below.

290.020 FIXINGS:

- Standards - reference Y90.2010
- Plugs - reference Y90.2020
- Screws - reference Y90.2030
- Proprietary channel inserts - reference Y90.2070

290.030 WORKMANSHIP:

- Drilling - reference Y90.3010
- Proprietary fixings - reference Y90.3020
- Fixing to reinforced concrete - reference Y90.3030
- Fixing to brickwork - reference Y90.3040
- Fixing to timber rails - reference Y90.3050
- Fixing to hollow stud/tile/block wall
- Reference Y90.3060A
- Fixing to concrete, brickwork or blockwork
- Reference Y90.3070A
- Fixing to metalwork
- Reference Y90.3080A
- Fixing to structural steelwork and concrete structures
- Reference Y90.3090A

PART 3 SPECIFICATION CLAUSES SPECIFIC TO W50

300.010 TYPE OF SYSTEM - GENERAL

Application : To work areas.
Standard : BS 5839-1.

300.020 CONNECTION TO LOCAL AUTHORITY FIRE BRIGADE

Existing.

300.030 ZONES

Application: Multiple per floor
Standard - BS 5839-1.
Zones

- Number: As indicated on the contract drawings

Show the location of zones by:-

- Specially prepared plan of building, permanently mounted adjacent to the indicator panel.

Zone testing

- Provide a means of testing wiring of each zone of system.

300.040 CONTROL SYSTEM

Application: Throughout building
Standard

- BS 5839-6 Annex B.
- BS EN 54-2 and BS EN 54-4.

Analogue addressable.

300.060 MONITORING

Provide all end of line and other circuit elements to ensure the system is fully monitored to comply with BS 5839.

300.080 REMOVAL OF TRIGGER DEVICE

Provide precautions against removal of trigger devices.

- Use trigger devices wired on circuits separated from manual call points.
- Route wiring so that manual call points precede trigger devices in circuit.
- Use trigger devices that are removed only by a special tool.
- Use trigger devices with bases that provide circuit continuity with trigger device removed.

Ensure that, where alarm sounders use same wiring as trigger device, removal of trigger device does not affect operation of alarm sounder.

300.100 REMOTE CENTRE

Make provision to send signal to remote centre.
- Location: UCL Security
- Signals
  - Alarm.
  - Pre-alarm.
  - Fault.
  - Zone isolated.

300.110 FIRE ALARM SPECIALIST

Engage a specialist to develop the design, supply, install, commission and set to work the fire alarm system.
- Specialist: Fisk Fire Protection Ltd

310.010 MANUAL CALL POINTS

Manufacturer and reference: Apollo Fire Detection Ltd. 55000-906
Standard
- BS EN 50130-4.
- BS EN 54-11.

Indication of operation
Protection against accidental operation
Mounting
- Flush.
- Weather resistant.

Operation
- MCP activation response within 1 second.
- Field programmable to trigger alert or evacuate alarms.
- Test key
- Addressable.
- Monitored.
- Integral activation indicator
- Manual operation
  - Key switch.
  - Break glass.
    - Anti-fragmentation film.
  - Thumb pressure.

310.020 AUTOMATIC DETECTORS

Provide automatic fire detectors from the same manufacturers and with common facilities.

- Standard - BS EN 50130-4.
- Plug in bases.
- Common base for all detector types.
- Addressable detector base.
- Mechanical device to accept only
  - Optical smoke detectors.
  - Heat detectors.
- Detectors locking.
- Communicate detector status & address
- Address code setting
  - Manual.
  - Software.
  - Separate addressable plug for each detector.
- Visible activation indicator.
- Visible remote indication for detectors concealed.
- Auxiliary contact
- Label detector and bases with address number.
- Colour of devices: White
- End of line device mounted in sensor

310.030 HEAT DETECTORS

Manufacturer and reference: Apollo Fire Detection Ltd. 55000-400
Point type

- Standard
  - BS 5446-2.
  - BS EN 54-5.

Heat-sensitive element

- Fixed temperature element.

Types

- Analogue addressable.

Temperature setting: 60^{o}C.

310.040 SMOKE DETECTORS

Manufacturer and reference: Apollo Fire Detection Ltd. 55000-600
Detector type

- Optical.
- Point type.
  - Standard
    - BS 5446-1.
    - BS EN 54-7.

- Analogue addressable.

310.045 MULTI-SENSOR DETECTORS

Manufacturer and reference: Apollo Fire Detection Ltd. 58000-700
Characteristics
- Addressable.
- Monitored.

310.070 SOUNDERS

Manufacturer and reference: Apollo Fire Detectors Ltd.
Standard - BS 5839-8 Annex
Sounder types
- Electronic sounder.
- Addressable.

Sounder characteristics
- d.c.
- Voltage 17 – 20V
- Sound power output (dBA): 100

Colour
- White.

Finish
- Protection to BS EN 60529
- Weather proof.
- Internal.

310.080 FIRE ALARM CONTROL AND INDICATING EQUIPMENT

Manufacturer and reference: Existing

310.110 ANCILLARY SERVICES

Make provision to open or close circuits of ancillary services by means of relay or similar device.
- Standard
  - BS EN 54-2.
  - BS EN 50130-4.
- Services
  - Closing of windows, smoke and fire doors.
  - Controlling ventilating systems.
  - Emergency lighting
- Relay type
  - Addressable

  - Monitored.
  - Power from addressable loop.
  - Activation indicator
- Input
  - Monitored
  - Addressable
- Activation indicator
- Output
  - Monitored.
  - Door holder.
  - Plant

310.130 REMOTE INDICATOR MODULE

Manufacturer: Apollo Fire Detection Ltd.
Standard
- BS EN 54-2.
- BS EN 50130-4.

Driven by its associated detector.
Monitored for open and short circuits.

310.140 LINE ISOLATOR MODULE

Manufacturer: Apollo Fire Detection Ltd.
Standard
- BS EN 54-2.
- BS EN 50130-4.

Derive power from addressable loop.
Visible LED indicator that module has tripped.
Maximum of 15 devices per short circuit device.
Maximum of 7 units per loop.

310.150 VISIBLE ALARMS

Manufacturer and reference: Apollo Fire Detectors Ltd. 55000-878
Standard
- BS EN 54-2.
- BS EN 50130-4.

Flashing.
High power LED.
Power supply: d.c.

320.010 QUALITY CONTROL

Handle, store and install equipment and components of the fire detection and alarm system in accordance with BS 5839 and the manufacturer's recommendations.

- Obtain all equipment and components from a single source.

Inspect all equipment and components on delivery, before fixing and after installation and reject and replace any which are defective.
Record all commissioning tests and provide the certification required by BS 5839-1.

