



Client:

Colooney National School,
Colooney,
Co Sligo

Project:

New Classroom Extensions

Electrical Engineering Services
Specification

Issue:

Tender (T0)

19-08-2026

A1172

Revision	Date	Prepared By	Approved By
T0	19/08/26	Bernard Byrne	Colman Reynolds

Section 1 – Low Voltage Power Systems**1. SCOPE OF WORK****1.1 System Description**

Provision for the alteration to the existing MDB to cater for the new extension works and new Emergency lighting panel.

Provision is to be made for a distribution boards (DB) to be located in the new office on the ground floor and IT store on the first floor to serve the new extension area's small and general power and lighting.

This shall include the associated cable distribution systems (trays etc.), cables and device isolators and Sub-circuit distribution. The erection and connection of all associated devices. Earthing and bonding of the complete system as per current standard.

1.2 Reference Specifications

The works shall comply with NSAI IS10101 wiring regulations.

2. SYSTEM OPERATING DETAILS

Item	Details
Operating Voltage	400/230V, 3 phase, 50Hz 230V, single phase, 50Hz
Short circuit rating of main protective device	40kA (1 second)
Permitted voltage drop	2% of nominal supply voltage to sub-circuit source plus 2% of nominal supply voltage to any sub-circuit device on full load. Maximum 4% on full load to any point in the system.
Date permanent supply required on site	In line with Main Contractor's Programme

3. LV POWER SUPPLY

3.1 The electrical contractor shall carry out all works associated with the new distribution arrangement which shall include services throughout the building extension.

- Lighting
- Emergency Lighting
- General Services
- Small Power
- Mechanical Services

3.2 Scope

All Factory Built Assemblies (FBA) and Custom Built Assemblies (CBA) provided for the protection, regulation and distribution of the electric service from the main switch to final switch distribution circuits at voltages not exceeding 1000V AC. Final device isolators are included elsewhere.

3.3 Standards

ETCI - Code of Practice for the Design, Selection and Erection of Low Voltage Switchgear Assemblies (referred to as Switchgear COP).
ESB National Code of Practice for Customer Interface.

IEC 439:Factory Built Assemblies.

IEC 157-1:Power Circuit Breakers.

IEC 408:Air Break Switches.

IEC 408:Fuse Combination Units.

IEC 269:Low Voltage Fuses.

IEC 898:MCBs

IEC 157:MCCBs

IEC 755:RCDs

IEC 292-1:Motor Starters

IEC 158-1:Contractors

IEC 255 &

IEC 292-1:Protective Relays

IEC 51:Indicating Instruments

IEC 185:Current Transformers

IEC 73:Indicating Lamps

IEC 337:Control and Auxiliary Circuit Control Switches

IEC 73:Push Buttons

IEC 439:Custom Built Assemblies.

3.4 Drawings, Schematics, Diagrams and Maintenance Manuals

The Contractor shall provide the following information with the switchgear which is being proposed:

Prior to Approval - 1 copy of drawing showing overall dimensions and layout.

After order - 2 copies of drawings showing overall dimensions, layout and foundation plans, also cabling areas, together with Schematics, Diagrams and Labelling for approval before commencing manufacture.

After manufacture - 2 copies of final drawings, schematics and diagrams together with 2 copies of maintenance instructions.

3.5. Products

General

FBAs are the preferred switchgear form and shall be used generally for all switchgear. CBAs may be proposed by the Contractor for financial or operational reasons, but their use must be approved in advance by the Engineer. Approved CBAs must comply with the principles of IEC 439.

All switchgear to be fitted with standalone CO₂ fire suppression system with an activation link to the building's fire detection and alarm system.

Free standing, floor mounted switchgear shall be raised a minimum of 100 mm. off the floor level by a metal plinth.

The Contractor is responsible for verifying that all switchgear and distribution boards supplied on this project comply with all the requirements for the project drawings and specifications.

Main incoming protective device shall have a minimum short circuit rating of 40kA in accordance with the Switchgear COP section 6.3.3 unless otherwise noted on the schedules.

Ensure that components are compatible with one another and avoid the concurrent use of

components manufactured to non-harmonized standards.

Verify discrimination between overcurrent devices. If requested provide manufacturers data and calculations to support the proposed assembly.

3.6 **Fault Ratings**

Equipment to be certified for the fault levels called for in the particular specification. ASTA Certificates to be provided when requested covering complete busbar assemblies (main and secondary), ACBs, HRC Fuse Switches and similar devices.

Where "Fuse Protected" FBAs are specified, the standard fault rating to be 40kA unless otherwise stated.

Where "Circuit Breaker Protected" FBAs are specified, the standard fault rating to be 40kA unless otherwise stated.

3.7 **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).

3.8 **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.

3.9 **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 HDHC Earth Busbar shall run the length of the FBA. The size of the busbars shall be in accordance with the Switchgear COP and IS10101 Wiring Regulations.

3.10 **Small Wiring**

General - PVC LSF flexible cable to be bunched and cleated or run in wiring duct. Jumper cables to hinged panels to be provided with additional overall insulation. Wiring is to be:

Phase L1	Brown
Phase L2	Black
Phase L3	Grey
Neutral	Blue
Earth	Green/Yellow

Wires to be provided with crimped terminations.

Switchgear - To be minimum 2.5mm sq.

Motor Control - To be minimum 1.5mm sq.

3.11 **Air Circuit Breakers**

General - To comply with P2 category and to be ASTA certified for 40kA rating at a power factor of 0.2 unless otherwise specified in the Particular Specification and provided with the following features:

- a) Draw out isolation, where specified.
- b) Triple pole with bolted neutral.
- c) TP internal overload/short circuit trips. External relays will be provided when specified.
- d) Manual spring closing mechanism. Power closing mechanisms will be included when specified.

3.12 **HRC Fuse Switches**

General - For general distribution AC22 category and for Motor Control Duty AC23 category. ASTA certified for 50kA rating unless otherwise specified in the Particular Specification and provided with the following features:

- a) Silver faced contacts.
- b) Manual spring closing mechanism.
- c) Single Pole or Triple Pole as called for with switched neutrals.

3.13 **Miniature Circuit Breakers**

General - SP, DP or TP as called for and to be 9kA current limiting type with thermal/magnetic protection as Type 1, 2, 3 or 4 as specified.

In general, lighting, general service socket outlets and small power final sub-circuits not serving motive power loads shall use Type 2 MCBs.

Motive power final sub-circuits shall use Type 3 MCBs.

Unless otherwise specified:

- a) Lighting final sub-circuits shall be protected by 10 amp RCB0s.
- b) G.S. and small power final sub-circuits shall be protected by 20 amp MCBs with integral 30mA, RCD protection (where earth leakage protection is specified).

3.14 **MCCBs**

General - MCCBs shall be SP, DP, TP or 4P as called for. Short circuit rating to be as called for and fitted with thermal/magnetic protection.

3.15 **110v Transformer**

N/A.

3.16 **Fuses**

IEC 269 relates to the electrical characteristics of fuses. Dimensional and mechanical properties

shall comply with any of the following standards:

VDE 0636	- Neozed or DO type
VDE 0660	- NW type
BS 88	- Parts 1,2 and 4
BS 1361	- type I & II
BS 1362	
NFC 63-201	
NFC 63-210	

3.17 **Residual Current Devices (RCDs)**

RCDs shall be of the differential current type and comply with IEC 755.

Unless otherwise specified RCDs shall be rated at 30mA and shall be combined with the final subcircuit MCB as an MCB/RCD protective device.

All RCDs shall be equipped with a test button to simulate operation of the device.

3.18 **Load Break Fault Make Switches**

N/A

3.19 **LBFM Switch Fuses**

LBFM switch fuses shall comply with the specifications for LBFM switches and shall be provided with high rupturing capacity non-deteriorating blade type fuses.

3.20 **Control & Indication Stations**

N/A

3.21 **Starters**

N/A

3.22 **Contactors**

Contactors shall be of the quick make and break type and shall be housed in enclosures as previously specified.

