SECTION FIVE: ELECTRICAL WORKS

ELECTRICAL SERVICES WORKS

5.01 Preamble and Scope of Works

This section of the specification details the particular requirements for the electrical services for the New Building at St Margaret Clitherow Catholic Primary School.

The entire system and all associated 230V requirement shall also comply and be in accordance with the current 17th Edition of the IEE Wiring Regulations BS 7671.

The Contractor's works shall include but not be limited to the following:-

1) Provision of sub main distribution equipment and cabling.

2) Provision of final distribution and dedicated small power installation.

3) Provision of internal and external lighting installation including emergency lighting.

4) Provision of fire alarm installation in compliance with BS5839 Pt 1, linked to the existing fire alarm system.

5) Provision of Security system.

6) Extension of data and telephone installation to the new building.

7) Provision of all associated trunking and containment.

8) Allowance for training of school staff of all systems.

9) The provision of operating and maintenance manuals, record drawings and instruction of maintenance staff.

This summary is for the general guidance of the Contractor. Any omission from this description will not relieve the Contractor from carrying out the whole works described within this specification.

The drawings prepared to accompany these documents are to illustrate the design intent and to allow the Contractor to prepare a tender. The drawings shall not be deemed to be full fabrication or workshop drawings. Whilst every care has been taken to ensure that the representations made on the drawings are accurate, the Contractor shall be responsible for preparing further fabrication, working drawings.

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5.02 Sub-Main and Final Distribution

The Contractor shall note the location for the incoming 400A TP&N fused service head and associated metering, existing 6W MEM MCCB panel board located within electrical intake room of the existing school as indicated on drawing 4282-E-04.

From the existing TP&N MCCB panel board, the Contractor install a 100A MCCB breaker and run a four core 50mm² XLPE/SWA and 25mm single core Y/GN cable on roof of existing building and in 500mm deep trench to the plant room of new building. Cables laid in trench shall be installed with plastic marker tape above cable route and 300mm form finished surface level.
The Contractor shall refer to drawing 4282-E-04 for cable route of sub-main serving new building.

The Contractor shall install a 12 way TP&N distribution board Ref:DBC and 8 way TP&N distribution board Ref:DBP within the plant room. DBP shall be fed from DBC via four core 25mm² XLPE/SWA cable for mechanical services.

The final circuit fuseboard shall be miniature circuit breaker, (MCB) type, in accordance with BS 5486: Part 12. 3-phase fuseboards shall be type B. The fuseboard shall be equipped with miniature circuit breakers rated in accordance with the final circuit requirements. Where 400V single or 3-phase final sub-circuits are served from the board, the associated MCBs shall have linked poles, so that operation of the circuit breaker simultaneously interrupts all phases. All miniature circuit breakers shall be carefully selected to obviate nuisance tripping due to in-rush currents.

The fuseboard shall be of Mem manufacture Memshield 2 or equal and approved, but shall be of common manufacture to permit interchangeability and simplify future spare part procurement.

The fuseboard assembly shall be wall mounted and provided with an integral main isolator. All spare ways shall be equipped with propriety blanking plates. Generally spare capacity equal to 25% of the number of outgoing ways used shall be allowed in the fuseboard.
The CPC/Armour of each cable shall link the main earth bar in accordance with BS 7671.

Circuits shall be fitted with RCBO type miniature circuit breakers in compliance with the 17th Edition Wiring regulations as detailed in the fuseboard circuit schedules.

The fuseboard shall be fitted with a typed circuit schedule affixed to the inside of the enclosure door using a sheet of transparent fire proof film. The new board shall generally be mounted with due care taken to ensure that the internal components are accessible for maintenance.

5.03 Lighting Installation

The Contractor shall include for the supply and installation of all luminaires, lamps and all control equipment as detailed on the drawings and within this specification.
In general the luminaires shall be independently supported within the finished ceiling or suspended via proprietary suspension kits.