- Provide manufacturer's certificates of equipment design to an approved quality management system and CIE component selection.

320.020 SMOKE DETECTOR INDICATORS

Fit smoke detector indicators external to doors, where zone is divided into rooms.

320.030 MANUAL CALL POINTS

Where manual call points are sited in zones.
Wire into detector circuit for fire zone.
Wire manual call points sited on staircase landings as a separate zone.

320.040 RECORD DRAWINGS AND OPERATING INSTRUCTIONS

Provide instructions on use of installation to person responsible for use of premises.
Supply the user with a logbook and certificate of installation and commissioning, in accordance with BS 5839-1, Appendix B and D.
Provide record drawings to user for maintenance and record purposes.
Show position of various items of equipment, junction boxes, etc, and sizes and routes of cables and wires. Include wiring diagrams of junction boxes and distribution cases.

Provide circuit diagrams of fire alarm system and its components.

320.050 CABLE INSTALLATION

Plan and install all fire detection and alarm system cables in accordance with BS 5839-1 and the cable manufacturer's recommendations.

- Run cables point to point without tees or spurs.

- Design loop load to not exceed 80% of cable capacity.

W51 EARTHING AND BONDING

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES

The Installation Contractor shall include in his tender for the supply, installation, commissioning, testing and setting to work a complete and fully functioning earthing and bonding system in accordance with the Contract drawings and details contained within this Specification.

100.020 DESIGN PARAMETERS

The earthing and bonding has been designed to meet the requirements of BS 7671.

100.030 SYSTEM DESCRIPTION

The earthing and bonding of the entire services installation and the building fabric, finishes, etc. shall comply with the requirements of BS 7671.

The method of fault protection against shall be by protective earthing, protective equipotential bonding and automatic disconnection of supply.

All final circuits shall be provided with separately wired circuit protective conductors which shall be connected to the earthing terminals of all equipment, outlets, etc. These CPC'S shall be at least the same size as the phase conductors unless stated otherwise.

The new trunking, baskets and trays shall be electrically continuous throughout their length and shall be bonded to the earth terminals of the distribution boards by a minimum 10mm^2 XLPE insulated cable.

The hot and cold water pipes at sink positions shall be bonded to each other and to the sink basin using minimum 4mm^2 LSF insulated cables.

The water and gas services pipework entering the area shall be bonded to each other and to earth using a minimum 25mm^2 cable.

Where a number of items are noted as being bonded, (to each other and to earth), they shall be bonded to a single continuous conductor which has the insulate locally removed to facilitate the bond to the cable and such that disconnection of one bonding position does not affect remaining connections.

A main earthing bar is to be provided at each LV Distribution position.

All new stainless steel worktops to be bonded to local point.

PART 2 SELECTION SCHEDULES FOR REFERENCE SPECIFICATIONS

280.000 EARTHING AND BONDING COMPONENTS

280.010 GENERAL:

Comply with work section general clauses reference Y80.1000 and those detailed below.

281.000 TESTING AND COMMISSIONING OF ELECTRICAL SERVICES:

281.010 GENERAL:

Refer to Works section V25.

282.000 IDENTIFICATION - ELECTRICAL

282.010 GENERAL:

Refer to Works Section V25.

PART 3 SPECIFICATION CLAUSES SPECIFIC TO W51

300.000 GENERAL

300.010 STANDARDS:

Carry out electrical system earthing work in accordance with BS 7671 (IEE wiring regulations), BS 7430, Electricity, Safety, Quality and Continuity Regulations and Local Electricity Supply Authority Requirements.

- Comply with the requirements of BS EN 50310.

300.020 EARTHING AND BONDING SCHEDULE:

Carry out earthing and bonding installation:-

- as indicated on the Contract Drawings
- as required by BS 7671

300.040 EXISTING INSTALLATIONS:

Check earth continuity conductors and loop impedance values of existing installation. Report defects and elements not in accordance with BS 7671 (IEE Regulations) before connecting new or modified installations to existing supply.

300.060 RISE IN POTENTIAL IN TELECOMMUNICATIONS

Ensure the potential rise in telecommunications circuits due to power system earth faults is limited, as BS 6701, to

- 430V.

300.070 EXCHANGE OF INFORMATION:

Consult with the electricity supply company regarding the earthing arrangements of the installation. Construct the earthing system to the requirements of electricity supply company. Ensure any part of the earth fault current path provided by the electricity supply company or others is suitable for the operation of the earth fault protection to be installed. Obtain the agreement and permission of undertakings providing services which are to be bonded to the earthing system.

310.000 PRODUCTS/MATERIALS

310.020 MAIN EARTH TERMINAL:

Provide earth bar at incoming electrical service position, for each switchboard.

- Bond earth terminals and metallic structure of switch and control gear and

plant.
- Connect each earth terminal to all other earth terminals by a ring conductor sized as BS 7430 and BS 7671.
- Location
- Adjacent to main LV switch panel.
- Mounting
- Mount earth bar on insulated supports located at 300mm centres for 25mm bar and 450mm centres for 50mm bar, giving 30mm clearance at rear of bar.
- Drill clearance holes, one for each cable plus 30% spare holes (two minimum) at 50mm minimum centres through bar for connection of cable lugs. Ensure clearance holes are minimum necessary size to maintain adequate lug/bar contact.

310.030 MAIN EARTH TERMINAL CONNECTIONS:

Connect main earth conductors and main equipotential bonding conductors to main earth terminals.
Terminate circuit protective conductors on switchboard earthing bar.
Terminate conductors with
- compression type lugs suitable for bolting direct to bar.
- Extend protective conductor from incoming main cable gland direct to main earth terminal.
- Extend separate protective conductor from main earth terminal to main switch/switch panel served by incoming main cable.
- When main cable is provided by electrical supply Company, extend separate protective conductor from Main Cable armouring gland or direct earth terminals or PME earth installed by supply Company to main earth terminal.
- Bond all main equipment and plant to an earth terminal, connected to the bonding ring conductor.

310.150 TELECOMMUNICATIONS FUNCTIONAL EARTH:

- Application: To all telecommunications equipment
  Provide functional earth in accordance with BS 6701 and BS 7430.

320.000 WORKMANSHIP

320.010 INSTALLATION OF EARTHING SYSTEM:

Carry out installation of earthing system in accordance with BS 7671 (IEE Regulations) and BS 7430.

