all emergency luminaires (maintained and non-maintained as appropriate) shall be compatible with the emergency lighting test system.

All emergency light fittings shall be designed and manufactured to meet the requirements of EN60598-2-22 and all applicable EU standards. All emergency light fittings shall also be EMC compliant and CE Marked.

The Electrical Contractor shall ensure that all emergency signs shall be compatible with the emergency lighting test system, to allow these devices to be incorporated into the building-wide testing regime.

Emergency lighting luminaires shall be mounted at least 2000mm from the finished floor level. Emergency lighting safety signs shall be positioned between 2000mm and 3000mm above finished floor level (measured to the base of the sign).

LED Downlighter & Control Module

The surface mounted and recessed LED Downlighters shall operate in 3-hour non-maintained mode using a 4W high output LED.

It shall have a status indicator LED to display test results.

It shall be supplied with a 300mm flying lead terminated in a RJ11 plug for connection to a LED Control Module.

The light output of the LED shall be at least 200 lumens for the full duration of 3 hours.

The LED Control Module shall monitor the local mains and will operate the lamp in the event of mains failure.

It shall use Nickel Metal Hydride batteries contained within its enclosure for operation of the LED in emergency mode.

All connections shall be by a proprietary plug and socket arrangement with latching catches to prevent accidental disconnection.



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LED emergency exit signs & control modules

LED Emergency Exit Signs shall be used in conjunction with remote Control Modules. The LED sign shall utilise a strip of LEDs

Cabling

All cable carrying mains voltage for emergency lighting services shall be LSZH. Wiring to all emergency light fitting shall be cabled in 3 x 2.5mm² LSZH which is installed in conduit. Wiring to exit signs shall also be installed in 3 x 2.5mm² LSZH in conduit to a surface outlet box over which the fitting shall be mounted.

All cabling shall low smoke and zero halogen (LSZH) insulated type, flame retardant to BS 4066, with stranded copper conductors, thermosetting insulation type E1.5 to BS 7655 all complying with BS 7211. All cabling shall be LSZH sheathed cable. Refer to section 62.09 and 62.10 below for further information on cable containment and refer to section 62.19 below for further information on cabling.

All the new emergency light fittings shall be wired on the same circuits as the new general lighting in the areas as indicated on the drawings. This ensures that the emergency lights will protect not just against a general power cut, but also against the failure of a lighting circuit.

If it desired to switch the normal lighting by a contactor; then this is done by the use of suitable multi pole contactors controlled as desired. The emergency lighting should be connected before the contactors, such that opening of the contactor won't discharge the batteries.

All new cables shall be supplied from the new sub electrical distribution board in the new extension of the building. Quantity and locations as indicated on the drawings.

Commissioning

The Electrical Contractor shall make allowance for the specialist manufacturer to commission the emergency lighting system in the new extension in accordance with the manufacturer's recommendations.

The Electrical Contractor shall allow for fully testing and commissioning the emergency lighting system throughout the new extension in full compliance with IS 3217:2013+A1:2017.

The Electrical Contractor shall allow for the following during the commissioning for the emergency lighting system for the new extension:



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- Carry out a full test on the emergency lighting system in the new extension. A full discharge/recharge test must be performed for every luminaire during commissioning procedures.
- The test shall be carried out at night time when it is fully dark to see the effectiveness of the emergency lighting system in the new extension. Results shall be recorded and any discrepancies highlighted.
- The Electrical Contractor shall allow for the witnessing of the emergency lighting system by the Engineer in the new extension.
- Check all emergency light fittings in the building to ensure all lamps and LED indicators are operational.
- Verify sub-circuit monitoring in the new extension.
- Simulate power failure to each area in the new extension.
- Verify maximum 24-hour recharge. The recharge period for the batteries after full discharge shall not exceed 24 hours.
- Carry out a second full duration test in the building after the 24-hour recharge has elapsed.

Lux level check:

The Electrical Contractor shall allow for carrying out a test on the emergency lighting system at night time to ensure that all lux levels are being achieved. The test shall be carried out at night time when it is fully dark to see the effectiveness of the emergency lighting system in the new extension. Results shall be recorded and any discrepancies highlighted.

After the test is completed, the Electrical Contractor shall confirm that all areas in the building are compliant with I.S. 3217:2013+A1:2017 and if not, what areas are not compliant.

The Electrical Contractor shall allow for the cost of labour for carrying this test outside of normal working hours.

Labelling:

The Electrical Contractor shall allow for labelling, numbering and identifying all the new emergency light fittings in the new extension. All fittings shall be adequately labelled with a dedicated ID number via a small adhesive sticker to identify fitting number and where it is wired from.

For example, if an emergency light fitting is wired from the main electrical distribution board MDB-01, it should be labelled; MDB.01-EL-01 and MDB.01-EL-02 for the second fitting and so on. The unique label shall be highlighted on the record drawing as highlighted below.



Record Drawing:

The Electrical Contractor shall allow for preparing a record drawing of the installed emergency lighting system in the new extension which shall include all locations of emergency light fittings throughout the new extension.

The Electrical Contractor shall also highlight on this drawing the location, type and ID of light fitting for the new extension. This record drawing shall be included in the O&M manual. It is the responsibility of the Contractor who installs the system to produce a relevant record drawing to the satisfaction of the Engineer.

Certificates:

When the system is commissioned and handed over to the Client, in compliance with I.S. 3217:2013+A1:2017, the Contractor shall provide the following certificates for the emergency lighting system for the new extension:

- Certificate of Installation as highlighted in I.S. 3217:2013+A1:2017.
- Final Certificate of Commissioning as highlighted in I.S. 3217:2013+A1:2017.
- Certificate of Handover as highlighted in I.S. 3217:2013+A1:2017.

Schedule of emergency light fittings:

The Electrical Contractor shall allow for supplying and installing the following light fittings for the emergency lighting installation.

All emergency light fittings shall be EMC compliant, CE Marked and manufactured to IS EN60598-2-22.

See drawings for locations and quantities.

Emergency light fittings and the wall mounted external light fittings shall be as follows:



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<u>Type</u>	<u>Description</u>
<u>E1</u>  Single sided wall mounting emergency exit sign	New emergency exit light fitting with 3hr <u>maintained</u> emergency operation c/w status indicator. Refer to drawing for directional arrows required. Light fitting shall adhere to the following: • Wall mounted. • Single-sided screen printed legend panel in appropriate European signs directive format pictogram. • Body - flame retardant ABS. • Panel - flame retardant acrylic • Legend - flame retardant PVC • Batteries (self-contained) - 4.8V 1.3A/h Ni-Cd • IP40. • Finish shall be white (RAL 9016) • 4 watt LED in total. • Built-in downlighter (60 lumens) • Three-hour maintained. • 6-year warranty • The light fitting shall conform to the current BS ISO 3864-1 & ISO 7010 S standards. • CE marked The proposed lighting fitting is <u>Ventilux Multilux</u> (or equivalent).