The Contractor shall: -

- Coordinate his installation with the ceiling arrangement.
- Allow for all necessary suspensions, supports and fixings.
- Ensure that where luminaires are installed into cut-outs in suspended ceiling areas, a backing plate of suitable material shall be used to adequately and safely support the luminaire in that tile or plasterboard finish.
- Ensure that all wiring is concealed within the building fabric.

In areas of exposed soffits or cladding, e.g. classrooms the Contractor shall run all cables associated with the lighting installation between continuous luminaires groups via flexible plastic conduits between battens and/or joists above ceiling cladding.
Any required cable drops to row of luminaires shall be neatly clipped to suspension wires.

The Contractor shall refer to the luminaire schedule for essential lighting package (luminaires, infills, lamps and suspension kits) to be obtained from:

Lighting Force
Tel: 01424 775459

The Contractor shall also include for the supply and installation of luminaires not included in the above package.

Circuits shall be wired in not less than 1.5mm² single-core LSF insulated cables.

The Contractor shall allow for wall mounted switching accessories, mounted at 1200mm AFFL to top which shall be white moulded faceplate type as from the MK Logic Plus range.

The switching arrangement associated with the installation shall generally be as shown on the drawings and generally comprise:

Luminaires within the classrooms supplied with DALI dimmable ballast shall be controlled via PIR/Photocell mounted onto infill panels for presence detection and integrated daylight control.

The luminaires shall be controlled by IS-LMSDALI10 gateway wired to the area controller by the Contractor via beldon 8791 cable.

SECTION FIVE: ELECTRICAL WORKS

The Contractor shall also install momentary retractive push to make switches as indicated on drawing to override control of luminaires close to teaching wall and general classroom lighting.

The contractor is to include for the design, supply, delivery, installation, testing and commissioning of specialist lighting control system to control the classroom lighting, and is to be as:

TheIS Limited
Phill McBrown
01252 470027

External luminaires shall be controlled by use of, long range presence detectors and timeclocks all via a contactor. The timeclock is to be wall mounted in the plant room with an override switch in the main entrance.

External wall mounted luminaires are to be wired via internal concealed cabling. Exact positions and heights of the external wall mounted luminaries are to be as detailed on the Architects elevations.

External lighting circuits shall be fitted with RCBO type miniature circuit breakers.

5.04 Emergency Lighting

The Contractor shall provide and install a complete system of emergency lighting to meet BS 5266. The emergency lighting shall comprise conversion packs fitted to the normal lighting luminaires. The units will provide three hours of emergency lighting in the event of a power failure acting in conjunction with a mains fluorescent luminaire and an inverter to provide the illumination. The use of incandescent fittings will not be allowed. Site conversion of luminaires will not be permitted unless specifically authorised by the Engineer.

All emergency luminaires shall be fitted with totally sealed maintenance free nickel cadmium batteries, a constant current charter, a solid-state inverter, a solid-state changeover switch, a supply fuse and short circuit proof transformer to meet BS 3535. The battery charger shall be able to restore full charge to the batteries from a state of complete discharge in twenty-four hours.

Each emergency luminaire shall be supplied from an unswitched live supply taken from the fuse circuit of the adjacent normal luminaires. Each emergency luminaire (or group of luminaires) shall have a test facility by means of a keyswitch located at the local switch position or adjacent to the controlling fuseboard. A light emitting diode (LED) shall be provided on all emergency lighting fittings or conversion fittings to identify that an AC supply is present, the charger is functioning and the battery is connected. The LED shall be fixed to the luminaire so that it can be clearly observed.

SECTION FIVE: ELECTRICAL WORKS

5.05 Small Power Installation

General

The Contractor shall include for the supply and installation of the small power installations detailed on the drawings and within this specification, complete with all necessary ancillary equipment and accessories to fulfil the design intent.

The small power accessories where indicated shall comprise switched and unswitched socket outlets, fused connection units, double-pole switches and local isolators as indicated and as detailed in this specification.

Small power circuit distribution shall comprise of final circuits served from MCB fuseboards located within plant room as detailed on the drawings.