The operating coil shall not overheat and shall be free from chatter or hum during operation.

The operating coil may be connected between phases or between phase and neutral as required. A suitably rated fuse shall be provided to protect the coil circuit.

The rating and type of contactor required shall be as indicated on the drawings or schedules.

3.23 **Installation Labelling**

Circuits - All devices to be provided with engraved plastic circuit labels. All label script must be approved in advance by the Engineer.

All covers, doors and complete FBAs to be provided with suitable warning labelling.

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.

Every separate switchboard shall have a permanent label stating the cable colour code used.

Other labelling shall be as directed in the Switchgear COP.

3.24 **Inspection and Tests**

Testing and Inspection shall comply with the Switchgear COP. The Engineer reserves the right to witness tests. The Contractor must supply written certification of tests.

Inspection and tests to ensure equipment is operating functionally correctly are to be carried out by the Contractor. Tests to include:

- a) Checking for compliance with drawings.
- b) Insulation - 2500V for 10 seconds.
- c) Functional tests on all devices.

4. **CABLE DISTRIBUTION SYSTEMS**

4.1 **Mains Cables**

Sub Main cabling shall be XLPE/LSF steel wire armoured cable either routed externally in PVC ducting or installed on cable tray or basket. SWA cables to have a CPC either within the cable or run separately with the cable. Clipping shall be in accordance with the manufacturer's guidelines. SWA cables shall be glanded at each end with the wire armour suitably earthed.

4.2 **Cable Tray**

Primary cable tray routes are shown on the drawings. This contractor may augment or revise same with the Engineer's approval for practical wiring considerations and site conditions. Such amendments will not be considered as extra cost justification. Circuits within trunking, cable tray or conduit systems shall be grouped together with tie tags and circuit identification levels at all outlets, switches, terminations and at appropriate locations along the length of the trunking/tray to allow circuit identification.

Cable capacities of conduit and trunking systems shall not exceed the requirements of the IS 10101:2020 Specifications. It is the responsibility of the Contractor to verify that the trunking system as designed satisfies these regulations. If cables will exceed the trunking capacities, the Contractor must bring this to the attention of the Engineer prior to order or installation of the trunking system.

Trunking 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.

5. **CABLES AND WIRING**

5.1 **Scope**

Trunking systems (ceiling, dado, flush floor, PVC and metal types), conduit (PVC and metal types) and associated accessories.

5.2 **Standards**

BS 4678:	Cable trunking.
BS 4678:	Part 1: Steel surface trunking.
BS 4678:	Part 2: Steel underfloor (duct) trunking.
BS 4678:	Part 4: Cable trunking made of insulating material.
BS 4662:	Boxes, surface or recessed, for the enclosure of electrical accessories.
IEC 614-1:	Conduits for electrical installations.
IEC 614-2,	
BS 4607:	Conduits of insulating material.
BS 731:	Flexible Steel Conduit.
BS 6946:	Metal channel cable support systems.

IEC 423:	Conduit, diameters, threads.
CEE 23,	
BS 4568:	Steel conduit and fittings (metric).
BS 476: Parts 5,7:	Fire tests for materials.
BS 2989:	Precoat hot dipped galvanising.
BS 729:	Finished hot dipped galvanising.

5.3 Products

Metal Trunking

General trunking that is surface mounted at ceiling level or used within ceiling and floor voids should be designed to BS 4678 and manufactured from precoated hot dipped galvanised sheet steel Grade Z2, to BS 2989. Sheet steel gauge shall be 1.2mm minimum.

For outdoor use or in damp or corrosive atmospheres sheet steel shall be finished hot dipped galvanised to BS 729 or similar treatment subject to the approval of the Engineer.

Fillets shall be metal, spotwelded to the trunking body.

For dado or skirting applications, the visible portions of the trunking shall be stove enamelled to a choice of colours. Any alternative finishes must be approved by the Engineer.

Under screed trunking shall be of minimum 1.6mm gauge hot dipped galvanised sheet steel to BS 729.

In flush floor applications the lid shall be of minimum 3.0mm gauge.

Expansion joints shall be installed at all building expansion lines.

5.4 PVC Trunking Systems

Use only for power and data outlets in general room.

To be manufactured from PVC to BS 4678: Part 4 and suitable for Cat 6 data outlets.

Earth wires to be run throughout PVC trunking systems.

Fillets shall be of the same thickness as the main body and shall fit securely and rigidly.

5.5 Cable Tray Systems

Cable tray shall be manufactured from hot dipped galvanised sheet steel (16 swg up to 300mm wide and 15 swg above 300mm wide) and shall be provided complete with all necessary bends, tees, risers, crossovers.

It shall be of the perforated type with minimum 40mm high sides with return flanges for added rigidity and each length shall be provided with heavy duty galvanised steel jointing pieces and joining cover plates to cover the cut ends of the tray.

All cut ends of tray shall be painted with aluminium paint and all exposed ends of cable tray or supports shall be provided with PVC protective caps.

Cable tray shall be supported so that the maximum deflection at mid span, when fully loaded, does not exceed 10 mm. Additional supports shall be provided at each bend, tee, or crossover. The type of supports to be used shall be as follows:

- a) In floor ducts or along walls, it shall be supported using H section galvanized steel supports fixed using fixing brackets and steel expansion bolts.

- b) Along the ceiling it shall be supported using H section hanging steel supports and brackets generally as specified above.

The H section shall be provided complete with ceiling plate which shall be bolted using 4 no. steel expansion bolts for concrete structures or welded using a continuous seam weld for steel structures.

- c) Vertical runs shall be fixed to Unistrut supports fixed to the wall using steel expansion bolts approved by the manufacturer for the loads involved.
- d) Drops to equipment except where they occur along a wall shall be fixed to a Unistrut support frame rigidly fixed at the top and bottom.
- e) Trapeze type supports shall not be used without the permission of the Engineer.

A separate earth wire sized in accordance with the IS 1010:2020 Rules shall be provided on all cable tray runs and substantial copper earth links shall be provided across all joints. The cable tray shall be bonded to the appropriate switchgear earth.

In exposed or corrosive locations, uPVC cable tray shall be provided.

5.6 Cable Ladder Systems

N/A

5.7 Metal Conduit Systems

Unless otherwise specifically noted on the drawings or in the specifications, conduit systems shall be heavy gauge hot dipped galvanised steel tubing.

Couplings shall be threaded, factory made and of the same material as the conduit.

Bushes and locknuts shall be manufactured from highest quality brass.

Circular conduit boxes shall be manufactured from grey cast iron for surface work and hot dip galvanized pressed steel for flush work. They shall be provided with spouts and smoothly bushes and threaded, entries as required.

Adaptable and accessory boxes shall be manufactured from grey cast iron for surface work and hot dip galvanized pressed steel for flush work. They shall be provided with bushed and threaded, conduit entries as required.

Accessory boxes, adaptable boxes and other outlet boxes shall be provided with a brass earth terminal for connection from the appropriate cover plate.

Where blank conduit systems are to be provided, they shall be blanked off and provided with minimum 2.5sq mm. draw wires.

Conduits shall be fixed using spacer saddles for surface work and pipe hooks for flush work. Multiple runs of conduits may be fixed to Unistrut supports using fixings approved by the manufacturer for the purpose.

Where conduit is to be fixed to structural steel, approved proprietary fasteners are to be used. Drilling of steelwork shall not be carried out without the Engineer's approval.

The minimum spacing of conduit supports shall be as follows:

<u>Nominal Conduit Size</u>	<u>Spacing of Supports</u>
25mm and less	1.75m

25mm to 40mm	2.00m
Exceeding 40mm	2.50m

Conduit joints shall be made using approved couplings provided by the conduit manufacturer.

Threads shall be painted with aluminium paint before the next fitting is screwed on and shall be screwed tight using a mechanical tool to provide a good mechanical and electrical connection.

Bends shall be made from conduit and shall be such that the internal diameter is not effectively reduced. The radius of curvature of the inner edge of any bend shall be not less than six times the overall diameter of the conduit. Bending radii shall comply with IS 10101:2020 Regulations. A standard bending press must be used.