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<u>Type</u>	<u>Description</u>
<u>E2</u>  Recessed fitting with 'Open Area' lens	New self-contained standalone recessed LED emergency light downlighter (<u>Open Area Version</u>). Fitting shall be a high performance LED light fitting. Light fitting shall be a <u>non-maintained</u> emergency operation c/w status indicator. Allow for remote control unit for standalone light fitting. Light fitting shall adhere to the following: • Recessed for open area version. Supplied with the open plan lens (symmetrical light pattern). • Self-contained. • 3 watt CREE LED • Lamp colour - 4500K. • 180 lumens in emergency • Material of lamp head - flame retardant polycarbonate plastic. • Remote bag - silicone coated fibre glass bag. • Batteries (self-contained) - 4.8V 4.5A/h Ni-Cd • Non-Maintained 3 hour duration • Class I. • IP20 • Colour shall be white RAL 9016 • Status indicator to indicate operational condition. • Ceiling cut-out required is 38mm. • 6-year warranty. • CE marked. • Fully compliant to EN 60598.2.22 The proposed lighting fitting is <u>Ventilux Optilens (Area Version)</u> (or equivalent).



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<u>Type</u>	<u>Description</u>
<u>E3</u>  IP65 rated LED bulkhead fitting	New self-contained standalone wall/ceiling mounted LED emergency bulkhead with 3hr <u>non-maintained</u> emergency operation c/w status indicator. Ceiling or wall mounted version dependent on location. Light fitting shall adhere to the following: • Surface mounted IP65 rated bulkhead. • Self-contained. • 3 X 1 watt CREE LEDs • Lamp colour - 5000K. • 300 lumens in emergency • Body - flame retardant polycarbonate plastic. • Diffuser - flame retardant clear polycarbonate plastic. • Gear Tray - powder coated sheet steel. • Batteries (self-contained) - 4.8V 4.5A/h. • Colours shall be White RAL 9016. • Class I. • 6-year warranty. • CE marked. • Fully compliant to EN60598-2-22 The proposed lighting fitting is <u>Ventilux Weatherproof</u> (or equivalent).



63.06 External bulkhead lighting attached to the building

External bulkhead lighting attached to the new extension of the building shall be installed as per the drawings. The Contractor shall allow for the cabling and power to these new light fittings.

Supply and fit external lighting as per the drawings and specifications. Lighting circuits shall be as indicated on the drawings. All external lighting mounted on the new extension shall be carried out in 3x2.5mm² LSF cable run in conduit or trunking.

All external wall mounted light fittings shall be controlled by a photocell & analogue timeclock arrangement c/w hand-off-auto switch located inside the new sub electrical board as indicated on the drawings.

Include for cabling and wiring all new external wall mounted light fittings back to the new sub electrical board (NSDB) for the new extension. Location as indicated on the drawings. Cabling requirements as highlighted above.

Demonstration to be given to the Employer's Representative for setting of time clocks at future date. All times to be agreed with Client. Demonstration to be given to Client for setting of time clocks at future date.

See section 63.01 below for information on the external wall mounted light fittings.

63.07 Cabling, wiring and cable sizes

Refer to section 62.19 for information on cabling.

63.08 Testing & Commissioning

The Electrical Contractor shall test all items of equipment individually and shall commission the full installation as a unified system. All testing and commissioning shall be carried out in the presence of and to the satisfaction of the Employer's Representative. The Electrical Contractor shall give to the Employer's Representative seven days notice in writing before testing or commissioning is carried out.

All tests shall be carried out in accordance with IEE Recommendations, relevant British and Irish Standards or IEC Publication.



64.0 COMMUNICATION SERVICES

64.01 ICT system

Existing installation:

The existing ICT system installed throughout the existing building shall be retained and shall be utilised and extended to cater for the new extension of the building.

New installation:

The areas of the new extension that is being built shall be provided with new CAT6A data points and associated cabling as per the drawings. Such points will be generally recess mounted in dado trunking or on the wall. The system as described below shall be installed in accordance with ISO 11801 and EN 50173. All equipment provided shall be from the same manufacturer to ensure optimum performance.

All new IT/data cabling shall be CAT 6A.

The installed system shall be certified by the specialist Contractor with a twenty-year performance and components warranty.

In 3-compartment trunking, provide for 35mm deep back boxes (Single: VTS/60.35 WHI, twin: VTS/70.35 WHI from Mk Prestige Plus Range) and RJ 45 outlets (Single: K3827 WHI, twin K3828 from Mk Prestige Plus Range) at all computer points as indicated on the drawings. Provide for surface steel conduit protection, draw wire, MK Metal clad Plus back boxes K8891 and RJ45 outlets.

The entire installation shall be carried out by a data specialist Contractor. The specialist Contractor shall be fully trained and certified to install the specified product and fully authorised to issue a warranty certificate.

All new IT points shall be wired and connected back to the existing communication cabinet located in the existing building. The contractor shall review the existing routes on-site and allow for all necessary cabling in connecting all new IT points back to the existing communication cabinet.

Wiring and Patch Panels:

The Electrical Contractor shall allow for the following wiring, cabling of the IT installation:

- All cabling for the data points as indicated shall be CAT 6A UTP (unshielded twisted pair) horizontal cabling 1071. Allow for



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cabling to all IT points as highlighted from the associated existing comms cabinet and punching down at both ends.

- Adequate number of UTP RJ45 Cat6A outlets to suit number of IT points. See drawings for quantities of data/IT points required in the new extension.
- All of the new Cat6A IT points throughout the new extension shall be wired from an existing patch panel in the existing comms cabinet.
- Adequate number of UTP RJ45 Cat6A patch cords to suit number of IT points as highlighted on the drawings. See drawings for quantities of data/IT points required in the new extension.

IT points for CCTV system, door access systems and intercoms:

All the cabling for the IT points that are to be installed for the CCTV system, door access systems and intercoms shall be wired back and connected to the existing comms cabinet in the paste up/printing in the existing building.

Allow for punching down the cabling to all IT points for the CCTV system, door access systems and intercoms at both ends.

Further Notes:

- Only the specified product shall be priced.
- All products shall meet the requirements to support 10GBASE-T to 100m and comply with IEEE 802.3an, TIA 568-B.2-10 (Category 6A) ISO/IEC 11801 Amendment 1 (Class E_A) and EN 50173.
- The RJ45 Patch Panel shall be able to accommodate 24 AWG (0.51 mm) stranded and solid cable conductors. The panels shall meet or exceed the ANSI/EIA/TIA 568-B, ISO IS 11801 and EN 50173 Category.
- All products shall be of one manufacturer, as specified.
- Class Ea channel performance of 500 MHz is required.
- The solution required shall be Systimax (or equivalent).
- The tenderer shall comply fully to this specification and in particular to the warranties section.
- No sub-let labour shall be allowed and all staff shall be permanent employees of the tenderer.
- All I.T. hardware, i.e. switches, hard drives etc. are excluded from this contract and are considered to be a Client fit out item.