In general wall mounted outlets and accessories shall be positioned at mounting heights in compliance with Part M of the Building Regulations i.e. within 450mm and 1,000mm above finished floor level.
Mounting heights of teaching wall outlets and accessories shall be 900mm AFFL and co-ordinated with the whiteboard.
Small power accessories and furniture mounted cable management system in resource areas shall be installed in accordance with drawing 4282/116. All mounting heights shall be agreed on site prior to installation with the Contract Administrator.

A floor box is to be utilised, where shown on the drawings in the open plan group area and shall be 3 compartment type, comprising 2 No twin switched socket outlets and 1 No twin data outlet. Outlets to floor box shall be laid out in such a manner that connection of plug in one outlet shall not restrict the exit of cable associated with other outlets. All cables serving floor boxes are to be fed via conduits laid in screed (avoiding under floor heating circuitry).

Outlet plates shall be as MK Logic Plus white, wired on dedicated ring circuits using single-core LSF-insulated cables.

Under no circumstances shall socket outlets be spurred from a ring circuit, unless specifically requested in writing by the engineer.

The Contractor shall allow for all socket outlets and accessories to be flush mounted unless indicated otherwise on the drawings.
Generally flush mounted outlets shall be with UPVC white plastic conduit drops buried into the building fabric terminating in the requisite outlet back box.

The final positions of wall mounted socket outlets shall be co-ordinated with the Architect's latest setting out details and shall take account of the latest room layout drawings.

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Disabled W.C

The contractor is to allow to supply, install, test and commission a new Disabled alarm system, located within disabled W.C.
The system is to comprise of:

1 No amber ceiling mounted pull cord located adjacent to the lavatory and within easy reach with integral reassurance light.
1 No Key re-set unit located inside the room.
1 No Audio Visual Sounder located externally to the room over the door.
1 No Power supply unit located locally.

The contractor will be required to provide a switched fused connection unit adjacent to the power supply unit, labelled accordingly.

The disabled WC alarm system is to be as supplied by The Wandsworth Group, QD350 or equal and approved.

5.06 Wiring & Containment

The contractor shall include to install 2No 300mm cable baskets from the plant room to the main entrance concealed within false ceilings of the corridor, which shall be used utilized to route final circuits and sub-mains cabling in the future ancillary services.

Circuits shall be wired in not less than 1.5mm² single-core LSF (Lighting) and 2.5mm² single-core LSF (Power) insulated cables.

Flexible cords to luminaires shall be 3-core 1.5mm² heat resistant flexible cable. The third core of the flexible core shall be used for earth continuity and shall be securely fixed to the luminaire. Luminaires containing emergency battery packs shall be supplied with 4-core 1.5mm² heat resisting cable.

For surface mounted luminaires the conduit system shall terminate in a BESA box to which the luminaire shall be fitted directly.
Separate 1.5mm² earth continuity conductors shall be run in the trunking and conduit system to effectively earth the luminaires to the respective fuseboard.

The Contractor shall use single-pole, double-pole, 2-way, intermediate, pilot or keyed type switches. All lighting switches shall be of the grid mounting type rated for a continuous load of 20A.

All switches shall be flush mounted quiet operating AC type, with toggle operator, and heat resisting with plastic housing.

Final circuit cabling from the fuseboard boards shall installed in cable basket or drawn into high impact plastic conduits. These shall be hidden from view, within voids and within the fabric of the building finishes.

SECTION FIVE: ELECTRICAL WORKS

All socket outlets and fused connection units shall have a separate earth continuity conductor installed from the earthing terminal of the outlet housing. The earth continuity conductor shall have a minimum cross section area of 2.5mm and shall be sleeved in green and yellow LSF.

5.07 Fire Alarm Installation

Under this section, the Contractor shall be responsible for the supply, installation, commissioning and setting to work of the modified fire alarm system to serve the existing school and new extension.