320.040 MAIN AND SUPPLEMENTARY EQUIPOTENTIAL BONDING:

- Application:
  Bond in accordance with BS 7430 and BS 7671 to main earth terminal all extraneous conductive parts of the installation.
- Ensure the following services are bonded.
- Main water pipes.
- Main gas pipes.
- Fuel oil pipes.
- Air ductlines.
- Heating pipework.
- Chilled water pipework.
- Exposed metallic parts of building structure.
- Thermal insulation metallic cladding.
- Metallic cable sheaths of all cables except British Telecom.
- Lightning protection systems.
- Others
  Bond with supplementary equipotential bonds to protective conductor system, all simultaneous accessible conductive.
- Ensure the following areas are bonded to BS 7671, Section 601.
- bathrooms and shower rooms.
- boiler houses.
- calorifier rooms.
- all other plantrooms.
- wet and damp process areas.
- kitchens and laundries.
- Bond to non-current carrying parts of Electrical Installation in associated spaces to BS 7671 and BS 7430.
- Use clamps to BS 951 for bonding of pipes.

320.050 MEDIUM VOLTAGE CABLE SHEATHS AND ARMOUR:

Bond the sheaths and armour of medium voltage cables solidly to earth,

- 3 core cable - At both ends.
- Single core tails
- At both ends of tail.
- Single core cables
- Solid.
- Single point
- Cross-bonding

320.060 LOW VOLTAGE SHEATHS AND ARMOUR:

Bond the sheaths and armour of low voltage cables solidly to earth,

- 3 core cables, at both ends.

- Single core cables
- At both ends.
- Single point, with separate circuit protective conductors.

320.080 IDENTIFICATION:

Use numbered and/or lettered plastic cable sleeves to indicate circuit numbers and phases of corresponding phase conductors.

Ensure conductors are connected to earth bar in same sequence as phase and neutral conductors.

Identify at substation, switchboard and building earth bars each protective, bonding and earthing conductor. Provide labels on bars adjacent to each conductor.

320.130 EARTHING OF CONSTRUCTION SITE ELECTRICAL SYSTEMS:

Earth construction site electrical systems to BS 7430, BS 4363 and BS 7375.

W70 STRUCTURED CABLING SYSTEM

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES:

The Installation Contractor shall include in his tender for the supply, installation, commissioning, testing and setting to work a complete and fully functioning structured cabling system in accordance with the Contract drawings and details contained within this Specification.

100.030 SYSTEM DESCRIPTION:

The Installation Contractor shall contact the following UCL 'In House' representative to supply a quotation, with the exception of containment, for the supply, installation, testing and commissioning of the structured cabling system:

UCL Information Systems
Contact: Mr. Mark Deacon
Tel: 020 3108 5959/07891 670971
Email: marc.deacon@ucl.ac.uk

The existing data network and cabling is to be replaced as part of the project. The proposal is for a like for like replacement of the data points during the main building rewire.

All existing equipment on site is to be removed, stored and reused if possible, with the exception of the existing data points and cabling.

The Installation Contractor shall appoint the Specialist Contractor for the installation works and to fully commission the system at the completion of any temporary works and at the completion of the overall works.

Where indicated, for a data point the Installation Contractor shall allow to install a suitable sized back box complete with containment back to the local patch panels.

PART 2 SELECTION SCHEDULES FOR REFERENCE SPECIFICATIONS

260.000 CONDUIT AND TRUNKING

260.010 GENERAL:

Refer to Works section V25.

280.000 EARTHING AND BONDING COMPONENTS

280.010 GENERAL:

Refer to Works section W51.

PART 3 SPECIFICATION CLAUSES SPECIFIC TO W70

300.000 PRODUCTS/MATERIALS

Any material, component or piece of apparatus described in this Specification by a brand name, manufacturer's name or figure number, has been assigned by the Engineer and comply with the requirements of the design intent. These items must be included in the bid.

If the Tenderer considers that a cost reduction may be realised by the use of an alternative equivalent product he is at liberty to identify the product and the cost reduction in a separate letter attached to the bid. The acceptance of any such alternative will be subject to the Engineer's written approval after submission of full details.

Any reference to a supplier's quotation means that there has been discussion and an exchange of information. The Tenderer must ensure that the equipment priced, ordered and installed complies fully with the Specification which may not be as the supplier's quotation.

300.005 STANDARDS:

- Provide structured cabling systems in compliance with the following standards:
- European Committee for Electrotechnical Standardisation (CENELEC) – European
- Telecommunications Industry Association (TIA/EIA) – American.
- International Organization for Standardisation (ISO) – International.
- This specification is based on the European Standards.
- Identify any instances where their solution is only compliant with the above.

300.010 AMENDMENTS AND REVISIONS:

In complying with any standard, equally comply with any published amendments and revisions issued up to and including start on site (and subsequently where the contractor can reasonably be assumed to be able to comply).

300.020 STANDARDS CONTRADICTIONS:

Confirm that this document to has been checked to identify any areas in which they feel it contradicts any of the following standards.

300.030 EUROPEAN STANDARDS:

Carry out work in accordance with the following European standards and all

standards that are referenced within.
- BS EN 50173-1 - Information Technology - Generic Cabling Systems.
- BS EN 50174-1 - Information Technology - Cabling Installation. Specification and quality assurance.
- BS EN 50174-2 - Information Technology - Cabling Installation. Installation planning and practices inside buildings.
- BS EN 50174-3 - Information Technology - Cabling Installation. Installation planning and practices outside buildings.

300.040 BRITISH STANDARDS:

Carry out work in accordance with the following British standards and all standards that are referenced within.
- BS 7671 - Requirements for Electrical Installations - IEE Wiring Regulations Sixteenth Edition.

300.050 INDUSTRY PRACTICE:

Carry out work in accordance with the following industry practices.
- Ensure that the structured cabling system is fully compliant with the fibre optic industry association (FIA) code of practice for the installation of fibre cables.

300.060 MANUFACTURER'S GUIDELINES:

Carry out work in accordance with the manufacturer's guidelines and recommendations for their proposed solution.

300.070 CLIENT SPECIFIC STANDARDS:

Provide details of any specific client standards such as:
- Comply with UCL Standards

310.000 TECHNICAL SPECIFICATION

Except if and where marginally varied by the detail later in the specification, the schedule reference below indicates which items are part of the SCS contract and which items are excluded from their contract, and therefore provided by others as noted.

320.020 USER OUTLETS:

- The location and quantity of the user outlets are detailed in the Contract Drawings reference W70-Structured cabling user outlets.

All face-plate outlets to be modular snap fit, such that one can be removed from a face-plate without affecting the others. Note, this applies to face-plates not patch panels.
Some user outlets are only suitable for stranded cables and some are only suitable for solid cables. Ensure that the appropriate RJ45 user outlets are used in each situation.