Punch-down and testing:

The specialist IT structured wiring contractor shall be responsible for punch down at each end of each Voice/Data Cable, together with testing and



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commissioning to current requirements and for warranty purposes. All cables shall be 100% continuity tested with results recorded on disc in Excel format.

All circuits shall be tested with an approval proprietary tester and all results shall be recorded in tabular form for the client.

The specialist IT structured wiring contractor shall provide the engineer with three copies of Operating and maintenance manuals consisting generally of As-Installed Drawings, Hardware Manuals, Test Sheets, Port Plans, Certification and Warranty.

The installation shall be fully tested (i.e. 100% of all cables) to comply with the requirements to support 1000BASE-T to 100m and comply with IEEE 802, TIA 568-B Category 6A ISO/IEC 11801 Class E and EN 50173. Fibre Optic cables shall be 100% tested @ 850nm and 1300nm.

Level III test instruments shall be used, and all test results recorded on disc and included in the hand-over documents.

Cables that fail the test must be replaced. The engineer reserves the right witness all of the testing.

Cable identification and labelling:

All labelling shall conform to good labelling and identification standards. The specialist contractor shall be responsible for labelling at both the user and communications cabinet location to an agreed labelling system in all UTP / Multicore / Fibre installation. Hand written labels will not be acceptable.

Testing, Commissioning and Certification:

Fully test all cable systems and provide written confirmation of the test results. For Category 6A cable systems, tests shall be to the Category 6A standard, using approved Category 6A test equipment.

All equipment and devices to manufacturer's specifications.

Provide statement certifying that the cable systems were fully tested, accompanied by the tabulated test results.

Submit certificates of all equipment installed such as PABX.

Training and Demonstration:

The Contractor shall include for demonstration and client training. Adequate notice shall be given to the client and, at an agreed time and in the presence of the engineer a training and demonstration event shall be provided.



64.02 PA System

General:

New Public Address (PA) speakers shall be installed in the new extension. These speakers shall be wired back to and connected to the existing Public Address (PA) system in the existing main school building.

The existing Public Address (PA) console is located in the existing main school building as indicated on the drawings. The existing Public Address system and condole shall be extended to cater for the new speaker in the new extension. The existing wiring for the PA system and speakers in the existing school building shall be retained.

See drawings for the location of the existing PA console in the existing school building.

The Electrical Contractor shall allow for following for the PA system installation in the new extension:

- Supply and installation of new PA Speakers in the new extension of the building as indicated.
- Terminating the new cabling for the new PA speaker to the existing PA system in the main school building and testing and commissioning of the new wiring to ensure that all new PA Speakers are operational.
- See below for specification on other PA system components.
- All other works deemed necessary.

Existing PA System in main school building:

The existing Public Address (PA) console is located in the existing main school building as indicated on the drawings.

The existing Public Address system and condole shall be extended to cater for the new speakers for the new extension.

See drawings for the location of the existing PA console in the existing school building.

New PA speakers in the new extension:

The Electrical Contractor shall allow for the supply and installation of new PA speakers in the new extension as indicated on the drawing. The new PA speakers shall be wall mounted speaker and shall be located as indicated on the drawings. The speaker shall allow 2-way communication from the existing PA system console in the main school building to the room.



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PA speaker shall be as CES WAS-6062 (or equivalent) and shall adhere to the following specification:

- Wall mounted.
- Vandal resistant loudspeaker.
- 6 watt 100 & 70 volt line.
- ABS with self-extinguishing UL94V0 cabinet.
- Finished in white (RAL 9016).



Speaker to be mounted 1600mm above finished floor level. Final location of speakers to be agreed with the Employers Representative.

Cabling to the new PA speaker in the new extension:

From the existing PA system in the existing building, the Electrical Contractor shall allow for supplying and installing cables to the new PA speakers in the new extension. Wiring shall generally be housed in a steel conduit system.

Cabling to the speakers from the DIN rail in the new Electrical cabinet shall be wired in a 2 x 2.5mm² screened speaker cable as specified below:

- 2-core 2.5mm² speaker cable.
- Cores twisted together.
- 2.5mm² core diameter.
- Outer jacket shall be Fire retardant LSZH jacket and black in colour.



Testing and commissioning:

The Electrical Contractor shall allow for the supply, installation, testing and commissioning of new public address devices to the existing PA system for the existing main school building. The PA system shall be extended to cater for the new devices in the new extension.



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Cable Carrier:

A new cable carrier shall be installed for the new speakers cabling installation in the new extension. A new cable carrier shall also be installed in the existing school building for the new speakers cable.

A system of galvanised steel cable tray shall be installed to distribute the cabling throughout the new and existing building as indicated on the drawings. Refer to section 62.09 and 62.10 above below for further information on cable containment.

All new cables and distribution shall be installed in a steel conduit/tray system. All cables on trays above the ceiling shall be securely clipped to the tray via clips.

The majority of main runs of the cable containment shall be installed at high level above the ceiling in the ceiling void, and as a result, shall be hidden. Refer to the drawings for further information.

All new conduits below ceiling level shall be surface mounted throughout the building.

Where trunking or cable tray systems pass through fire compartment boundaries, the Electrical Contractor is responsible for the internal fire stopping with a suitable approved material, and also the provision of a lid to cover cable tray at such points.

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68.0 SECURITY AND PROTECTION

68.01 Fire alarm system

General:

A new fire alarm installation shall be installed for the new extension as indicated on the drawings. The new fire alarm system shall be installed and commissioned in compliance with I.S. 3218:2013+A1:2019.

All new devices as indicated for the new extension shall be wired back and connected to the existing main fire alarm panel in the existing school building which shall be located as indicated on the drawings.

In the new extension, a fully addressable L1 type fire alarm system fully in accordance with I.S. 3218:2013+A1:2019 and as identified in the drawings shall be provided for in the new extension of the building.

The system shall comprise ionisation and optical smoke detectors, heat detectors, combined heat detectors, combined smoke detectors, alarm beacons/sounders, visual alarm devices, manual call points, fire alarm interfaces, short circuit isolators and similar alarm input devices, located as shown on the drawings.

Existing Fire Alarm System:

The existing fire alarm system in the main school building is an addressable fire alarm system.

The main fire alarm panel in the existing building shall be retained and utilized for all new devices in the extension of the building as indicated on the drawings. The Electrical Contractor shall allow for connecting the new fire alarm devices in the new extension back to the existing main fire alarm panel in the existing main school building.

Smoke detectors:

The Electrical Contractor shall allow for the supply and installation of all smoke detectors throughout the new extension as indicated on the drawing. All new detector heads in the extension of the building shall include a condition indicating LED light and the smoke detectors sensors shall be complete with bases. The Electrical Contractor shall supply necessary address flags and address labels for all devices.

All new automatic fire detectors shall generally be of the optical smoke detectors type. These detectors shall have an address code setting and shall be addressable



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and suitable for an addressable fire alarm system. Separate addressable plugs for each detector shall be provided.