An analogue addressable 2-loop fire alarm system shall be installed within the new building consisting of Fire Alarm Panel, smoke and heat detectors, sounders and cabling to comply with classification L3 in conformance with BS 5839 part 1.
The new fire alarm panel shall be linked to and be compactable with the existing Haes analogue addressable fire alarm panel located within the main school.

The fire alarm panel shall be served via a 16A MCB from distribution board DBC and in accordance with clause 29.2 of BS5839 part 1. The supply shall terminate in a labelled un-switched fused connection unit adjacent to the fire alarm panel, as detailed on the drawing, fed via FP200 gold cable.

Automatic smoke and heat detectors of the appropriate type shall be provided as indicated on the drawings. Detectors shall comprise an analogue automatic detector fitted to an addressable plug-in base. Each base shall be programmed with individual code number, which shall be configured to an approved description indicating the location, zone number and loop number when initiating an alarm condition.

Heat detectors shall incorporate two heat response elements to provide rate of rise and fixed temperature detection such that when the temperature reaches 60°C the detector shall switch to the alarm state irrespective to the rate of the temperature rise.

Manually operated addressable type break-glass call points shall be located as indicated on the drawings. Call points shall be surface mounted. Both automatic and manual devices shall be provided with an engraved screw fixed label attached to the detectors base or call point back box providing red lettering on a white background detailing the device number and loop.

Fire alarm interfaces shall be installed to the main doors and gas isolation valve within the plant room.

Wiring to fire alarm devices shall be 2-core 1.5mm^2 FP200 red sheathed cables, concealed within the building fabric.
Sounders shall be provided to provide a minimum of 60dBA or 5dBA

above any background noise likely to exceed 30 seconds. Sound level frequencies shall be kept within the range of 500 to 1,000Hz

The Contractor shall allow within his price the employment of the specialist fire alarm contractor to supply and install all necessary equipment including that associated with the modification of the existing main school fire alarm panel if necessary.

The Contractor shall be responsible for placing an order and providing attendance with the specialist fire alarm contractor to supply, install and commission the modified fire alarm system serving the entire school.

The school's nominated fire alarm specialist details are as follows:

Millenium Fire Protection Limited
153 Canterbury Road
North Harrow
Middlesex
HA1 4PA
Tel: 0208 424 8824
Contact: Paul Harper

The Contractor shall include to liaise with the specialist for the exact requirements and final positions of all proposed equipment prior to works commencing on site.

The Contractor shall include for all necessary containment to facilitate wiring between and within new building and existing school.

A commissioning certificate, logbook and system diagram shall be handed over for use by the end user upon the completion of an installation. The commissioning certificate, logbook and system diagram are considered an integral part of the Health and Safety Manual and therefore the installation will be deemed incomplete until the documents are incorporated into the Manual.

SECTION FIVE: ELECTRICAL WORKS

5.08 Data and Telecommunications Installation

The Contractor shall supply, install, test and commission the cat 6 UTP data cabling and wireless installation as detailed on the tender issue drawings.

The Contractor shall run a 1 x 4core 50/125 fibre optic cable from data cabinet located in existing school to a new wall mounted data cabinet located in the group room. A 1U fibre patch panel shall be supplied and fibre patch leads terminated in each cabinet.

The Contractor shall install as a minimum 2 x 24 port Cat 6 UTP patch panels with 25% spare capacity and associated cable management to achieve a fully functional data installation. The wall mounted data cabinet shall include a 6wayPDU.
The Contractor shall allow to provide and install all requisite wire ways complete with boxes and terminate cat6 UTP cables onto modules and white outlet faceplates.

The Contractor shall also supply and install to each of the classrooms a Netgear WAGL102WAP for wireless internet access located at high level above doors.

From the existing telephone system, the Contractor shall run cables to telephone outlets indicated within 2No Group rooms and include for all equipment associated with the termination of cables.

The Contractor shall be responsible nominating a data and telecommunications specialist to carry out the above works and placing an order and providing attendance with the specialist to supply, install, test and commission the installation.