Approved expansion fittings shall be provided on all conduits where they cross building expansion joints and elsewhere as recommended by the Manufacturer.

Ventilation outlets shall be provided to allow free circulation of air.

Conduits shall be sealed to prevent the ingress of dirt, dust etc., immediately after installation and shall be cleaned out and dried prior to the installation of any cables.

Conduits shall be laid out on the loop-in system with approved type draw-in boxes provided between fittings, switches etc., where the distance between such points exceeds 9 m. The location of draw-in boxes shall be subject to the approval of the Engineer.

No cables shall be installed until all conduit and accessories are securely fixed and in the case of flush installations, until such time as the plastering has been completed and passed by the Architect as sufficiently dry.

Where installed on tiled walls, conduit boxes or accessory boxes shall be so located that they occur at the centre of four adjoining tiles or centred on a single tile.

Recessed outlet boxes or adaptable boxes shall not be installed back-to-back without the permission of the Engineer.

Where installed in reinforced concrete walls, floors, stairs, etc., conduit shall be securely fixed to the reinforcing steelwork and all outlet boxes, etc., shall be rigidly fixed to the shuttering prior to pouring concrete.

Provide approved fire barriers in conduit where it passes through walls or floors.

5.8 Flexible Metal Conduit

Flexible metal conduit shall be used for all connections to motors or other equipment likely to vibrate and elsewhere were indicated in this document or on the drawings. Low Smoke and Halogen-Free (LSHF) type shall on be supplied.

Flexible metal conduit shall be manufactured from galvanized steel to provide mechanical protection, with a thermoplastic PVC coating to enhance resistance to corrosion, water, oil, and other chemicals and shall be provided with watertight adaptors and connectors.

Flexible metal conduit shall conform to the below standards:

- 1) IS 10101:2020
- 2) IEC 60364
- 3) IEC 61386

No flexible connection greater than 1000mm long shall be used without the Engineer's approval.

A visible PVC insulated earth cable shall be provided to link the rigid conduit and/or trunking to the device being connected.

5.9 Flexible PVC Conduit

Shall be used for connections between luminaires in false ceilings and rigid conduit/trunking systems where specified. May also be used in other areas where risk of physical damage is minimal.

A visible PVC insulated earth cable shall be provided to link the rigid conduit and/or trunking to the device being connected.

5.10 PVC Conduit Systems

Use of PVC conduit systems must be specifically noted on the drawings or elsewhere in the Specifications. In general, all conduit systems shall be metal. Where approved, PVC conduit systems shall be installed as follows:

- a) Cast-in-place or surface mounted - heavy gauge circular
- b) In screed or concealed - light gauge circular
- c) Switch drops and in plaster - light gauge oval

Horizontal conduit runs should be saddled at 1.0m spacing in normal circumstances. Vertical runs shall be saddled at 1.2m spacings.

Cold bending of conduit may be carried out on conduits up to 25mm diameter. Bending radii shall be to IS 10101:2020 Regulations.

Install expansion couplings at expansion joints and approximately every 4.0m on surface installations.

5.11 Watertight Conduit

Conduit for use in damp internal locations and external locations shall comply with the general specifications above and with the following:

- a) It shall be rendered effectively watertight throughout its length.
- b) Conduit boxes, adaptable boxes, etc., shall be of the watertight pattern with threaded entries, external fixing lugs and machined faces and covers. Covers shall be rendered watertight by the inclusion of suitable gaskets.

Conduits installed underground shall be of the watertight type and the minimum size to be used shall be 25mm diameter.

5.12 Installation

Cable capacities of conduit and trunking systems shall not exceed the requirements of the IS 10101:2020 Specifications. In respect of conduits, the Contractor shall install conduits of a size and quantity to meet the regulations. It is the responsibility of the Contractor to verify that the trunking system, as designed, will satisfy these regulations. If cables will exceed the trunking capacities the Contractor must bring this to the attention of the Engineer prior to order or installation of the trunking system.

Circuits (single or three-phase) within trunking cable tray and conduit systems shall be grouped together with tie tags and circuit identification levels at outlets, switches, terminations and at appropriate locations along the length of the trunking/tray to allow circuit identification. In general terms, circuits should be grouped at 3m intervals and identified/labelled at least once in every physically compartmented area (e.g. room, corridor, etc.).

L.V. cables shall be installed on cable trays at a spacing of twice the diameter of the larger adjoining cable unless otherwise directed.

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.

Site fabricated bends, tees, elbows, joints, etc., are not permitted where factory made, or prefabricated proprietary products exist.

Where trunking or cable tray systems pass through fire compartment boundaries, the Contractor is responsible for the internal stopping of trunking systems with a suitable material and for the provision of a lid over cable tray at such points and firestopping between the cables and lid.

Earth continuity straps on metal trunking systems shall be installed on the outside of the trunking and in a location that will make them clearly visible for inspection.

The Contractor shall include for suitably sized header trunking sections to any or all sides of distribution switchgear. Such details will not be shown on the drawings.

The Contractor shall include as required for links between trunking systems at different levels if these are not shown on the drawings.

Trunking and cable tray systems shall be suspended in accordance with the manufacturer's data but at centres not greater than 3.0m and near both sides of bends.

Trunking in screed and accessories shall be rigidly fixed to the floor slab and levelled to ensure that all outlet boxes, inspection boxes, etc., finish flush with the finished screed level and the Contractor shall include for adjusting the frames and lids so that they finish flush with the finished floor level.

Floor boxes shall be fitted with removable inserts during screeding to prevent the ingress of screeding material, etc., into the system.

The Contractor must mark out all proposed cable distribution system routes on site for approval by the Architect/Engineer. All riser positions must be approved in advance on site. Routes shown on tender drawings are provided for guidance and the Contractor is responsible for verifying same prior to submittal of Tender. Cost Variations will not be permitted for alternate routing that may be necessary to cater for site conditions.

6. POWER SUB-DISTRIBUTION SERVICES

6.1 The following are the principal Standards which shall apply:

I.S.201: Polyvinyl Chloride (PVC) Insulated Cable and Flexible Cords of Rated Voltage up to and including 450/750V.

Applies to rigid and flexible cables with insulation and sheath, if any, based on polyvinyl chloride, of rated voltages U_o/U up to and including 450/750 V used in power installations of nominal voltage not exceeding 450/750 V.

I.S.202: Rubber Insulated Cables and Flexible Cords of Rated Voltage U_o/U up to and Including 450/750 V.

Applied to cables and flexible cords with insulation based on rubber or other elastomer of nominal voltages U_o/U up to and including 450/750V suitable for use in power installations of nominal voltage not exceeding 750V a.c.

I.S.270: Conductors and Insulated Cables.

Specifies conductors of copper and aluminium, (alloy and coated) solid, stranded, and flexible for core size of 0.5mm sq up to 2,000mm sq.

I.S.271: PVC Insulation and Sheath of Electric Cables.

Specifies the physical requirements and verification test methods for certain types of PVC insulations and sheaths. It includes IEC227, IEC540 and CENELEC HD 21 and HD 385.

I.S.272: Cross-Linked Polyethylene Insulation of Electric Cables.

Specifies test requirements and tests for cross-linked polyethylene insulation.

I.S.273: Cables With Polyvinyl Chloride (PVC) or Cross-Linked Polyethylene (XLPE) Insulation 600/100V and 1900/3300V with and Without Steel Wire Armour (SWA).

Outlines the construction, system of identification, and tests of the above type cables.

I.S.274: Code Designations, Identification and Markings for Electric Cables and Cords.

Describes the codes, designations and markings permitted for the various types of harmonised electrical cables.

I.S.275: Rubber Insulation and Sheath of Electric Cables.

Specifies the physical requirements and test methods for the types of rubber insulation and sheathes of electric cables given in table 1.

BS6207: Specification for mineral insulated copper sheathed cables with copper conductors.

BS6121: Mechanical cable glands

BS6081: Specification for terminations for MICS cable.