The Electrical Contractor shall label each detector and base with address number. The colour of detectors shall be white. Detectors to be of the optical point type unless otherwise indicated on the drawings and shall be in accordance with B.S. 5446-1, I.S. EN 54-7 and I.S. 3218:2013+A1:2019. Sensitivity of the smoke detectors shall be set by the main panel control software.

Wiring used for detectors shall be in compliance with I.S. 3218:2013+A1:2019.

Smoke detectors shall adhere to the following specifications:

- Type: Addressable optical smoke detector
- Sensor Method: Light Scatter
- Sensor Element: IR Diode
- Conditioning light: Yes
- Operating Voltage: 20V d.c. to 35V d.c.
- System Voltage: 35V d.c.
- Quiescent Current: 200µA
- Alarm Current: 5mA
- Operating Temp: -10°C to + 55°C
- Storage Temp: -20°C to + 60°C
- Charging Time: 4 minutes
- Relative Humidity: <RH95% non-condensing.
- I.P. Rating: IP40
- Addressing Method: Soft addressing, Non-Volatile EEPROM.
- Material: ABS
- EMC Conformance: EMC conformance to BSEN50130-4.
- CE Conformity: Yes
- Certification: EN54-7 / LPCB 041, I.S. 3218:2013, BS 5446-1, IS EN 54-7.



Heat detectors:

The Electrical Contractor shall allow for the supply and installation of all new heat detectors throughout the new extension of the building as indicated on the drawing.

All new detector heads shall include a condition indicating LED light and the heat detectors sensors shall be complete with bases.



The Electrical Contractor shall supply necessary address flags and address labels for all devices.

These detectors shall have an address code setting and shall be addressable and suitable for an addressable fire alarm system. Separate addressable plugs for each detector shall be provided.

The Electrical Contractor shall label each detector and base with address number. The colour of detectors shall be white. Detectors to be of the optical point type unless otherwise indicated on the drawings and shall be in accordance with B.S. 5446-1, I.S. EN 54-7 and I.S. 3218:2013+A1:2019. Sensitivity of the smoke detectors shall be set by the main panel control software.

Wiring used for detectors shall be in compliance with I.S. 3218:2013+A1:2019.

Heat detectors shall adhere to the following specifications:

- Type: Addressable heat detector
- Sensor Method: Thermistor
- Sensor Element: Thermistor
- Conditioning light: Yes
- Operating Voltage: 20V d.c. to 35V d.c.
- System Voltage: 35V d.c.
- Quiescent Current: 200µA
- Alarm Current: 5mA
- Operating Temp: -10°C to + 80°C
- Storage Temp: -20°C to + 60°C
- Charging Time: 4 minutes
- Relative Humidity: <RH95% non-condensing.
- I.P. Rating: IP40
- Addressing Method: Soft addressing, Non-Volatile EEPROM.
- Material: ABS
- EMC Conformance: EMC conformance to BSEN50130-4.
- CE Conformity: Yes
- Certification: EN54-5 / LPCB 041, I.S. 3218:2013, BS 5446-2, IS EN 54-7.





Combined smoke detectors and sounders:

A number of new sounders shall be combined with smoke detectors as indicated on the drawings. The Electrical Contractor shall allow for the supply and installation of all new addressable combined smoke detector and sounder heads throughout the new extension of the building. Each head shall include a condition indicating LED light and a suitable base for the sounder. All new detector heads shall include a condition indicating LED light and the smoke detectors sensors shall be complete with bases.

See 'smoke detectors' section above for specification on smoke detectors.

The Electrical Contractor shall supply necessary address flags and address labels for all devices. Wiring used for detectors shall be in compliance with I.S. 3218:2013+A1:2019.

Combined smoke detectors and sounders shall adhere to the following specifications:

- Type: Addressable optical smoke detector and sounder
- Sounder Base: Yes
- Sound output: 96dB(A) at 1metre
- Sensor Method: Light Scatter
- Sensor Element: IR Diode
- Conditioning light: Yes
- Operating Voltage: 20V d.c. to 35V d.c.
- System Voltage: 35V d.c.
- Quiescent Current: 200µA
- Alarm Current: 5mA
- Operating Temp: -10°C to + 55°C
- Storage Temp: -20°C to + 60°C
- Charging Time: 4 minutes
- Relative Humidity: <RH95% non-condensing.
- I.P. Rating: IP40
- Addressing Method: Soft addressing, Non-Volatile EEPROM.
- Material: ABS
- EMC Conformance: EMC conformance to BSEN50130-4.
- CE Conformity: Yes
- Certification: EN54-7 / LPCB 041, I.S. 3218:2013, BS 5446-1, IS EN 54-7, BSEN50130-4, EN54-7, EN54-2 and EN54-17.





Void Detectors:

New smoke void detectors shall be installed in the extension of the building to protect the ceiling void as indicated on the drawings.

Smoke or heat detectors above the ceiling shall be complete with a remote monitoring indicating LED. The remote monitoring LED indicator lamp shall be installed below the ceiling so that users of the new extension will know if the void detector above the ceiling is in alarm.

Allow for installing detectors in the ceiling spaces and subsequent LED indicators in the ceiling below the detector.

See 'smoke detectors' section above for specification on smoke detectors. The Electrical Contractor shall supply necessary address flags and address labels for all devices.

Wiring used for detectors shall be in compliance with I.S. 3218:2013+A1:2019.

Manual Call points (break-glass units):

The Electrical Contractor shall allow for the supply and installation of all new manual call points in the new extension of the building as indicated on the drawing.

Manual call points shall be surface mounted as indicated on the drawings. All points to be fully resettable type via key operation. Break glass units will not be accepted as all manual call points shall be PVC. All call points shall be supplied c/w surface mounting back box to suit.

Call points to be installed 1100mm from the finished floor level and 150mm from doorframes.

Wiring used for manual call points shall be in compliance with I.S. 3218:2013+A1:2019.

Manual call points shall adhere to the following specifications:

- Type: Addressable manual call point
- Operating Method: Non Frangible, Resettable
- Operating Element: Microswitch
- Conditioning light: Yes
- Operating Voltage: 20V d.c. to 35V d.c.
- System Voltage: 35V d.c.
- Quiescent Current: 200µA
- Alarm Current: 2mA
- Operating Temp: -25°C to + 70°C



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- Storage Temp: -25°C to + 70°C
- Charging Time: 1 minute
- Relative Humidity <RH95% non-condensing.
- I.P. Rating: IP24
- Addressing Method: 8 Way DIL switch
- Material: POM / Polycarbonate
- EMC Conformance: EMC conformance to BSEN50130-4.
- CE Conformity: EN54-11 & EN54-17
54-7.



General fire alarm interface units (I/O units):

The Electrical Contractor shall allow for the supply and installation of all standard fire alarm interface units as indicated on the drawing and for the linking of these to the relevant systems as indicated. Interface units (Input/Output models) shall be provided as indicated on the system drawings.

Short circuit isolators shall be installed where the loop wiring crossed a fire compartment wall and where the wiring enters another fire zone.