370.000 INSTALLATION

Ensure all manufacturer guidelines, main contractor site rules and any specialist client requirements detailed within the complete tender documentation are followed.

Carry out all installation works in accordance with the site health and safety file, with the contractor ensuring their areas of responsibility operate in a clean and tidy environment. Ensure all outlets are protected from dust ingress.

370.010 BRING INTO SERVICE SUPPORT:

Make available engineers over at least the two days either side of each bring into service (TBC) date, as well as on the BIS date(s) itself, to provide whatever support is required.

370.020 PROJECT MANAGEMENT:

Appoint a qualified and experienced structured cabling system project manager to plan, direct and oversee their works and workers, and to liaise with and provide timely information to all relevant parties.
Meet the main contractor's programme as separately notified.

370.030 TRAINING:

Train the users how to use the system, showing all elements of patching and user outlet relocation and addition.

Provide training for up to four users, with training being scheduled with reasonable notice at the request of client name or their agents. The users may be trained together or separately, before or within one month after hand over, at the discretion of client name or their agents.

370.040 TESTING:

Describe how it is intended to prove the provenance of the components which will be installed. Provenance in this sense means how the parts were provided by the manufacturer, how they were obtained by the contractor, how they were held by the contractor, etc, ensuring overall that they are what they purport to be.

Carry out full testing as specified in the standards for all elements of the structured cabling system, and obtain appropriate passes for each element such as to ensure total structured cabling system compliance with the standards.

- Tests to include but not be limited to:
- Attenuation.
- NEXT (near end cross talk).
- DC resistance/unbalance.
- Mutual capacitance and capacitance to ground.
- Impedance.
- Distance in meters from the relevant patch panel to each outlet.
- Testing in accordance with the manufacturer and TIA/EIA, ISO and EN standards.
    - Tests carried out on the cat3 or CW1308 cabling to include but not be limited to:
- Full continuity tests on every conductor.
- Polarity tests on every pair.
    - Tests carried out on the fibre optic cabling to include but not be limited to optical time domain reflectometer (OTDR) tests.
    - Where test results are produced by electronic means submit the electronic versions in
- CD
    - If special software is required to view the results, free issue the necessary disks containing the software, together with the required user license(s)

370.050 TESTING EQUIPMENT:

List and describe the proposed testing equipment, which will be used on site and/or in their factory.
All equipment used for testing to be certified with a valid calibration certificate, a copy of which is to be provided to the client or their agents at their premises with reasonable notice.
Provide sample test result sheets for each of the tests to be carried out.

370.060 INSPECTION CHECKS:

During the installation period the client or their agents will make various physical inspections of the installation, including but not limited to: standard of workmanship, standards adherence, labeling.

The client or their agents will carry out witness checks of about 10% of the structured cabling system and the testing. Ensure reasonable notice is given before commencement of any tests.
Before hand over and after full testing by the contractor, the client or their agents will carry out random sample tests to confirm the quality of the installation. Tests will include electronic tests and inspection for such as labeling shortcomings.

Make available all personnel and equipment required to enable the client or their agents to carry out any of the above checks, both on site and in their factory.

370.070 AS INSTALLED INFORMATION:

Provide an operations manual that explains how to use the structured cabling system and describes what can and what cannot be connected to it.
Provide the as installed information as defined below and in accordance with the main contract requirements. Provide this information as part of the systems operations manual.

- Drawings
- Equipment room plan
- Outlet positions
- Schedules
- Cables and outlets
- Test results
- Component descriptions
- Handover certificate
- Warranty certificate

370.080 LABELING:

- Provide appropriate labeling for all elements of the scheme. This will include:
- Horizontal Cabling Subsystem
- Horizontal cable
- User outlet
- Patch panel, both the panel and the outlet
- Building Backbone Cabling Subsystem
- Backbone cable
- Patch panel, both the panel and the outlet
- Campus Backbone Cabling Subsystem
- Backbone cable
- Patch panel, both the panel and the outlet
- Fly leads
- Cabinets and frames
- Labels on patch cords are not required.

Cables to be labelled at all points where they enter or exit from concealment.
All labeling to be machine produced. Ensure that hand written labels are not used.
Patch panel labeling to consist of two rows of characters. Top row to be common to the complete length of the patch panel and be descriptive of the outlet type, i.e. 1st Floor User Outlets. The bottom row to identify each individual outlet.

380.000 WARRANTY

Provide a warranty for the complete structured cabling system.
Type

- Installer warranty.

Duration of the warranty to be from the handover date of the completed system for a minimum of:

- 10 Years

Appropriate extensions to the structured cabling system to equally be covered by the warranty. Appropriate extensions to be those which meet the manufacturer's design guides, installed by the contractor (or by any other contractor registered with and authorized by the end manufacturer as a certified installer) using certified components and procedures as prescribed by the manufacturer.

Arrange for the structured cabling manufacturer to visit site during the installation and at practical completion and confirm to the client, or their agents, manufacturer compliance.

The warranty shall not be voided by normal use of the system, including moves and changes carried out by the client or their agents.
The warranty shall provide for the client or their agents to contact the contractor in the first instance, who shall attend the site within one working day to carry out appropriate tests and who will then progress the claim through the manufacturer. Action on the claim shall have been agreed and initiated within 10 working days of notification of the claim. The action shall be completed without unreasonable delay.

A contract shall exist between the client and the manufacturer such that if the contractor is no longer in existence (or in the event of non-performance by the contractor) then the manufacturer shall fulfill all the obligations of the contractor.

State the name, address and claim contact details (department name, persons name and phone no) of the manufacturer. This may be used to verify that the warranty is fully compliant with the above requirements.

Y60 CONDUIT AND TRUNKING

Y60.1000 GENERAL

Y60.1010 STANDARDS:

Provide conduit and cable trunking in accordance with the relevant British Standards and in particular the requirements of BS 7671:2008+A3:2015 Requirements for Electrical Installations (The IET Wiring Regulations).