6.2 **Products**

Unless otherwise specified, the following shall apply for all projects.

Distribution Cabling

Distribution cables (i.e., main and sub-main cables between switchgear, transformers, generators etc.) shall be one of the following types, all as indicated on the drawings, schedules, or Particular Specifications:

- a) Armoured type with PVC LSF insulation, PVC sheath, steel wire armour and PVC over sheath (PVC/VCL/LSF/SWA/PVC).
- b) Unarmoured type with PVC LSF insulation and PVC sheath (PVC/VCL/LSF). (Not suitable for burial in the ground).
- c) Armoured type with XLPE (cross linked polyethylene) insulation, PVC bedding, steel wire armour and PVC over sheath (XLPE LSF SWA).
- d) Mass impregnated non draining paper insulated steel wire armoured type with lead sheath (PILCSWA) in accordance with BS 6480I.
- e) Protodur insulated with unvulcanised rubber sheath concentric copper conductor with copper foil helix and Protodur oversheath (NYCY) all in accordance with VDE 0271.
- f) Protodur insulated and Protodur sheathed (NYY) in accordance with VDE 0250. (Not suitable for burial in the ground)

- g) Powdered mineral insulated with seamless copper sheath (MICS). This cable shall be provided with a PVC oversheath.

Unless otherwise indicated on the drawings, cables shall have stranded copper conductors.

Insulation shall be minimum 600/1000 volt grade.

Cable terminations shall be of the compression type approved by the cable manufacturer for the duty involved.

Glands shall be manufactured from the highest quality machined brass and where used with armoured cables or cables with protective conductor, they shall be provided with brass earth tags to bond the armour or protective conductor to the enclosure. Each gland shall be provided with a moulded Polychloroprene shroud to provide an effective seal on the gland and the cable oversheath.

6.3 Final Sub-Circuit Wiring

Cables for installation in conduit and/or trunking, shall generally be one of the following types:

- a) PVC insulated type with stranded copper conductors 600/1000 volt grade PVC insulation (Type PVC).
- b) Elastomer insulated with stranded copper conductors 600/1000 volt grade elastomeric insulation. (Type EPR).
- c) High temperature PVC insulated type with stranded copper conductors, 600/1000 volt grade high temperature (85 deg.C.) insulation. (Type PVC-HT).

6.4 Fire Detection and Alarm Section

For the fire alarm and detection system the cable must be PH 120 rated "Enhanced" as a minimum. All fire detection and alarm system cabling to be fixed in accordance with the manufacturers recommendations.

6.5 Fire Resistant Cable

Refer to cable type for fire detection and alarm systems.

6.6 Flexible Cables

Flexible cables shall be one of the following types or combinations thereof, all as indicated elsewhere in this document. All flexible cables shall have stranded copper conductors.

- a) 300/500 volt grade PVC insulated PVC sheathed type suitable for a maximum ambient temperature of 55 deg C.
- b) 300/500 volt grade heat resisting PVC insulated PVC sheathed type suitable for a maximum ambient temperature of 85 deg C.
- c) 300/500 volt grade rubber insulated type with HOFR sheath suitable for a maximum ambient temperature of 85 deg C.
- d) 300/500 volt grade rubber insulated type with a tough rubber sheath, copper wire braid and OFR outer sheath suitable for a maximum ambient temperature of 60 deg C.
- e) 600/1000 volt grade armoured flexible cable with EFR insulation, PCP inner sheath, pliable galvanized steel wire armour and heavy PCP outer sheath.
- f) 300/500 volt grade glass fibre insulated and braided type suitable for a maximum

ambient temperature of 185 deg C.

- g) In selecting the type of flexible cable to be used, the Contractor shall consider the temperature of the device being connected to, the possibility of mechanical damage, and any corrosive vapours or liquids that may be present.

Each coil of cable or flexible cable shall bear the manufacturer's label sealed to the coil, stating the cable size, the type and temperature rating of the insulation, the date manufactured, and the results of all tests carried out at the manufacturer's works. No cable or flexible cable manufactured more than one year prior to delivery shall be used on the works.

No conductor smaller than 1.5sq mm shall be used without the permission of the Engineer.

Cable greater than 10sq mm shall not be installed in the same trunking compartment as smaller cables without the permission of the Engineer. Cable colours shall strictly comply with the IS 10101:2020 Wiring Regulations.

6.7 Power sub-distribution services

Installation

Cable support spacing's shall be in accordance with the recommendations of the IS 10101:2020.

Cables run on cable tray or cable ladder shall be fixed using nylon cable ties as manufactured by BICC Ltd. or equal and approved.

Cables fixed direct to the building structure shall be installed as follows:

- Using fixing devices and methods specified or recommended by the cable manufacturer.
- Using PVC insulated heavy duty copper saddles, either single or multi way for MICS cables.
- Using aluminium cleats for all other cables. Single bolt cleats shall be used for cables up to 50mm overall diameter and tow bolt cleats for all larger cables.

Cables run on "Unistrut" supports shall be fixed using aluminium cleats approved by the manufacturer for the purpose.

Cables installed in trenches shall be pulled in over adequately spaced rollers and any resultant surplus shall be snaked across the width of the trench. Cable crossing shall not be permitted except where cables branch from the main run.

The minimum internal radius of any bend in a cable shall not be less than the following:

- 72 times the overall diameter for PILCSWA cables.
- 8 times the overall diameter for PVCPVCLSF, PVCPVCSWALSFPVC, XLPELSFSWA, NYY and NYCY cables.
- times the overall diameter for MICS cables.

Single core cables shall be installed in trefoil arrangement with a minimum of one cable diameter between trefoil groups. Nonferrous trefoil clamps shall be used for fixing.

In multicable installations cables shall be installed parallel to each other with a minimum spacing between cables of the outer diameter of the largest cable in the group.

Where cable joints or junction boxes, etc., are required, they shall be located in readily accessible

positions, and all such devices shall be clearly labelled. Cable joints are only permitted where cable lengths exceed the standard cable reel length or where they are essential and approved by the Engineer.

Cables shall be marked where they enter and leave switchgear, junction boxes, motors, physical compartments (e.g. rooms, corridors, ducts etc.,) and at not greater than 7.10m centres along the run. Cable markers shall be of the self-locking nylon type (Critchley or equal) and shall be identified with the cable number, the switchboard designation and the designation of the item served.

Where parallel feeder cables are provided, they shall be of equal length.

Cable glands shall be bonded to the appropriate earth busbar or terminal using PVC insulated earth cable sized in accordance with the IS10101:2020 Rules. A separate earth wire shall be run with each unarmoured cable sized in accordance with the Is1010:2020 Rules.

6.8 Trenches and Pipe Ducts

Unless otherwise indicated elsewhere all trenches, pipe ducts and/or floor ducts, shall be provided by the Main Contractor. However, the Contractor shall be responsible for ensuring that they are of adequate size and are installed correctly.

Cable trenches shall be excavated to provide a minimum cover of 750mm for LV and ELV cables and 1000mm for MV cables. The bottom of the trenches shall be evenly graded and covered with a minimum layer of 75mm of fine earth or sand. After the cables have been laid, they shall be covered with 50mm of sand and the trenches shall be backfilled with rock free earth and compacted.

Pipe ducts shall be manufactured from heavy duty sewer quality PVC and shall be provided with sealed sleeves so that the complete system is watertight.

They shall be laid in trenches (specified elsewhere). Where pipe ducts enter a building, they shall be rendered gas, water and fire tight by the Contractor and all blank ducts shall be provided with asbestos covered and taped hardwood plugs.

Yellow PVC cable identification tapes marked "Danger -Electric Cable Below" shall be provided by the Contractor for all underground cables. They shall be provided 150mm over the cable or pipe duct and again 150mm below ground level.

Include for all steelwork necessary to support equipment installed over floor ducts.

The Contractor shall advise the Main Contractor at an early stage of his requirements regarding trenches, pipe ducts, etc.

Where installed in made up ground (e.g. roadways, yards etc.), cables shall be installed in pipe ducts. Elsewhere, they shall be installed in trenches.