In addition to the items above, the following items shall be connected and interfaced to the fire alarm system and as a result interface I/O units will be required at all equipment:

- Door access controllers.
- Gas detection system
- Magnetic door hold open device
- Any other items described on the drawings.



Drawing/Map:

The Electrical Contractor shall allow for installing a laminated A3 drawing of the new fire alarm system installation and devices in the new extension at the new fire alarm panel location to indicate where all fire alarm devices are located throughout the entire building. This drawing shall indicate and identify the location of the fire alarm devices throughout the building i.e. on the alarm panel



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if it identifies that the device 45 has gone into alarm, you should be able to see on the drawing where device 45 is located.

Wiring:

All new cabling used for the fire alarm system throughout the new extension and the existing school building shall meet classification 'PH120 Enhanced'. A fire-resistant cable with a lesser PH classification than PH120 and if not of enhanced grade status shall not be permitted on this project.

The entire fire alarm system shall be wired in 2 x 2.5mm² 'Prysmian FP Plus' fire alarm cabling (or equivalent) as specified below. Cabling shall be 2core and earth type.

The fire alarm cable shall be rated at 120mins in compliance with BS 8432-2 (flame, shock and water spray). The fire-resisting cable shall have 2-hour fire rating according to IEC 331.

All cabling shall be manufactured by a BASEC approved manufacturer. Cables shall be installed strictly in accordance with the manufacturer's requirements.

The enhanced PH120 fire alarm cabling shall satisfy the following requirements for integrated water spray and mechanical shock:

Conductor:

Plain annealed copper. Solid 2 x 2.5mm² to meet the requirements of BS EN 60228 class 1 or class 2.

Insulation:

High performance, damage resistant enhanced insulation to meet BS EN 50363-5, Type EI5.

Overall metallic screen and CPC:

Polyester backed laminated aluminium or copper tape bonded to outer sheath to provide overall screen. In contact with full sized, tinned annealed copper circuit protective conductor and laid-up with the cores to provide automatic screen earthing.

Sheath:

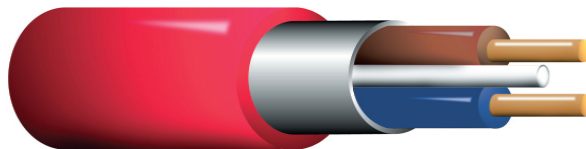
Robust thermoplastic low smoke, zero halogen and reduced flame propagation outer sheath. Suitable for outdoor installation with exposure to normal daylight UV.



Sheath shall be coloured 'Red' for Fire Alarm System wiring indication.

Standards, Tests & Approvals:

- I.S. 3218:2013+A1:2019
- BS 8432-2 (120 minutes)
- BS EN 50200 (PH 120)
- BS 7629-1 Enhanced 120
- BS 60332-1-2
- BS EN 60754-1
- BS EN 61034-2
- BS EN 50200 PH30, PH60, PH120
- BS 8434-2 Flame, impact & water test for 'enhanced' cable
- BS 5839-1, 6, 8 & 9 'enhanced' fire resisting cable
- BS 5266-1 'enhanced' fire resisting cable
- BS 8519 'Category 2' control cable
- BASEC approved
- LPCB approved (specific products & fire tests only)



The Electrical Contractor shall allow for all necessary power supplies to the new fire alarm devices and equipment.

The Electrical Contractor shall ensure that any other attendances or modifications required to the installation in order to leave the whole of the completed installation in a satisfactory condition are included in his tender.

All to the approval of the Employer's Representative.

Testing & Commissioning:

The Electrical Contractor shall test all items of equipment individually and shall commission the full installation as a unified system. All testing and commissioning shall be carried out in the presence of and to the satisfaction of the engineer.

The Electrical Contractor shall give to the engineer seven days notice in writing before testing or commissioning is carried out. Commissioning shall comply with I.S. 3218:2013+A1:2019.



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The Electrical Contractor shall allow for the following during the commissioning:

- Carry out a full test on the new fire alarm system which includes all devices, panels, etc. to ensure that the items are fully operational.
- Test every device in situ including manual call points, sounders, detectors, interfaces, etc. To test each item the Electrical Contractor shall use appropriate test method/device.
- Confirm sound levels throughout the new extension of the building. Audibility level readings shall be taken in each room using an instrument complying with BS 5969, type 2 with slow response and 'A' weighting.
- All trigger devices i.e. manual call points, heat, and smoke detectors shall be tested for correct operation.
- A mains failure test shall be carried out to verify and standby battery system complies with the requirements of this specification.
- Confirm that the new fire alarm system in the new extension of the building is linked to the existing fire alarm system in the existing building.
- The Contractor must confirm that the entire system all components operate satisfactorily. The Electrical Contractor shall test for:
 - Operation of each device function
 - Operation of integral indicators (LED's, etc)
 - Fire alarm panel indications and functions
 - Network functions

Certificates:

When completed, in compliance with I.S. 3218:2013+A1:2019, the Electrical Contractor shall provide the following certificates for the new fire alarm system for the new building:

- Certificate of Installation as per Annex C2 on I.S. 3218:2013+A1:2019.
- Final Certificate of Commissioning as per Annex C3 on I.S. 3218:2013+A1:2019.
- Certificate of Handover as per Annex C6 on I.S. 3218:2013+A1:2019.

Cable Carrier:

A new cable carrier shall be installed for the new fire alarm installation in the extension of the building. A dedicated cable tray shall be installed for the fire alarm cabling as indicated on the drawings.

A new cable carrier shall also be installed in the existing school building for the linking of the new fire alarm devices to the existing fire alarm panel in the existing school building.



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A system of galvanised steel cable tray shall be installed to distribute the fire alarm cabling throughout the new extension and existing building as indicated on the drawings. Refer to section 62.09 and 62.10 above below for further information on cable containment.

All new fire alarm cables and distribution shall be installed in a steel conduit/tray system. All fire alarm cables on trays above the ceiling shall be securely clipped to the tray via metal clips.

The majority of main runs of the cable containment shall be installed at high level above the ceiling in the ceiling void, and as a result, shall be hidden. Refer to the drawings for further information.

All new conduits below ceiling level shall be surface mounted throughout the new extension of the building.

Where trunking or cable tray systems pass through fire compartment boundaries, the Electrical Contractor is responsible for the internal fire stopping with a suitable approved material, and also the provision of a lid to cover cable tray at such points.

Remote monitoring of the fire alarm system:

The Electrical Contractor shall ensure that the new fire alarm system in the new building is monitored via being linked to the existing main fire alarm system in the main building.

68.02 Intruder alarm system

General:

The Contractor shall be completely responsible for supply and installation of the intruder alarm system in the new extension of the building as indicated on the drawings.

All cabling shall be run in galvanised steel conduit. The Contractor shall be completely responsible for the supply, installation, testing, commissioning and handover all elements of the security installation.

An intruder alarm system shall be installed in the extension of the building comprising of passive infrared (PIR) dual tech movement detectors and window/door contacts as indicated on the drawing.