- BS7671:2008+A3:2015 Amendment 3

Y60.2010A CONDUIT SYSTEMS METAL RIGID CLASS 2:

- Fittings
  - 2020A RIGID CONDUIT SYSTEM - METALLIC CONDUIT:
    Use couplers to match conduit grade and finish.
    Use solid couplers to join lengths of conduit.
    Conduit fittings and adaptable boxes
      Material - Malleable iron adaptable boxes.
      Do not use factory made bends, inspection bends or inspection couplers unless shown on drawings or schedules.
      Ensure fittings are same class and finish as associated conduit system.
      Supply covers for circular or adaptable boxes in the same material and finish as boxes.
      Use steel dome or cheese headed screws to secure covers for Class 2 finish.
      Use brass dome or cheese headed screws to secure covers for Class 4 finish.
      Limit number of entry holes within loop-in boxes to four.
      Adaptable box, minimum size - 100mm x 100mm x 50mm.
    Connections
      Use couplers and externally screwed brass bushes to connect conduit to loop-in circular conduit boxes, switchgear, distribution boards, and adaptable boxes.
      Use solid couplers.
    Conduit fixing saddles - Spacer bar.
    Plugs - Hexagonal malleable iron.
    Locknuts - Hexagonal steel.
  - 2020B RIGID CONDUIT SYSTEM - METALLIC CONDUIT AS DRAWINGS/SCHEDULES:
    Use couplers to match conduit grade and finish.
    Use solid couplers to join lengths of conduit unless inspection couplers are shown on the drawings or schedules.
    Conduit fittings and adaptable boxes
      Material - Malleable iron adaptable boxes.
      Do not use factory made bends, inspection bends or inspection couplers unless shown on drawings or schedules.
      Ensure fittings are same class and finish as associated conduit system.
      Supply covers for circular or adaptable boxes in the same material and finish as boxes.
      Use steel dome or cheese headed screws to secure covers for Class 2 finish.

Use brass dome or cheese headed screws to secure covers for Class 4 finish.
Limit number of entry holes within loop-in boxes to four.
Adaptable box, minimum size - 100 mm x 100 mm x 50 mm.
Connections
Use couplers and externally screwed brass bushes to connect conduit to loop-in circular conduit boxes, switchgear, distribution boards, and adaptable boxes.
Use solid couplers.
Conduit fixing saddles - Spacer bar.
Plugs - Hexagonal malleable iron.
Locknuts - Hexagonal steel.
Provide conduit systems to BS EN 61386:2004+A11:2010. Use conduit of each type from one manufacturer.
Material - Metal, steel.
Method of connection - Threadable.
Suitability for bending - Rigid, BS EN 61386-21:2004+A11:2010.
Electrical characteristics - with electrical continuity.
Resistance against corrosive or polluting substances
Conduits with same protection outside and inside BS EN 61386-1:2004+A11:2010 Table 10 Class 2
Medium protection
E.g. stove enamel or air drying paint.

Y60.2010B CONDUIT SYSTEMS METAL RIGID CLASS 4:

- Fittings
  - 2020A RIGID CONDUIT SYSTEM - METALLIC CONDUIT:

Use couplers to match conduit grade and finish.
Use solid couplers to join lengths of conduit.
Conduit fittings and adaptable boxes
Material - Malleable iron adaptable boxes.
Do not use factory made bends, inspection bends or inspection couplers unless shown on drawings or schedules.
Ensure fittings are same class and finish as associated conduit system.
Supply covers for circular or adaptable boxes in the same material and finish as boxes.
Use steel dome or cheese headed screws to secure covers for Class 2 finish.
Use brass dome or cheese headed screws to secure covers for Class 4 finish.
Limit number of entry holes within loop-in boxes to four.
Adaptable box, minimum size - 100mm x 100mm x 50mm.
Connections
Use couplers and externally screwed brass bushes to connect conduit to loop-in circular conduit boxes, switchgear, distribution boards, and adaptable boxes.
Use solid couplers.
Conduit fixing saddles - Spacer bar.
Plugs - Hexagonal malleable iron.
Locknuts - Hexagonal steel.

- 2020B RIGID CONDUIT SYSTEM - METALLIC CONDUIT AS DRAWINGS/SCHEDULES:

Use couplers to match conduit grade and finish.

Use solid couplers to join lengths of conduit unless inspection couplers are shown on the drawings or schedules.
Conduit fittings and adaptable boxes
Material - Malleable iron adaptable boxes.
Do not use factory made bends, inspection bends or inspection couplers unless shown on drawings or schedules.
Ensure fittings are same class and finish as associated conduit system.
Supply covers for circular or adaptable boxes in the same material and finish as boxes.
Use steel dome or cheese headed screws to secure covers for Class 2 finish.
Use brass dome or cheese headed screws to secure covers for Class 4 finish.
Limit number of entry holes within loop-in boxes to four.
Adaptable box, minimum size - 100 mm x 100 mm x 50 mm.
Connections
Use couplers and externally screwed brass bushes to connect conduit to loop-in circular conduit boxes, switchgear, distribution boards, and adaptable boxes.
Use solid couplers.
Conduit fixing saddles - Spacer bar.
Plugs - Hexagonal malleable iron.
Locknuts - Hexagonal steel.
Provide conduit systems to BS EN 61386:2004+A11:2010. Use conduit of each type from one manufacturer.
Material - Metal, steel.
Method of connection - Threadable.
Suitability for bending - Rigid, BS EN 61386-21:2004+A11:2010.
Electrical characteristics - with electrical continuity.
Resistance against corrosive or polluting substances
Conduits with same protection outside and inside
High protection - Hot dip zinc coating. BS EN 61386-1:2004+A11:2010 Table 10 Class 4.

Y60.2020A RIGID CONDUIT SYSTEM - METALLIC CONDUIT:

Use couplers to match conduit grade and finish.
Use solid couplers to join lengths of conduit.
Conduit fittings and adaptable boxes
Material - Malleable iron adaptable boxes.
Do not use factory made bends, inspection bends or inspection couplers unless shown on drawings or schedules.
Ensure fittings are same class and finish as associated conduit system.
Supply covers for circular or adaptable boxes in the same material and finish as boxes.
Use steel dome or cheese headed screws to secure covers for Class 2 finish.
Use brass dome or cheese headed screws to secure covers for Class 4 finish.
Limit number of entry holes within loop-in boxes to four.
Adaptable box, minimum size - 100mm x 100mm x 50mm.
Connections
Use couplers and externally screwed brass bushes to connect conduit to loop-in circular conduit boxes, switchgear, distribution boards, and adaptable boxes. Use

solid couplers.
Conduit fixing saddles - Spacer bar.
Plugs - Hexagonal malleable iron.
Locknuts - Hexagonal steel.

Y60.2020B RIGID CONDUIT SYSTEM - METALLIC CONDUIT AS DRAWINGS/SCHEDULES:

Use couplers to match conduit grade and finish.
Use solid couplers to join lengths of conduit unless inspection couplers are shown on the drawings or schedules.
Conduit fittings and adaptable boxes
Material - Malleable iron adaptable boxes.
Do not use factory made bends, inspection bends or inspection couplers unless shown on drawings or schedules.
Ensure fittings are same class and finish as associated conduit system.
Supply covers for circular or adaptable boxes in the same material and finish as boxes.
Use steel dome or cheese headed screws to secure covers for Class 2 finish.
Use brass dome or cheese headed screws to secure covers for Class 4 finish.
Limit number of entry holes within loop-in boxes to four.
Adaptable box, minimum size - 100 mm x 100 mm x 50 mm.
Connections
Use couplers and externally screwed brass bushes to connect conduit to loop-in circular conduit boxes, switchgear, distribution boards, and adaptable boxes. Use solid couplers.
Conduit fixing saddles - Spacer bar.
Plugs - Hexagonal malleable iron.
Locknuts - Hexagonal steel.