Each circuit in trunking shall be bound with cable ties at 7.1m intervals and provided with approved nylon cable tags identifying the circuit number and distribution board it is fed from. Wiring inside lighting fittings or similar heat producing devices shall be provided with heat resistant glass fibre sleeves.

Unless otherwise specified elsewhere, wiring shall be carried out using PVC insulated cables in conduit and/or trunking. Circuiting shall be as indicated on the drawings with each circuit protected by an appropriately rated MCB.

The default circuit wiring and MCB sizes for single phase circuits wiring and MCB sizes shall be as follows:

- 2.5mm sq for 6 amp rating with 10 amp MCB
- 4.0mm sq for 15 amp rating with 20 amp MCB

- 4.0mm sq for 20 amp rating with 25 amp MCB
- 6.0mm sq for 25 amp rating with 32 amp MCB
- 10.0mm sq for 40 amp rating with 50 amp MCB
- 16.0mm sq for 60 amp rating with 63 amp MCB

Final connection to equipment shall be carried out using armoured flexible cable in areas where mechanical damage is possible or "RADOX" or similar in other locations.

After installation and prior to energising the system, each cable shall be subjected to the following tests:

- Phase identification test.
- Earth continuity test

The Contractor may also be asked to carry out high voltage insulation resistance tests on some or all cables. There shall be no charge from the Contractor for executing these tests.

6.9 Final Sub-Circuit Cable Details

Where specified, NYM/J cabling shall be used for all 230V general services and small power circuits. Where installed in partitions NYM/J cables shall be glanded into recessed metal back boxes using individual compression type threaded plastic glands. Where installed buried in plaster NYM/J cables shall be routed through PVC or metal conduit terminating directly into a recessed metal back box. NYM/J cable not installed on cable tray or cable carrier shall be neatly clipped using suitable sized cable clips at 400mm centres.

Where specified, PVC/PVCLSF cabling shall be used for all lighting sub-circuits incurring all switch points. Where installed in a ceiling void PVC/PVCLSF cables shall terminate in a multi-spout PVC conduit box adjacent to the luminaires. PVC/PVCLSF shall be terminated into the PVC conduit box using compression type threaded plastic glands with no more than 2 No. PVC/PVCLSF cables per gland.

Final connection to all luminaires shall be via an unfused plug and socket arrangement and a three core 1.5mm sq, high temperature, PVC sheathed, PVC insulated flexible cable. All PVC/PVCLSF cables installed in ceiling / roof voids shall be clipped using suitable sized cable clips at 400mm centres. PVC/PVCLSF cables installed in partitions and buried in plaster shall be routed through PVC conduit terminating directly into recessed metal back boxes. A 1.5mm sq PVC earth cable shall be installed to all switch back boxes and luminaires plug and sockets. PVC/PVCLSF cabling shall not be used for surface installations.

Socket outlets shall be:

- a) 13A, rectangular, 3-pin throughout.
- b) Switched.
- c) Plastic; as MK "Logic Plus" manufacture.
- d) Part M Compliant

All circuits feeding socket outlets shall be fed from individual RCBO units.

Fused spur outlets shall be fused at the rating as suited to the load being served.

7. SUNDRY ITEMS

7.1 Scope

Junction boxes, lighting switches, socket outlets, hand driers, fused spur outlets, heaters and other general electrical system accessories.

7.2 Standards

BS 3042:	Terminal Blocks.
IEC 408:	Load Break Fault Make Switches.
IEC 269:	HPC Fuses.
BS 1363:	13A, Three Pin Socket Outlets.
IEC 309:	Industrial Socket Outlets.
BS 3535:	Dry Type Transformers for Door Bell/Buzzer Systems

7.3 Products

Junction Boxes

Junction boxes shall be one of the following types depending on location:

- a) In internal dry locations, they shall be manufactured from rust proofed sheet steel finished stove enamel grey with a minimum protection class of IP 51 in accordance with IEC Publication 144 and shall be provided with hinged lockable doors.
- b) In external, internal damp or corrosive locations they shall be manufactured from glass fibre reinforced polyester or similar weatherproof material, with a minimum protection class of IP 55 in accordance with IEC Publication 144 and shall be provided with opaque hinged lids with locking devices.

Junction boxes shall be provided with all necessary terminals of the screw clamp fully shrouded type mounted on terminal rails. All terminals shall be marked by the inclusion of terminal numbers using a numbering system approved by the Engineer.

Junction boxes shall be labelled and numbered as specified.

Terminal and wiring diagrams shall be fixed to the inside of each junction box and additional copies shall be provided in the installation manuals referred to elsewhere.

7.4 Lighting Switches

Lighting switches shall be provided and ganged as indicated on the drawings. They shall be either 1-way, 2-way or intermediate as indicated and shall be one of the following types or combination thereof:

- a) Switches for internal use shall be of the 15/20 Amp inductive rating grid switch type.
- b) Switches for external use shall be weatherproof to IP65.

Where wiring of more than one phase enters a switch box, vertical barriers shall be provided between phases and 'red' warning plates engraved "Danger 400 Volts" shall be provided below the cover plate.

Provide for engraving multi-gang switch plates where so indicated on the drawings or schedules.

7.5 General Purpose Socket Outlets

General purpose socket outlets shall be of the 13 Amp 3-pin switched Part M compliant MK Albany Plus or equal and approved.

They shall be either twin or single, all as indicated on the drawings. All switched socket outlets shall be provided with neon indicators.

Unless otherwise noted on the drawings, socket outlets shall be of the switched type.

Socket outlets for mounting in floor outlet boxes shall be of the metal type as part of the floor box.

7.6 Industrial Socket Outlets

Industrial socket outlets shall be of all insulated construction, non-reversible type.

Each socket outlet shall be provided complete with hinged flap and matching plug top.

They shall be one of the following types or combination thereof, all as indicated on the drawings.

- a) 110 Volt SPN & E (3-Pole) non-reversible weatherproof type. (Colour code: Yellow).
- b) 230 Volt SPN & E (3-Pole) non-reversible weatherproof type. (Colour code: Blue).
- c) 400 Volt TPN & E (3-Pole) non-reversible weatherproof type. (Colour code: Red).

They shall be either switched or unswitched surface mounted type. Where switched socket outlets are indicated, they shall be of the interlocked type.

Current rating of socket outlets shall be as indicated on the drawings or schedules.

7.7 Non-Standard Socket Outlets

Where it is required or specified that only special equipment be connected to certain socket outlets, then "Non-Standard" gauge 13 Amp 3-pin shuttered socket outlets shall be provided, complete with matching plug top.

7.8 Electric Hand Driers

N/A

7.9 Fused Spur Outlets

Fused spur outlets shall comprise double pole switch, single pole 5 Amp or 13 Amp fuse and fuse holder, bushed flex outlet and neon indicator.

7.10 Installation

Electric Hand Driers

N/A

7.11 Fused Spur Outlets

Unless otherwise indicated on the drawings, wiring shall be carried out using 2.5mm sq. PVC insulated cables in conduit and/or trunking spurred from the nearest general purpose socket outlet circuit.

Include for final connection in PVC/PVCLSF flexible cable to equipment supplied from each outlet.

7.12 Double Pole Switches

Wiring shall be carried out using PVC insulated cables in conduit and/or trunking. Circuiting shall be

as indicated on the drawings with each circuit protected by an appropriately rated MCB.

Wiring and MCB sizes shall be as follows:

- a) 2.5mm sq for 16 Amp rating with 20 Amp MCB.
- b) 4.0mm sq for 20 Amp rating with 25 Amp MCB or as necessary to reduce voltage drop on final subcircuit.
- c) 6.0mm sq for 32 Amp rating with 32 Amp MCB.
- d) 16.0mm sq for 63 Amp rating with 63 Amp MCB.

Final connection shall be in armoured flexible cable via a cable outlet box mounted adjacent to the unit being connected.

Double Pole switches shall be engraved with the name of the device being controlled (e.g. cooker).