The intruder alarm system for the new extension of the building and devices shall be supplied and installed by the Contractor. The Contractor shall provide a 3 gang 220-volt 13-Amp fused spur outlet with neon indicator at all necessary



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equipment positions such as panels, etc. Spur outlets shall be located at the equipment positions as required.

Proposed equipment layouts are as shown on the drawings, however all precise locations to be confirmed on site with the Employer's Representative. The systems installed shall also comply fully with IS 199:1987, ISO: 9002: 1987, DD243:2004 (sequential verification of alarms) and all subsequent amendments.

Intruder Alarm installations to be in compliance with EN50131/1 Intruder Alarm Systems. Compliance with I.S. 228:2007 Monitoring Centres for Intruder Alarm Systems. Security equipment in compliance with ISO 9001 Registered by an Accredited Certification Body. The Contractor shall employ a suitably qualified ISIA company to install the Intruder Alarm system.

The specialised Contractor shall design, install and commission a fully operational intruder alarm system, which shall comply to IS199. The specialised Security Contractor must be a suitably qualified ISIA company and shall be NSAI accredited. A certificate of compliance shall be required on completion of the works as will a unique reference number from the Garda Authority for monitoring purposes.

Main control panel:

The contractor shall allow for retaining the existing main intruder panel for the building. The location of the panel is located on the drawing. The contractor shall allow for connecting all new devices back to this panel.

Movement Detectors:

Install PIR movement detectors as indicated on drawings. Detectors shall be dual technology type incorporating passive infra-red and microwave technologies, and remote walk test facility to enable routine testing. Movement detectors shall be of the Passive Infra-Red/Microwave 'Dual Tec' type of sufficient range and coverage for areas indicated. They shall be suitable for Wall or Truss Mounting as appropriate. The sensor shall be suitable for the coverage of the perimeter window areas as indicated on the drawing. All alarm sensors shall be suitable for the areas and locations which they are installed and shall include full anti-tamper facilities.

Dual technology sensors shall adhere to the following specifications:

- Dual element pyro-electric sensor.
- X-band DRO based microwave.
- Optional lenses 18m and 30metre.
- Anti-masking detection.
- 0-1m adjustable mask detection.



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- Selectable EOL (End Of Line) resistors.
- AND/OR technology.
- Patented Independent Floating Thresholds (IFT).
- Blue wave technology.
- Auto sensitivity feature.
- Digital temperature compensation.
- Triple LED indication.
- Sealed optics.
- Tamper proof brackets included.
- ABS plastic.
- Tested and certified to IS EN 50131-2-4.

Internal Sounders c/w flash:

Internal sounders shall be 12volt d.c. electronic 'SQR Sounder'. As 'HKC HN8-ECHOFLR' low profile sounder complete with strobe (or equivalent). Sounder shall be configured to silence after 30 minutes in operation.

Internal sounder shall adhere to the following specification:

- High output dual piezo.
- Variable volume control.
- Housing with tamper switches.
- Sounder shall come with strobe (red or blue). Strobe and sounder shall adhere to the following specifications:
 - Strobe Current: 120mA.
 - Siren Current: 135mA.
 - Strobe: 1W.
 - Siren: 104dB at 1m.
 - Weight: 150g.
 - Size: 150mm x 100mm x 36mm.
 - EN50131-4.
 - EN Grade 2.
 - Environmental Class II.

Magnetic Reed Door Contacts/Inertia Sensors:

Magnetic reed contacts for external doors and windows where indicated on the drawings shall be of the double reed magnetic type with shock sensors as required.

Cable containment:

A new cable carrier shall be installed for all cabling to the intruder alarm system throughout the building as indicated on the drawings. All new cabling for the



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intruder alarm system installation shall be installed in a steel conduit/trunking system. See section 62.09 and 62.10 for further information on cable carrier.

Commissioning:

Allow for commissioning and testing of the entire intruder alarm installation. Commissioning Certificates to be included within as fitted manuals. The intruder alarm panel shall be fully labelled and the zone charts handed over to the Client before the system is fully commissioned.

A certificate of commissioning shall be forwarded to the Employers Representative on the day after commissioning. Commissioning Certificates to be included within 'As-Built' O&M manuals.

Intruder alarm cabling:

All intruder alarm cabling to devices and between intruder alarm panels shall be 6-core security alarm cable and shall adhere to the following specifications:

- 6-cores
- White jacket colour
- Maximum Resistance less than 155 Ohm/km
- BS4737-3.30: 2015 Type 3 (Yellow Rip Cord)
- Voltage Rating 50Vrms
- Jacket Material Lead and Tin Free PVC
- PVC Insulation – BS EN 50636-3 TI 1
- PVC Sheathing - BS EN 50636-4.1 TM1
- Conductor Material Tinned Copper
- External Diameter 3.8mm (nominal)

68.03 CCTV system

General

The Electrical Contractor shall be responsible for the supply, cabling, installation, testing and commissioning of the CCTV camera for the new extension as indicated on the drawings.

The Electrical Contractor shall allow for supplying all necessary power supplies and data points to the CCTV cameras as indicated on the drawings. Quantities and locations of all CCTV camera, are as indicated on the drawings.

The Electrical Contractor shall allow for connecting the new CCTV cameras as indicated on the drawing back to the existing digital recorder in the principals office in the main building in the location as indicated on the drawing.



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Contractor shall review the existing CCTV system in the existing building when he visits site to review the existing system.

Electrical attendances:

The Electrical Contractor shall allow for providing the following electrical attendances to the CCTV system:

Internal cameras in the Building:

- 1no CAT6 data point terminated in a RJ45 outlet to each internal CCTV camera. Height of the data point is highlighted on the drawings. The CAT6 data point to each CCTV camera shall be supplied from the existing comms cabinet as indicated on the drawings. Final location of data point to be confirmed by the CCTV system installer.
- Supply and installation of the CCTV camera and final connection of power supply and IT cable to the camera.

External cameras on the Building:

- 1no CAT6 data point terminated in a RJ45 outlet to each internal CCTV camera. Height of the data point is highlighted on the drawings. The CAT6 data point to each CCTV camera shall be supplied from the existing comms cabinet as indicated on the drawings. Final location of data point to be confirmed by the CCTV system installer.
- Supply and installation of the CCTV camera and final connection of power supply and IT cable to the camera.

Wall mounted CCTV monitor in the Building:

- 1no CAT6 data point terminated in a RJ45 outlet to the wall mounted CCTV monitor in the building. Height of the data point is highlighted on the drawings. The CAT6 data point to the CCTV monitor shall be supplied from the existing comms cabinet as indicated on the drawings. Final location of data point to be confirmed by the CCTV system installer.
- 1no 13amp single socket power supply to the CCTV monitor in the new temporary building. Height of the single socket is highlighted on the drawings. The socket shall be supplied from the new electrical board in the new extension of the building. Final location of the socket to be confirmed by the CCTV system installer.