5.09 Security Installation

The Contractor shall allow to place an order with and provide attendance with the existing maintenance security company to supply install and commission intruder alarm system in accordance with the NACOSS-NSI regulations.

The existing Security systems are to be upgraded to cover the new building. This will encompass the requirement for the installation of new security panel linked back to the security system within the main school, presence detection devices, magnetic door contacts to all external doors, final exit key set panel, internal sounder, external wall mounted bell and dummy. Separate door contacts shall be provided for the overhead warm air curtain.

The intruder alarm system shall be open protocol and of double knock type, programmed to trigger the alarm if two alarm signals are received within a certain time in order to minimize nuisance tripping.

All wiring associated with the intruder alarm system shall be concealed

within the building fabric.

The Contractor shall be responsible for placing an order with and providing attendance on the existing maintenance security company to supply, install and commission the modified system.

The schools existing security specialist is detailed as follows:

Capstan Security
127 East Barnet Road
New Barnet,
Herts
EN4 8RF

Tel: 0208 441 9700
Fax: 020 8449 5319
Contact: Richard Langmead

The Contractor shall include to liaise with the company for the exact requirements and final positions of all proposed equipment prior to works commencing on site.

5.10 Lightning Protection

Lightning protection systems shall be designed, constructed and tested in accordance with the requirements and recommendations of BS EN 62305, including all appendices.
The system shall comprise an air termination network, concealed wherever possible, linked to the structural steel frame as down conductors and concealed tapes where steel frame is not available. The tapes shall in turn be connected via test/disconnect links, to earth electrodes, where necessary, housed within proprietary earth pits.

The lightning conductor system for the building or structure shall be effectively bonded to the main earthing terminal of the building in accordance with the requirements of BS7430. The bonding conductors shall not be smaller than 25mm x 3mm.

Metalwork adjacent to the system or located on the roof shall be bonded to the system in accordance with current regulations.

Where the metalwork is a pipe or duct running parallel to the down conductor, it shall be bonded to the down conductor at the highest and lowest points of the run of pipe or duct but not below the test point of the down conductor.

Where a copper conductor is to be bonded to an aluminium or galvanised component such as an aluminium clad flue, aerial or sheet, then the connection shall be made by means of aluminium strip and aluminium/copper joint, made in a position clear of the flue, sheeting etc.

A suitable label shall be provided adjacent to this bonding connection at the main earth terminal. The earthing terminal will be in the main electrical switchroom.

Allowance must be made for connection to all extraneous metalwork in accordance BS EN 62305.

5.11 Electrical Works in Association with Mechanical Installation

The Contractor shall be responsible for the supply and installation of the complete electrical installation associated with the power requirements of the various items of mechanical equipment and components indicated on the drawings.

The Contractor shall provide a fused connection unit adjacent to control panel of passivent natural ventilation systems as indicated on drawings. From the control panel 3No 4-core twisted pair screened cables shall be run to paasivent temperature sensor/manual time controlled override unit, carbon dioxide sensor and actuator in roof space in each of the 4No zones (classrooms). A temperature sensor located on north facing wall shall also be connected to the control panel.

The Contractor shall provide a fused connection unit adjacent to Permadrip irrigation control panel as indicated on drawings and run a 2-core 0.5mm² cable from the controller to a suitable location for a rain sensor.

The Contractor shall provide a fused connection unit adjacent to under floor heating pumps in each of the 7No. zones served on a radial circuit.

The Contractor shall refer to drawing 4282-M03 for the location of mechanical services.
A three phase supply via XLPE/SWA cable shall be provided from the plant room to the packaged pumping station, indicated on 4282/110 and 10A TP&N IP65 isolator shall be provided adjacent to control unit.
A three phase supply via XLPE/SWA cable shall also be provided from the plant room to the external air source heat pump indicated on 4282-M04 and 10A TP&N IP65 isolator shall be provided adjacent to control unit.

Each power supply shall terminate at an isolator or fused connection unit with neon indicator situated adjacent to the equipment being served as detailed on the drawings.