7.13 **Single Phase Fans (<250 watts)**

Single phase fans shall be supplied and fitted by the Mechanical Contractor unless otherwise specified.

Controllers for single phase fans shall be of the two-speed reversible type and shall be provided with the fans unless otherwise indicated on the drawings.

Wiring shall be carried out using 2.5mm sq. PVC insulated cables in conduit and/or trunking with each unit fed unswitched from the nearest lighting circuit. Three pole isolator shall be provided for each fan and located at high level outside the room.

Final connection to the fan shall be carried out using PVCLSF/PVC flexible cable via a local 2 Amp socket outlet and plug top.

Where indicated on the drawings, time delay control shall be provided for single phase fans using a 1-15 minute variable time delay switch. The unit shall be mounted in a flush mounted enclosure adjacent to the lighting switch controlling the fan. The fan shall be switched with the local lighting.

7.14 **Water Heaters**

Unless otherwise indicated on the drawings or elsewhere in this document, water heaters and shower units shall be supplied by the Mechanical Contractor.

Wiring shall be carried out by the Electrical Contractor using PVC LSF insulated cables in conduit and/or trunking. Circuiting shall be as indicated on the drawings and schedules.

Termination at equipment shall be as follows:

- a) In a local 20 Amp double pole switch with neon indicator and bushed cable outlet for undersink and cistern type water heaters.
- b) In a local 45 Amp double pole switch with neon indicator and bushed cable outlet for electric shower.

Final connection to water heaters shall be carried out in heat resistant (85°C) PVCPVC flexible cable.

Locate switches for water heaters at least 1000 mm. away from sinks or wash hand basins.

7.15 CARBON DIOXIDE MONITORING SENSOR (TRAFFIC LIGHT INDICATOR)

A CO₂ Monitor is to be supplied and installed under the contract. The Monitor is to be supplied by the Electrical contractor who will wire and install the monitor.

The monitor is to have:

- 230V AC supply voltage
- 3 colour LCD backlight indicating ventilation
- requirement based on CO₂ measurement
- Nondispersive infrared sensing technology
- Volt-free relay output to control a ventilator
- Digital display of carbon dioxide levels (ppm)
- Temperature and humidity monitoring
- Dual alarm indication; audible alarm and
- backlight colour switch
- Programmable setpoints
- Bespoke or preset configurations



The Monitor is to be supplied by DUOMO or similar approved.

8. ELECTRIC HEATERS

Electric Radiant Panels

9. EARTHING AND BONDING

9.1 Scope

Equipment Earthing, Building Earth and Equipotential Bonding.

9.2 Standards

The following are the principal Standards which shall apply:

ETCI:	Wiring Regulations
BSCP1013:	Earthing Code of Practice
BS4444:	Guide to electrical earth monitoring and protective conductor proving
BS951:	Specification for clamps for earthing and bonding purposes.
UL467:	Grounding and Bonding Equipment

9.3 Products

A complete earthing and equipotential bonding system shall be provided as specified and as shown on the drawings.

The earthing systems shall be installed so that all metallic structures, enclosures, trunking, trays, junction boxes, outlet boxes, cabinets, machine frames, portable equipment and other conductive items in close proximity with electrical circuits operate continuously at earth potential and provide a low impedance path for possible earth fault currents.

The earth resistance at any point in the installation shall not exceed 1 ohm. If the resistance value of 1 ohm or less cannot be obtained by driven earth rods the Contractor will submit alternative methods to achieve the required result for review by the Engineers. The system earth and the equipment earth shall be connected to a common earth bus.

Jumpers

Each electrical expansion fitting shall be provided with an external copper bonding jumper secured by approved earthing straps on each end of the fitting. Jumpers shall be tin plated copper, braided and flexible, suitable for the required use.

Protective Conductor

The protective conductor shall be copper. The material selected shall be resistant to any corrosive condition existing at the installation and shall be suitably protected against corrosion. The conductor shall be solid or stranded, insulated, and shall be installed in one continuous length without a splice or joint. Protective conductors run with or enclosing the circuit conductors shall be as described in the IS 10101:2020 wiring Regulations.

9.4 Installation

Install equipment in accordance with manufacturer's instructions. Earth leads shall be insulated and protected against mechanical damage and an isolating link shall be provided to allow measurement of the appropriate earth electrode resistance at the MSB.

Connection at earth rods shall be by non-ferrous clamps, brass locknut and washers on compression cable lugs and shall be protected against corrosion by an approved weatherproof tape. The "Thermoweld" process for electrical connections may be used instead.

The completed equipment earthing system shall be subjected to an insulation test at each service disconnect enclosure ground bar to ensure that the earth resistance, without chemical treatment or other artificial means, does not exceed 1 ohm. Certified test reports of the earth resistance shall be submitted for review by the Engineers.

The earth-fault protection system shall be performance tested. A written record of this test shall be made and submitted to the Engineers.

10 ELECTRICAL SUPPLY SCHEDULE OF MECHANICAL DEVICES

The electrical contractor shall verify prior to installation:

Power and controls wiring with the mechanical contractor.

Correct layout of mechanical equipment with Mechanical Engineer and Mechanical Contractor and accuracy of Mechanical Device Schedule.

11 ELECTRICAL SERVICES TO PASSENGER LIFT

N/A

12. TESTING AND COMMISSIONING

- 12.1 Complete and return the test and commissioning sheets upon Practical Completion of the project. Copies of these results shall be included in the O&M manuals.

Element 63 – General Lighting

1. Scope of Works

The works consist of the supply, installation and commissioning of all new internal, external and emergency lighting in the new extension and ancillary area affected by the extension works.

1.1 System Description

Sub-circuit installation for the new extension area to be supplied from the new DB to be provided. Supply, delivery and installation of luminaires, lamps, switching systems and devices.

1.2 Reference Specifications

Works to be carried out in accordance with:

- 1) NSAI IS 10101:2020 regulations.
- 2) CIBSE Lighting Guides
- 3) TGD001, TG030, SDG-02-06 & TDG 031
- 4) Relevant Building Regulations

2. LIGHTING SYSTEM

- 2.1 The Schedule of Luminaires is indicative of the type of luminaries that will be chosen but does not limit the final choice by the Engineer.
- 2.2 Final sub-circuit wiring shall be 2.5mm sq single core PVC LSF in galvanized trunking and conduit to a klik socket backed up with (10A) RCBO protection.

3. LUMINAIRE AND LAMP SCHEDULES

- 3.1 The following light fittings shall be included in the price schedule document:

As per the drawings

4. LUMINAIRES

- 4.1 Luminaires shall be supplied complete with:

Louvres, diffusers, lampshades, transformers, lamps, mounting brackets and accessories as specified in the luminaires schedule. Liaise with Main Contractor on mounting details. Provide photocells, timers and contactors as necessary.
- 4.2 High-temperature 1.5mm 3 core, EPR/PVCLSF, flexible lead and plug top shall be supplied by the Contractor for final connection to the fittings.
- 4.3 Final connection to suspended and recessed luminaires shall be via plug-in klik socket, except as specified below for emergency luminaires.
- 4.4 Luminaires erected prior to the completion of wall, floor and ceiling finishes must be sealed from dust/dirt and protected from damage. Such luminaires may not be used for lighting of the works unless approved.
- 4.5 The circuiting of luminaires as shown on the drawings is indicative of the circuiting required. Contractor shall prepare circuit proposals for approval by the engineer prior to commencement of wiring. For internal circuits Max. 10 luminaires or 1.0kW max. fluorescent/discharge load or 1.5kW

max. tungsten load.

- 4.6 All luminaires shall be dimmable and compatible with the dimming controller supplied, which shall be checked and confirmed by the successful contractor.
- 4.7 All luminaires and associated accessories in wet areas, ie WC's, shower rooms, etc. shall be minimum IP54 rated.

5. **LIGHTING CONTROLS**

5.1 **Light Switches & Dimming**

- Lighting controls in teaching spaces shall generally consist of LED type Dali fittings controlled via a Daylight sensor with absence & presents detection. Switching via push type retractable dimmer switches as noted on the drawings. Light levels sensors shall be commissioned to maintain a minimum light level in accordance with TGD recommendations - 300lux for classroom, 500lux for specialist rooms.