Conduit runs serving wall mounted CCTV devices shall terminate in the devices own box.

A 13A-power fused spur outlet with neon indicator shall be provided at the CCTV cameras, monitors, multiplexer/recorder and video positions indicated on the



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drawings. CCTV cabling and devices shall be supplied and installed by the Electrical Contractor.

The Electrical Contractor shall co-ordinate and optimise the location of the external light fittings with the external CCTV cameras. Where possible, the light source should be above and behind the camera. If this is not possible, the light source shall be at 90° to the main viewing axis of the camera.

Proposed equipment layouts are as shown on the drawings, however all precise locations to be confirmed on site with the Employer's Representative. All mounting structures and brackets for all devices shall be included for in the tenderer's price.

Cable containment:

A new cable carrier shall be installed for all cabling to the CCTV cameras throughout the new extension as indicated on the drawings. All new IT cables and power supplies to the CCTV system installation shall be installed in a steel conduit/trunking/tray system. See section 62.09 and 62.10 for further information on cable carrier.

All conduits shall be recessed and hidden in the building fabric. The new electrical distribution system shall be installed in a steel conduit/trunking system throughout which shall be located in the ceiling void. This includes all horizontal runs whether in false ceilings or exposed on walls/ceilings. If it is possible, the conduits and trunking system shall be installed in the ceiling void.

All conduit drops or tray containment drops to electrical services in the new extension from the main run of electrical containment shall be exposed and surface mounted.

The new electrical distribution system shall be installed in a steel conduit/trunking system throughout the building. The conduits below the ceiling shall either be installed in plastic or galvanised steel.

CCTV Cameras:

External CCTV camera

Fit external network bullet cameras in the building with the following specifications (refer to drawings for quantities):

- Type: 4MP high resolution network bullet camera
- Network: Yes
- POE: Yes
- IP rating: IP67



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- Housing Colour: Ivory or White
 - Image Resolution: 2688 H x 1520V
 - Image Sensor: 1/2.9" Progressive Scan CMOS
 - Day and night: IR cut filter with auto switch
 - Min. Scene Illumination: 0.01lux @ (F1.2,AGC ON),0lux with IR
 - DNR: 3D DNR
 - Wide dynamic range: 120db
 - Iris: F2.0
 - Shutter time: 1/3 s to 1/100,000 s
 - Lens: 2.8 - 12 mm @ F1.4, motorized lens (-Z), angle of view: 112°~33.8°
 - Synchronisation: Internal synchronisation
 - Communication Interface: 1 RJ45 10M/100M self-adaptive ethernet port
 - Auto gain: Low/Middle/High/Off
 - D/N mode: Colour/BW/EXT
 - White balance: Auto/manual
 - Privacy mask: On/Off
 - Motion detection: On/Off
 - Integrated IR Lighting: Yes (IR LEDs)
 - Infrared: Yes
 - IR distance: 30metres
 - Iris Mode: AES only
 - Power Source: 12V DC, POE
 - Power Consumption: 5.5W
 - Approximate Dimension: 95mm x 105mm x 260mm.
 - Approximate Weight: 1200g
 - Operating Temperature: -30° C to 60° C
 - Humidity: 0% to 95% relative, non-condensing
 - Notes: Compatible with network system
 - Camera manufacturer: Hikvision, or equivalent.

Allow for supplying the following in conjunction with the camera:

- The necessary brackets for wall mounting or pole mounting the camera as advised by the supplier.
- Allow for supplying and installing all junction boxes and all necessary accessories for installing all the cameras.
- Any other items that the Contractor deems necessary.





Internal CCTV cameras

Fit internal network dome cameras in the new extension of the building with the following specifications (refer to drawings for quantities):

- Type: 4MP high resolution network dome camera
- Network: Yes
- POE: Yes
- IP rating: IP67
- Housing Colour: Ivory or White
- Image Resolution: 2688 H x 1520V
- Image Sensor: 1/2.9" Progressive Scan CMOS
- Day and night: IR cut filter with auto switch
- Min. Scene Illumination: 0.01lux @ (F1.2,AGC ON),0lux with IR
- DNR: 3D DNR
- Wide dynamic range: 120db
- Iris: F2.0
- Shutter time: 1/3 s to 1/100,000 s
- Lens: 4mm
- Synchronisation: Internal synchronisation
- Communication Interface: 1 RJ45 10M/100M self-adaptive ethernet port
- Auto gain: Low/Middle/High/Off
- D/N mode: Colour/BW/EXT
- White balance: Auto/manual
- Privacy mask: On/Off
- Motion detection: On/Off
- Integrated IR Lighting: Yes (IR LEDs)
- Infrared: Yes
- IR distance: 30metres
- Iris Mode: AES only
- Power Source: 12V DC
- Power Consumption: 5.0W
- Approximate Dimension: 115mm (diameter) x 83mm (height)
- Approximate Weight: 500g
- Operating Temperature: -30° C to 60° C
- Humidity: 0% to 95% relative, non-condensing
- Notes: Compatible with network system
- Camera manufacturer: Hikvision, or equivalent.

Allow for supplying the following in conjunction with the camera:

- The necessary brackets for wall or ceiling mounting the camera.
- Allow for supplying and installing all junction boxes and all necessary accessories for installing all the cameras
- Any other items that the Contractor deems necessary.



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Specification:

The installation shall comply fully with IS EN 50132, IS EN 50131, IS 199:1987 and ISO: 9002: 1987 and all subsequent amendments. The specialised CCTV Contractor that the Contractor employs must be ISIA qualified and NSAI registered.

Commissioning:

The Specialist Contractor shall allow for commissioning the new CCTV camera into the existing CCTV system in the building.



69.0 COMMISSIONING, INSTRUCTION TO CLIENT AND HANDOVER

69.01 Commissioning of systems

Scope

Testing, Commissioning, Certification (TCC) and handover of the works specified.

Standards

- The sections of any standard specified for these works, that dictate testing, commissioning and/or certification formats or procedures
- RECI

Procedures

All systems and equipment must be fully tested and commissioned by the Contractor in accordance with the standards specified, the manufacturer's instructions and the specific requirements of these specifications. Spot testing will not be acceptable for any systems.

The Contractor shall supply, at his own expense, any and all equipment, labour and materials necessary to carry out these works as specified.

Practical Completion shall be withheld until all TCC is complete.

Prepare a schedule of all TCC works required for the project and proposed dates for the execution of same. the Engineer shall be informed of all TCC works a minimum of 3 working days in advance.

Submit written confirmation of all tests executed. Present clearly written or typed commissioning reports and provide original certificates where available.

Testing and Commissioning

Carry out testing and commissioning as follows:

- To all manufacturers specifications.
- For all cable systems (By installer of cable systems).
- Fully test and commission fire alarm panel and all devices individually (By system supplier).