Y60.2080A CABLE TRUNKING AND FITTINGS:

Comply with BS 4678. Use trunking of each type from one manufacturer.

Y60.2090B METAL SURFACE TRUNKING - ZINC FINISH:

Material
Steel trunking to BS 4678-1. Supply partitions and covers same material as trunking.
Gauge of metal - Table 1 BS 4678.
Trunking type
Standard cable trunking with compartments.
Style
Use trunking manufactured with inward return edge flanges and fitted with flange couplers which ensure that when the cover is removed a minimum of 80% of the nominal trunking or compartment width is available for access.
Protection to BS 4678-1

Electroplated zinc having a minimum thickness of zinc coating of 0.0012mm inside and outside.
Hot dip zinc coated steel to BS EN 10326:2004, BS EN 10327:2014 or BS EN 10143:2014.

Finish - Manufacturer's standard, all surfaces.

Colour - Self Colour or Manufacturer's standard.

Fixings

Use purpose made brackets to fix to structural steel or suspension rods.
Provide external fixing lugs where specified protection for the installation is IP44 or greater.

Fittings

Use bends, tees and angles of similar gauge, type and finish as trunking body and supplied by same manufacturer.

Use purpose Partitions and Covers

Ensure partitions are electrically continuous with the body of the trunking or provide a connector for a circuit protective conductor.
Ensure gap between partitions and lids maintains segregation of circuits.
Provide individual mounting plates for each accessory mounted on trunking covers.
Material - Same material as trunking.
Joints made jointing pieces fixed with screws into captive nuts. Ensure screws do not protrude through the nuts.
Ensure rigidity of trunking is maintained across joint.
Ensure external dimensions of trunking are maintained and not reduced by more than 4% across joints between trunking lengths and/or fittings.
Use purpose made fittings of the same manufacture where trunking connects to switchgear and distribution boards.
Provide flanges for connection of flush floor trunking to vertical trunking to maintain the cross sectional area of compartments with 50 mm minimum radius.
Maintain electrical continuity at each joint by a copperlink, (tinned copper for galvanized trunking), fixed on outside of trunking, secured by screws, nuts and shakeproof washers. Screws must not project through the nut. Make provision for continuity to be achieved without need to remove paint from ferrous metal where trunking has a painted finish.

Screws, Nuts, Washers

Do not use self tapping screws. Use cheese or round head screws except where provision is made for the use of counter-sunk heads.

Material

Use steel zinc coated
- BS 3382 Parts 1 and 2.

Cable supports

Provide horizontal trunking with removable cable retainers or bridges to retain cables in situ.
Provide vertical trunking with pin racks to support cables at 3000 mm maximum spacing.
Use insulated pins or insulation sleeved pins on pin racks.

Y60.2110A SERVICE OUTLET BOXES:

•Recess lids
Provide service outlet boxes and junction boxes constructed from sheet steel with same finish as trunking.
Maintain continuity and segregation of compartments through boxes and fit flyovers where necessary.
Provide service outlet boxes with separate and segregated access to outlets associated with each wiring compartment. Fit cable guard or grommet to each section.
Incorporate spigots on boxes for connection to trunking.
Make frames adjustable on each corner, recess lids.
Manufacture frame and lids for service outlet boxes and junction boxes of cast metal, and suitable to accept type of floor covering.
Outlet plates
Provide outlet plates for each low voltage compartment equipped with socket outlets.
Provide outlet plates for each extra low voltage compartment equipped with items.
Provide outlet plates for each telephone compartment that ensure the telephone compartment and its outlet plate conform to the requirements of BT and of the telephone system installer, equipped with telephone outlets.
Provide blank outlet plates for any unused compartments.

Y60.2120A POWER POLES:

Provide service poles complete with associated conduit or trunking fittings. Maintain continuity and segregation of circuits throughout. Provide outlet boxes with separate access to wiring compartments.
Material - Extruded Aluminium.
Finish - Manufacturer's standard.
Fixings - Free standing or complete with fixing brackets at top.

Y60.2150A SEPARATE OR MULTI-COMPARTMENT TRUNKING:

Use separate trunking or multi-compartment trunking for segregation of services.
Ensure steel partitions have a provision for connecting a circuit protective conductor.
Provide separation of wiring for circuits as required by BS 7671.

Y60.2170 SUPPORTS AND FIXINGS:

Provide proprietary suspension systems comprising channel sections with return lips and compatible fixing accessories made of material to BS EN 10162:2003, BS EN 10210:2006.
Ensure support components for Class 4 conduit have the same finishing method as the conduit carried out after manufacture. Ensure components in direct contact with conduit match profile of conduit.
Ensure all steel components such as studding, bolts and steel screws, bolts, nuts and washers are either cadmium plated and passivated or zinc electroplated to BS 3382 after manufacture. Do not use metal fixing components likely to deteriorate

and/or cause damage through electrolytic action.

Y60.3010A GENERAL:

Ensure entire system is electrically and/or mechanically continuous, to BS 7671.

Fire barriers

Comply with the requirements of BS 7671 wherever the conduit or trunking passes through the perimeter of a fire compartment (wall, floor or ceiling).

Appearance

Arrange conduit, trunking and ducting to present neat appearance, parallel with other service runs and lines of building construction, except where in screed or in-situ concrete. Ensure plumb vertical runs.

Cable installation

Install cable in conduit, trunking or equipment enclosures only when completely erected throughout its length.

Do not use framework of partitions or similar unless indicated.

Building expansion and settlement

Make provision in conduit and trunking at expansion and settlement joints to allow for movement of building structure. Provide circular through or adaptable boxes no more than 300 mm either side of expansion or settlement joints for conduit crossing.

Join boxes with flexible steel conduit type C or conduits arranged to form a telescopic joint and cover overall with PVC sleeve to provide minimum degree of protection of IP44 or purpose made telescopic joint protected by a PVC sleeve to at least IP44.

Quality

Cut conduit clean and square with axis. Remove any burrs prior to erection.

Site form 90º in conduit wherever practical or use circular or adaptable boxes.

Construct bends and sets cold with a bending machine. Do not apply heat when forming sets or bends.

Use bending tools complying with British Standards appropriate to conduit material.