It should be noted that automatic dimming in SEN rooms are not allowed.

- Lighting controls in corridor areas shall be based on 2-way switching either end of the corridor, with local PIR control. Corridor lighting, controlled via dedicated key switches located next to the intruder alarm keypad shall be provided.
- Student Toilet facility lighting shall consist of key operated manual "On/Off" switching with automatic presence and absence detection. In student facilities containing windows, lighting controls shall consist of key operated manual "On/Off" switching with automatic absence detection only.
- Lighting controls in specialist rooms with high-speed cutting machinery shall be via manual "On/Off" switching only.

5.2 **Sensors & Detectors**

- Lighting controls shall be recessed, or surface mounted provided with a detection range of 24m from a mounting height of 2.5m
- Parasitic load in standby mode shall not exceed 0.3w.
- Absence detection shall be variable from 10 to 60 minutes
- All controls shall be provided with a minimum of 5-year manufacture warranty

6. **EMERGENCY LIGHTING SYSTEM DETAILS**

6.1 **System Description**

The new extension Emergency lighting shall be supplied via the New SDB proposed to cater for all services within this area. The new emergency lighting within the existing school building shall be supplied via a new Emergency lighting control panel consisting of CTU, contactors and RCBO's. This is to facilitate local circuit monitoring of the existing lighting circuits with the new emergency lighting circuits. This new emergency lighting control panel shall be supplied via the existing MDB via a 32a MCCB.

- 6.1.1 The Schedule of Emergency Luminaires is indicative of the type of luminaries that will be chosen but does not limit the final choice by the Engineer.
- 6.1.2 Final sub-circuit wiring shall be 2.5mm sq PVC I LSF cable in Steel conduit with (10A) RCBO protection.

6.2 **EMERGENCY LIGHTING**

- 6.2.1 Supply and install Central Test Unit (CTU) with 30min. and 3hr. test periods as Ventilux or equal and approved (For the MDB and each SDB).
- 6.2.2 Zone Interface Units will be integrated into the central test unit emergency lighting contactors shall be provided as part of the lighting MCB board.
- 6.2.3 Wiring between emergency packs and luminaries must be in fire resistant cable such as RADOX/FP200, or equal and approved.
- 6.2.4 Luminaires with integral emergency packs that are wired on plug and socket assemblies shall be supplied with a red plug top as MK 665 RED, fused at 5A.
- 6.2.5 The Contractor shall include for all emergency lighting system commissioning costs. Installation to comply with IS3217:2023.
- 6.2.6 LEDs must be clearly visible on the exposed portion of any emergency luminaries and located in a manner that will not interfere with the operation or maintenance of the luminaries or be liable to damage or concealment within the luminaries. All LED's must be green in colour to confirm with draft harmonised European standards.

6.3 **TESTING AND COMMISSIONING**

- 6.3.1 The installation shall be fully tested and commissioned by the Contractor. Include for specialist Testing and Commissioning of the emergency lighting system.
- 6.3.2 The Contractor shall perform a 3-hour duration test on the emergency luminaries and provide the Engineer with at least 5 working days' notice of this test
- 6.3.3 The installation shall be fully tested and commissioned by the Contractor. Include for specialist Testing and Commissioning of the lighting control system.

Element 64 – Communications

1. Scope of Works

The Works included in this section shall comprise of the following:

1. Data Cabling installation
2. Telephone System wiring
3. PA & Class Change Sysytem

1.1 System Description

Supply installation and commissioning of a Cat 6a UTP/LSF Datacomms systems throughout the extension wired from the existing main comms cabinet. The main comms is located within the IT Store on the first floor.

Works to include Comms Cabinets, Cat6a cable installation, 3no new patch panels and field outlets. Provision of Cat 6a UTP/LSF patch cords and fly leads and links to Telecoms. Works to include all Telecom phone services and connection.

The existing PA & Class change System is to be extended to the new extension with new Gooseneck Microphone provided within the Admin Office.

1.2 Reference Specifications

- LAN equipment and materials to comply with and be installed in accordance with EIA/TIA 568.2 standard for Cat 6aUTP/Class E, ISO/IEC 11801:2002 and CENELEC EN 50173-A1.
- Department of Education TGD's

2. CAT 6a CABLING SYSTEM

- 2.1 Provide Cat 6a UTP CCA from the Comms cabinet to all data outlets in the new extension. The Datacomms system shall be Commscope or similar and approved. Datacomms system to be provided with Manufacturer's warranty for a minimum of 12 months from project PC.
- 2.2 Provide 3 new 24 way comms racks to the existing comms cabinet.
- 2.3 The maximum permitted length of a data cable is 90m from the patch panel to the field device excluding patch cords and fly leads. The contractor shall notify the engineer at installation stage if this distance is being exceeded.
- 2.4 Data cables shall only be terminated and tested by registered approved installation contractors. Written confirmation of the installation contractor to be provided with the tender.
- 2.5 Data cables shall be installed on cable tray, in trunking and conduit as required and shown on the layout drawings. Cables shall be installed in accordance with the manufacturer's guidelines in a neat and tidy fashion. Appropriate cable ties shall be used with data cables loomed in bunches of no more than 12 cables.
- 2.6 Field outlets shall be RJ45 Cat 6a connector (not angled) with plastic plate, ganged as shown on the drawings. The field outlets must be fully compatible and manufactured by the cable supplier.
- 2.7 All field outlet connectors and each end of the data cable shall have a permanent label identifying the unique number of the particular circuit. The numbering sequence of each

field outlet to be one to infinity.

3. **COMMS CABINET**

The following shall be provided:

- 3.1 Alteration to the existing comms cabinet
- 3.2 3no Cat 6a 24 port patch panels shall be provided in the Comms Cabinet. Patch panels shall be a maximum of 24 way 1U 19 inch rear connection punch down connector type. A 1U cable marshalling unit shall be fitted between 2no 24 way patch panels with one at the top and one at the bottom in each Comms Cabinet. Cable marshalling shall also be provided vertically on each side of the Comms Cabinet to facilitate outlet patching within the Comms Cabinet. Patch panels shall be manufactured by the chosen Cat 6a solution supplier.
- 3.3 Each patch panel outlet shall be fitted with a permanent label with a numbering system to match the field outlet. The numbering system shall be agreed with the school services in advance of termination and testing.

4. **Telephone Services**

- 4.1 Provide a dedicated phone line within each office space & Principals Office as indicated on the drawings and connected to the school's phone system capable of making internal and external calls.

5. **PUBLIC ADDRESS & CLASS CHANGE SYSTEM**

The existing public-address system shall be extended to the new extension with speakers to all teaching spaces, offices and circulation areas. The system shall consist of the following:

- One gooseneck microphone
- Wall mounted speakers

6. **TESTING & COMMISSIONING**

- 6.1 Testing and certification of all Cat 6a cabling from the field outlet to the patch panel connector shall be carried out by registered approved contractors. Written confirmation of the testing required by the contractor to be provided with the tender.
- 6.2 Testing and commissioning of the Class change & PA system shall be third party tested via a specialist contractor

ELEMENT 65 – Security & Protection

1. SCOPE OF WORK

1.1 System Description

Provision for the supply, installation, commissioning and certification of:

- new Fire Alarm System - devices as indicated on the drawings.
- the extended & New Intruder Alarm System to the new extension and corridor area
- new Access control system
- Alteration to existing and provision for a new CCTV monitor

1.2 Reference Specifications

Works to be carried out in accordance with:

- NSAI IS 10101:2020 regulations
- IS 3218:2013 + A1:2019 Code of Practice for Fire Alarm Systems
- I.S. EN 50131/1:2006 for Intruder Alarm Systems
- Relevant PSA Guidelines

2. FIRE DETECTION & ALARM

2.1 SCOPE OF WORK

2.1.1 System Description

The provision shall be for a new addressable L2/L3 system throughout the existing and new building areas. Works shall include the supply, installation, commissioning and certification of the installation. The new fire alarm installation shall include for all new devices, Fire Alarm Panel and associated cable and cable containment be installed to the current standards and in accordance with the layout drawing. The New addressable panel shall be capable of being networked to the existing addressable fire alarm system.