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- For addressable systems, verify addresses by confirming same during device test activation (By system supplier).
- Test battery back-up operation (by system supplier).
- Perform audibility test throughout facility. Provide written confirmation of test results (by system supplier).
- Test all external interfaces with the fire alarm system (e.g. HVAC panel, gas detection, etc.) and confirm results in writing. Overall responsibility for this test is with the Electrical Contractor. The Systems Supplier will also be involved.
- Perform sounder sequencing tests and confirm operation of sounders is in full accordance with the specifications.

Certification

- To I.S. 3218:2013+A1:2019, 4 part Model Form.
- RECI Certificate as required.
- Systems/components certification.

Commissioning Records and Reports

All checks, measurements and adjustments must be recorded in writing at the time they are made by the commissioning staff, and copies made available immediately to the Engineer. The form that this report will take shall be agreed with the Engineer prior to commissioning.

When the Contractor is satisfied that the plant and systems have been correctly commissioned, he shall submit a final report to the Engineer, setting out all matters relevant. The final format of this report shall be agreed with the Engineer before completion.

Handover of systems

When the Contractor has satisfied the Engineer that all commissioning has been completed satisfactorily, that the Clients staff have been adequately briefed on all plant and in all maintenance procedures, that all spares have been duly handed over and placed in stores, and that all instruction and maintenance manuals, together with all record drawings, have been delivered to the Client and the Engineer, the Engineer shall issue Completion Certificates to the Contractor. Each section of the plant shall then be handed over to the Clients representative in the presence of the Engineer.



69.02 O&M Manuals

The Contractor shall provide a Class D Operating & Maintenance manual.

To facilitate submission of record drawings, the Contractor shall keep on site a complete set of all drawings used on the Contract Works, on which he shall mark alterations to the designs shown thereon as such alterations are carried out. THIS PROCEDURE SHALL BE STRICTLY ADHERED TO.

Three prints shall be supplied of each drawing in addition to 3no compact disks containing all drawings in AutoCAD 2008 Format.

All operation and maintenance manuals along with their associated record drawings shall be prepared in accordance with the requirements of BSRIA document 1/ 871 Operating and Maintenance Manuals for Building Services Installations.

Three complete sets of Operating and Maintenance Manuals and record drawings shall be supplied to enable the Employer to operate and maintain the systems correctly. The manuals must therefore contain all necessary technical information on each item of equipment and the associated components which have been used to assemble and construct the system(s). Three no. hard copies and three no. soft copies of the final approved O&M documentation will be required.

In addition, manuals for each system must contain information on the design intent of the system, commissioning and testing results and reports of how the components of the system are adjusted to achieve the design intent, line diagrams to show how the system is arranged in the building giving the location of all equipment and components, its control system, how the system must be set in the normal operating mode and in the event of any emergency, routine check that must be made and a list of spares which should be kept and a list of any special tools which may be required.

The manuals must be prepared in such a way that an Engineer without any previous knowledge of the Project may use them to operate and maintain the system.

Contents of Manual

The Operating and Maintenance Manual shall be specific in respect of the complete Contract Works and shall include the following sections:

- Section 1 Description
- Section 2 Plant and Engineering Systems



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- Section 3 Lighting Control Systems
 - Section 4 Operating and Maintenance Procedures
 - Section 5 Commissioning and Testing
 - Section 6 As-Built drawings

Section 1 – Description

This section shall comprise:

- A detailed description of each building services system
- General description of all plant and equipment
- A detailed description of the automatic lighting control system
- Design data for the system and for each item of plant which affects the performance of the system

Section 2 - Plant and Engineering Systems

This section shall comprise:

- Detailed technical information as published.
- Manufacturers drawings (where applicable) showing all components of the plant item with each component number in accordance with the parts list
- Parts list for each item of plant
- Manufacturers addresses and telephone numbers
- Complete instructions for ordering replacement parts in a manner that will prevent errors or misunderstanding including order number for each plant
- Installation instructions as provided by manufacturer
- Colour coding identification schedule for each building services system
- Detailed schematics of the installed electrical boards, including manufactures details, board charts, etc.

Section 3 - Lighting Controls System

This section shall comprise:

- Wiring diagrams of lighting and lighting control systems.
- Parts list for each different type of item.
- Manufacturer's addresses and telephone numbers.
- Complete instructions for ordering replacement parts in a manner that will prevent errors or misunderstanding, including order number for each component item.
- Installation instructions as provided by manufacturers.



Section 4 - Operating and Maintenance Procedures

- A step-by-step method of starting, operating and shutting down a system and how this affects other systems. The procedure for an emergency shut-down.
- A list of routine checks that should be made and the frequency of the checks.
- A comprehensive schedule of routine maintenance based on Manufacturer's recommendations for items of plant etc. This program should state clearly what work should be done for each day, week, month, year or given number of hours.
- A list of tools and keys which will be required in the operation and maintenance of the systems.
- Fault finding procedures.

Section 5 - Commissioning and Test Report

The report for each system shall contain a record of all the parameters which affect the performance of the system at the time of commissioning. A similar report shall be prepared for tests which have been made. The report shall be comprehensive and shall contain a record of the settings of all valves and controls and any other adjustable components so that the system may be reset to the commissioned state by reference to the report.

Presentation:

- Indexing System

Each volume shall be numbered and shall be divided into sections using an appropriate numbering system

- Paper Sizes

The manual will contain manufacturer's literature which will be different sizes. Large pages will be folded and small pages will be fitted in plastic pockets with a reinforced edge punched for filing in A4 lever arch files. The page size shall be standardised for all volumes using A4 paper (210 x 297mm) with four holes punched centrally in the longer side 80mm apart

Diagrams shall be prepared on A4 or A3 (297 x 420mm) paper

- Section Dividers

Stiff cardboard section dividers with extended tabs shall be used; these shall be SUMMIT Ring Book Guides or equal and approved.



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- Files for Manual

A4 lever arch files with rigid plastic coated covers shall be used which shall be EMGEE or equal and approved

Inlaid lettering on the front cover shall indicate the title, i.e. Operating and Maintenance Manual, the Name of the Project and Volume Number. A label shall be fitted in the window on the spine of the file listing its contents.

The Trade Contractor is advised that all Record Drawings and O & M Manuals in the form described herein must be handed over to the Engineer prior to the issue of a Practical Completion Certificate for the Trade Contract Works. Failure to issue these Record Drawings and O & M Manuals will also defer the issue of the Practical Completion Certificate until such time as they are received.

If the Trade Contractor fails to issue such documentation on time, then the Engineer will have the right to engage such other third parties to prepare these Record Drawings and O & M Manuals and any resultant cost incurred by him shall be borne and set against the Contract.

Identification of Services and Plant

All cable trays and trunking shall be labelled clearly with colour coded bands which identifies its content.

Section 6 – As-built Drawings

The Contractor shall include for a complete set of as-built drawings which shall incorporate all works carried out and completed by the Contractor. All services, trunking/tray, routes and circuits within the building shall be identified on these drawings.

To facilitate submission of record drawings, the Contractor shall keep on site a complete set of all drawings used on the Contract Works, on which he shall mark alterations to the designs shown thereon as such alterations are carried out.