Ensure no indentation or reduction in cross sectional area occurs during installation.

Use correct tools to assemble conduit. Ensure no toolmarks or damage to components occurs.

Y60.3020 LAYOUT:

Ensure the maximum circuit lengths and groupings of cables indicated are not exceeded.

Conduit sizing

Where dimensions are not indicated select trunking and conduit sizes in accordance with Appendix A of Guidance Note I Selection and Erection published by the IET.

Y60.3030 SPACING:

Install conduit, trunking and equipment clear of other services. Measure distance from external surface of any thermal insulation. Notify instances where minimum clearance cannot be achieved and bond items concerned. Minimum general spacings between conduits, trunking, equipment and

insulated steam services - 300 mm.
other services excluding steam - 150 mm.
above central heating radiators - 1000 mm.
ensure separation is in accordance with of Guidance Note I Selection and Erection published by the IET.

Y60.3040 CONDENSATION PREVENTION:

Install conduit and trunking systems to ensure internal condensation does not affect operation of associated circuits. Provide drainage points in accordance with BS 7671.
Where conduit passes through external wall between two areas of different ambient temperatures or in other locations likely to cause condensation, install a conduit or adaptable box. After wiring fill box with inert, permanently plastic compound with high insulation value.

Y60.3050A PROTECTION AND REPAIR OF STEEL COMPONENTS:

Paint joints of conduit and minor damages to finish of conduit and trunking immediately after erection or after damage occurs.
Use paint compatible with finish as follows

Galvanized finish, use two coats zinc rich paint.
Black enamelled finish, use two coats of good quality, air drying, black enamel paint.

Remove grease, oil, dirt and rust before applying protective paint.
Notify serious damage and repair or replace as instructed.

Y60.3060 EQUIPMENT CONNECTIONS:

Where surface mounted equipment is installed in conjunction with concealed conduit work, terminate concealed conduit at flush mounted conduit or adaptable box. Drill back of equipment, bush for back entry and mount equipment to conceal back box.
Connect to fixed equipment via conduit box located adjacent to termination point, using either solid or flexible conduit as indicated for final connection to equipment terminations.
Use conduit box as cable change point to facilitate changed wiring locally to adjacent equipment.
Connect trunking to equipment by specially fabricated connectors or by couplers and externally screwed brass bushes.

Y60.3070 CLEANING BEFORE WIRING:

Clean inside of conduits and trunking with swabs immediately before wiring.
Inspect all components and remove any foreign matter, fit temporary plugs to open ends of conduit and trunking to prevent ingress of water and solid material.

Y60.3080A WIRING:

Comply with BS 7671 when wiring installations.
Segregate circuits as indicated.
Ensure draw wires are left within empty conduits for use of specialist installers. Use draw wires comprising nylon tapes with fitted eyelets.
For concealed conduit ensure system is installed to enable re-wiring to be carried out from boxes for fittings or accessories only. Draw-in boxes will only be permitted with prior permission in writing.
Do not use tallow or any other substances to facilitate drawing-in of cables.

Y60.3090 BUILDERS WORK:

Ensure conduit is not concealed until work has been inspected and approved.
Obtain permission before horizontally chasing walls.
Ensure that conduit and fittings buried in concrete or behind plaster are protected against corrosion or electrolytic action prior to rendering.
Ensure conduit concealed in wall chases is covered by plaster and/or rendering to minimum depth of 12 mm.

Y60.4010 DRAW-IN BOXES:

Provide draw-in boxes in conduit at maximum intervals of 10 metres or after bends and/or sets totalling 180 degrees.

Y60.4020 INSTALLATION OF CAST IN OR BURIED CONDUIT:

Ensure cast-in conduits are firmly secured to reinforcing steelwork and that accessory and/or conduit boxes are secured so they do not move during subsequent building operations.
Ensure there is no blockage immediately shuttering is removed.
Check there is no mechanical damage to conduit in floor screed prior to screeding.
Fix securely before screed is poured. Provide temporary protection to conduits until screeds are laid.
Ensure minimum amount of cross-overs occur dependent upon screed depth. Do not install draw boxes in floors.
Do not install conduits
in screeds in areas indicated.

within site blinding.
in main structural slabs unless prior permission in writing is obtained.

Y60.4030 CONDUIT BOXES:

Ensure that wherever conduit boxes are cast in the face of the box is flush with the face of the concrete or plaster. Fit circular conduit boxes with extension rings to ensure a flush face with plaster or concrete or where terminal blocks are to be accommodated.
Ensure fixing holes are countersunk where material thickness allows or use round head screws to prevent damage to cables and remove burrs before cables are drawn in.
Use a minimum of two screw fixing for standard circular conduit boxes and four screws for large conduit boxes and adaptable boxes up to 150 mm x 100 mm.
Use back outlet boxes where surface conduits pass through walls, to outside accessories or lighting points.
Secure switch boxes and socket boxes using countersunk steel screws where provision is made for them or if not use round head screws. Use plug inserts and finally grout in position prior to plastering or screeding.

Y60.4040 FIXING CONDUIT:

Support conduit in accordance with Appendix I of Guidance Note I Selection and Erection published by the IET.
Ensure conduit is not under mechanical stress. Fix conduit boxes independently of conduit. Make allowance for any additional mechanical loading supported by conduit boxes.
Where protection is specified as IP44 or greater ensure fixings of conduit boxes are suitable to maintain degree of protection.
Use following methods of fixing conduit:-

LOCATION	TYPE OF FIXING
Floor screeds.	Saddles or crampets.
Buried in plaster or render.	Crampets or saddles.
Above false ceilings.	Saddles.
Surface.	Saddles.

Y60.4050 FLEXIBLE AND PLIABLE CONDUIT:

Use flexible conduit for final connections to motors, other equipment subject to vibration or adjustment and to thermostats, motorised valves and similar items mounted in pipelines or ducts.
Use sufficient length between equipment and circular through box at end of conduit run (minimum 450 mm) to allow necessary full range of withdrawal, adjustment or movement.
Use solid type adapters to terminate flexible conduit.
Use PVC covered flexible conduit where installed externally, exposed to weather or

in any position where ingress of moisture or condensation may occur.

Y60.4060 SCREWED STEEL CONDUIT:

Use materials clean and free from defects, rust, scale and oil. Obtain prior permission in writing for use of materials subject to remedial work before erection. Repair any damage caused by threading, bending or erection by painting with zinc rich paint before any rust occurs.
Ensure length of thread on conduit matches that in conduit couplers, fittings or equipment with no thread exposed after erection except at running couplers.
Ensure conduits butt inside couplers.
Use lubricant when cutting threads.
Use minimum number of running couplings
For running couplings in Class 2 conduit, use coupler and locknut. Paint exposed thread with zinc rich paint.
For running couplings in Class 4 conduit, use three piece conduit unions.