The contractor shall include for the provisions to provide the 1st years maintenance of the new fire systems within their tendered price.

2.1.2 Reference Specifications

Works to be carried out in accordance with NSAI IS 10101:2020 regulations and IS3218:2024 Code of practice for Fire Detection and Alarm Systems.

2.2 SYSTEM DETAILS

2.2.1 System Type

The new system shall be an Addressable system, open protocol, 2 loop control panel with 25% spare capacity for devices. System to be Honeywell Morley (as per existing) with Appollo devices or equivalent.

2.2.2 Installation Classification

The installation shall comply with IS 3218:2024 and provide an L2/L3 level of protection incorporating manual call points.

2.3 EQUIPMENT DETAILS

- 2.3.1 Refer to drawings for quantities and types of devices.
- 2.3.2 Fire Door Holders shall be electromagnetic wall mounted type to comply with BS7273-4 with a 230V power supply and compatible with the proposed fire alarm system. Power supplies for Fire Door Holders shall be provided by the contractor as part of the works.
- 2.3.3 The system supplier shall include for the following:
- a) Testing, commissioning and certification to IS 3218:2024, of the altered and extended installation. Final testing must be in accordance with the project programmed and issue of certification must be within 24hours of final testing/commissioning.
 - b) Provide drawings and manuals upon Practical Completion
 - c) Allow for 1 No. visit to site to instruct the end user on the system operation.

2.4 ANCILLARY SYSTEMS

- 2.4.1 The fire alarm system shall be capable of interfacing with the following systems:

Intruder Alarm	Access Control	MCC Panel	Gas Slam
Fire Door Holders	Monitoring Station via intruder alarm	Networked to existing	

2.5 INSTALLATION

2.5.1 Cable System

Wiring to new device circuits shall be in 2.5mm sq "Enhanced" cable PH 120. Cable wiring to sounder circuits shall be in 2.5mm sq "Enhanced" cable PH120.

Single fire alarm cables shall be either clipped direct in all ceiling voids and plant room type areas or fixed in accordance with manufactures recommendations. Where fire alarm cables are to be routed surface in public or office areas, they shall be installed in galvanised steel conduits with coupler and bush at each end. Where fire alarm cables are grouped together, they shall be installed on galvanised cable tray for areas such as ceiling voids and risers and fixed via non-combustible supports so the circuit integrity shall not be reduced below that afforded by the cable used.

All wiring circuits shall be tested in accordance with NSAI IS 10101:2020 & IS 3218:2024

Provide permanent labels on all devices. Reference system to be approved in advance by the Engineer.

The Contractor is wholly responsible for the overall installation and the co-ordination of, and attendance on, systems suppliers.

2.6 COMMISSIONING AND TESTING

- 2.6.1 Commissioning to be provided by a third-party contractor
- 2.6.2 Commissioning certificates in the form of the IS3218:2024 Form must be fully completed by both the systems and wiring contractors before Practical Completion will be awarded.
- 2.6.3 The contractor shall perform audibility tests as part of the commissioning of the system and present the results to the Engineers in tabular format.

2.7 MANUALS AND DRAWINGS

- 2.7.1 The user shall be instructed in the operation of the system at Practical Completion or shortly thereafter. At this time, a commissioning certificate, user logbook, zone/device charts, as-installed drawings and an operations manual must be handed over. Three further copies of the above must also be included in the O.& M. manuals. Allow for a subsequent instruction session with the Client when the facility is operational.

3. INTRUDER ALARM SYSTEM AND ACCESS CONTROL

3.1 SCOPE OF WORK

3.1.1 System Description

Provision of an Intruder Alarm throughout and access control to doors as indicated on the drawings.

The contractor shall include for the provisions to provide the 1st years maintenance of both the access control and gate automation systems within their tendered price.

3.1.2 Reference Specifications

Works to be carried out in accordance with:

1. NSAI IS 10101:2020
2. IS EN 50131 regulations
3. Part M of the Building Regulation

3.2 SYSTEM DETAILS

- 3.2.1 The Contractor shall make allowance to link the existing Intruder Alarm system to the new intruder alarm to include the new extension. The allowance shall include any upgrade works required to the existing system to accommodate the new additional provision. The intruder alarm system shall be linked by GSM unit to a Remote Monitoring Station.

- 3.2.2 Access Control shall be provided on doors outlined on the drawings and shall consist of fob controller with Fob release and Emergency release. A request release button shall be located within the office to provide admin staff with control of such doors. A door intercom system shall be provided as part of the access control system between the entrance and office.

3.3 EQUIPMENT DETAILS

- 3.3.1 Intruder Alarm system consisting of zoned control panel, keypads, door contacts and presence detectors, internal sounders and external sounder/strobe to provide Intruder detection and alarm within each Unit. Existing Equipment is HKC.

- 3.3.2 Access control shall consist of a Fob pad on the non-secure side, door head mounted electromagnetic lock, with Fob and emergency release on the secure side. Emergency release shall be "Break glass to Release" and shall be green. The electromagnetic locks shall be surface mounted low profile as Abloy and mounted on the head of the door frame. The Fobpad shall be wall mounted on the non-secure side of the door. Each reader shall be selected to suit its environment.

A two-way communication intercom between the entrance and office shall be provide and shall consist of the following:

- Vandal Proof construction
- Built in Keypad

3.4 INSTALLATION

3.4.1 Power Supply

The intruder alarm and access control system shall be fed from individual 5A 230v fused spur outlet fed from the local sub-distribution board.

3.4.2 Cable System

Wiring to be multicore PVC/PVC LSF in line with the system manufacturer's guidelines installed on ELV cable tray in ceiling voids. Surface drops to be in steel conduit with drops in partitions to be in PVC flexible conduit.

Test all wiring circuits

Provide permanent labels on all devices. Reference system shall be approved in advance by the Engineer.

The Contractor is wholly responsible for the overall installation and the co-ordination of, and attendance on, systems suppliers.

3.5 COMMISSIONING AND TESTING

3.5.1 Commissioning certificates must be provided by both the systems and wiring contractors before Practical Completion will be awarded.

3.6 MANUALS AND DRAWINGS

3.6.1 The user shall be instructed in the operation of the system at Practical Completion or shortly thereafter. At this time, a commissioning certificate, as-installed drawings and an operations manual must be handed over. Three further copies of the above must also be included in the O. & M. manuals. Allow for a subsequent instruction session with the Client when the facility is operational.

4. CCTV SYSTEM

4.1 SCOPE OF WORK

4.1.1 System Description

Provision of the alteration to the existing CCTV of the interior and exterior of the building.

4.1.2 Reference Specifications

1. Works to be carried out in accordance with NSAI IS 10101:2020 regulations.
2. PSA Regulation

4.2 CCTV SYSTEM DETAILS

4.2.1 CCTV coverage of selected areas with CCTV controller located in the Comms Cabinet and live feed monitors provided in the office.

4.3 **EQUIPMENT DETAILS**

- 4.3.1 Provide a 21" flat screen HDMI monitor located in the new office.

4.4. **INSTALLATION**

4.4.1 **Power Supply**

The power supply for the CCTV and shall be taken from the Comms Cabinet PDUs.

4.4.2 **Cable System**

CCTV wiring to be Cat 6 UTP LSOH internal rated for internal CCTV locations and Cat 6 UTP LSOH external rated rodent resistant for the external CCTV locations.

4.5 **COMMISSIONING AND TESTING**

- 4.5.1 Commissioning certificates must be provided by both the systems and wiring contractors before Practical Completion will be awarded.

4.6 **MANUALS AND DRAWINGS**

- 4.6.1 Provide "As Installed" drawings and Operation and Maintenance Manual of the CCTV system in soft and hard copy.