The Contractor shall supply, install and connect all final connecting flexible cables, and where required flexible conduits, into the terminals of the plant or equipment.

5.12 Operating and Maintenance Manuals, Record Drawings

a) Operating and Maintenance Manuals

The Contractor shall prepare and present, at the time of the handover meeting, two copies of a comprehensive operating and maintenance manual for the modified services.

Each manual shall contain a full description of all the installed systems together with detailed information, pertaining to safety procedures, including manufacturer's data, on all frequency and extent of required maintenance and operating procedures including simple fault finding.

Each manual shall be bound within a 2-ring PVC-bound stiff-sided binder able to withstand constant usage. The size of the manuals shall be no larger than international size A3.

An electronic copy of the installation record drawings shall be provided on CD-ROM.

b) Instructions of Client's Staff

On completion of the testing and commissioning of the electrical services installation, the Contractor shall allow for fully instructing the Client's Representative, in the operation of the various systems and items of equipment. The Contractor shall allow for a complete day in the instruction of the Client's personnel in the operation of the plant and equipment.

c) Record Drawings

The Contractor shall prepare and present at the time of the handover meeting two complete sets of record drawings. The drawings shall be prepared at a scale not less than those shown on the tender of supplementary drawings. The drawings shall be prepared using CAD. Disks will be made available of the tender drawings to the Contractor for developing into record drawings if requested. The disks will be in AutoCAD 2006 format.

Record drawings for submission shall include:-

- Fire alarm layout drawing.
- Security systems drawings
- Small power installation
- Lighting installation
- Layouts at a scale of not less than 1:100 detailing the locations and type of all devices and addresses.

SECTION FIVE: ELECTRICAL WORKS

5.13 Earthing & Bonding

The Contractor shall design and establish a full earthing system which will meet the requirements of BS 7671 17th Edition of the IEE Wiring Regulations, and as detailed below.

The extraneous metalwork of the mechanical services shall be bonded to the earth network. These shall be bonded to the main earth point within the electrical cupboard.

The Contractor shall test the whole earthing installation as detailed within the general section of this specification. Particular care shall be taken to ensure that equipment supplied via trunking and conduit is adequately bonded.

Particular attention shall be paid to the earthing of suspended ceiling grids, mechanical services pipework and ductwork, metallic sinks and other exposed conductive parts to ensure earth continuity throughout.

A full system of supplementary bonding shall be provided within the development in accordance with the IEE Regulations and the general section of this specification.

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SECTION FIVE: ELECTRICAL WORKS

Appendix – 1

Schedule of luminaires obtained from Lighting Force

A	1x49W T5 direct/indirect suspended luminaire with high frequency dali dimming ballast, 2 point suspension wire supplied with lamps. **As Veksan lotus**
B	2 x 54W T51200mm wall mounted linear luminaire supplied with lamps. **As Delta Light Connect A**
C	1x11W circular recessed LV downlighter with mode transformers supplied with lamps. **As Delta Light CoolCat**
D	Wall mounted blue 3W led complete with power supply and drivers. **As Delta Light Heli 1 blue**
H	Wall mounted Mask Inox 18W external luminaire
I	Inground Led luminaire complete with drivers and emergency pack
J	2 x35W IP44 wall mounted direct/indirect luminaire
K	Surface mounted 21/28W dimslimlink seamless luminaires

Schedule of luminaires supplied by Contractor

F	1500mm 1 x 49W T5 surface mounted luminaire with polycarbonate diffuser and H/F control gear. **As Thorlux Lighting Thorproof TP11797J**
FE	As 'F' but with 3hr emergency pack
G	1x32W recessed downlighter with drop glass and H/F control gear **As Thorlux Lighting G3 GT12668J**
GE	As 'G' but with 3hr emergency pack

SECTION FIVE: ELECTRICAL WORKS

Appendix – 2

Distribution board schedules

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Builders Works In Connection With Electrical Services

Carried forward to Main Summary

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