Y60.4080 UNDERGROUND INSTALLATION:

Where buried below ground, use Class 4 conduit. Do not use any buried conduit boxes unless prior permission in writing has been obtained. Wrap conduit with PVC self-adhesive tape, half lapped. Extend taping 150 mm beyond point where conduit leaves ground. Install circular through conduit boxes at the end of the tape. Fill conduit boxes after cable installation with inert, permanently plastic compound with high insulation value, and wrap in PVC self adhesive tape.

Y60.5010 MANUFACTURE OF TRUNKING:

Take measurements on site before producing drawings for manufacture of trunking.

Y60.5020 ACCESS:

Arrange trunking to allow access to wiring. Locate covers on top or sides of trunking if practicable. Arrange access so covers are on a continuous face and cables can be laid in throughout the length of the trunking. Notify where either condition cannot be achieved.

Y60.5030A FIXING TRUNKING:

Ensure trunking is independently fixed and supported from building fabric. Obtain approval for proposed fixings/supports.
Support trunking in accordance with the manufacturers requirements and/or Guidance Note 1 Selection and Erection published by the IET.
Use two fixings minimum per standard length.

Y60.5040A STEEL TRUNKING:

Install steel trunking in accordance with the manufacturers requirements and those of BS 7671.
Use trunking to avoid multiple parallel conduit runs, subject to approval.
Cut trunking clean and square with axis, prepare ends and remove burrs and sharp edges. Ensure inside of trunking is free from anything liable to damage cables either during installation or after covers are fitted.
When trunking is held in a vice, ensure surfaces remain undamaged and components are not warped.
Avoid tool marking or damage to trunking system components.
Do not site fabricate trunking tees, bends, flanges and other accessories. Use only factory made accessories.
Form circular holes over 6 mm diameter in trunking body using correctly sized punch sets. Use twist drill for holes up to 6 mm maximum diameter.
Use only factory formed openings for accessories.
Line unprotected apertures in trunking with PVC or nylon edging strip.
Fit ends of runs with removable blanking plates.
Ensure connections are not made to covers unless indicated or approval obtained.
Provide fixed section of cover projecting 25 mm either side of fabric where trunking passes through wall, floors or ceiling.
Fit cable retaining straps at 500 mm intervals except where cover is on top.

Y61 HV/LV CABLES AND WIRING

Y61.1000 GENERAL

Y61.1010 CABLE MANUFACTURE:

Use new cables, delivered to site with seals intact, manufactured not more than one year prior to delivery, labelled with manufacturer's name, size, description, BS number, classification, length, grade and date of manufacture.

Y61.1020 CABLE CERTIFICATION MARKING:

Mark all types of cables with CENELEC cable certification marking or if included in British Approvals Service for Cables (BASEC) in accordance with BASEC regulations.

Y61.2005 LSOH SHEATHING:

Supply cables with Low Smoke Zero Halogen (LSOH) sheathing, tested in accordance with BS EN 60754:2014 and BS EN 60332:2009.

Y61.2010D STANDARD ORDINARY FLEXIBLE CORDS - MULTI COPPER CORES:

Standard - BS EN 50525:2011

Y61.2020E STANDARD POWER SUPPLY CABLES, COPPER CONDUCTORS, LSF SHEATHED AND ARMOURED:

Standard - BS 6724, Tables 4, 6, 8, and 10.
Mechanical protection - Armour.

Y61.2020G STANDARD CABLES FOR CONDUIT AND TRUNKING, COPPER CONDUCTORS, LSF INSULATED:

Standard - BS 7211, Tables 3(a) and 4(a).
Mechanical protection - Conduit and trunking.

Y61.2020J STANDARD FLAT CABLES, 2-CORE OR 3-CORE, COPPER CONDUCTORS WITH OR WITHOUT CPC, LSF INSULATED SHEATHED:

Standard - BS 7211, Table 7.

Y61.2020K STANDARD POWER SUPPLY CABLES, COPPER CONDUCTORS LSF INSULATION, SHEATHED:

Standard - BS 7211, Tables 5 and 6.
Mechanical protection - Unarmoured.

Y61.2020M STANDARD CABLES WITH DEFINITE FIRE PERFORMANCE:

Standard - BS 7629-1:2015 type as shown on drgs/schedules.
Fire performance BS 5839-1:2013 Standard.
Sheath colour - red.
Mechanical protection, as shown on drgs/schedules.

Y61.2020N STANDARD CABLES FOR WALLS, PARTITIONS AND BUILDING VOIDS WHERE PENETRATION BY SHARP OBJECTS IS A HIGH RISK:

Standard - BS 8436:2011.

Y61.2030A STANDARD 3.3 KV, COPPER CONDUCTORS, ARMOURED AND LSF SHEATHED CABLES:

Standard - BS 5467:2016, Tables 14 and 16; BS 6622:2007, Tables 2 and 3.
Mechanical protection - Armour.

Y61.2030B STANDARD 3.3 KV, COPPER CONDUCTORS, ARMOURED AND LSF SHEATHED CABLES:

Standard - BS 6724, Tables 14 and 16.
Mechanical protection - Armour.

Y61.2030C STANDARD 11 KV, COPPER CONDUCTORS, ARMOURED AND SHEATHED CABLES:

Standard - BS 6622, Tables 4 and 5.
Mechanical protection - Armour.

Y61.2050C PAIRED, SCREENED AND UNARMOURED CONTROL CABLES:

Standard - BS EN 50288-7:2005
Mechanical protection - Unarmoured, Type 1.

Y61.2050G MULTI-CORE UNARMOURED LSF, SHEATHED AUXILIARY CABLES:

Standard - BS 7211, Table 6
Mechanical protection - Unarmoured.

Y61.2080A STANDARD COAXIAL CABLES, FOR BROADCAST RECEIVING:

Standard - BS EN 50117.

Y61.2100A INFORMATION TECHNOLOGY CABLES - STRUCTURED WIRING:

Provide IT cables in accordance with the IT system suppliers specification.
Type of system - Structured cabling; EIA/TIA 568.
Specification - EIA/TIA 568; UTP (EIA/TIA TSB-36).
Termination reference
EIA/TIA 568; RJ45 (EIA/TIA TSB-40).
Cable construction - Multi pair; unshielded (UTP).

Y61.3010A CABLES GLANDS - UNARMOURED CABLES, INDOORS:

Cable type
Flexible; wiring and power; control and auxiliary; and communications.
Standard - BS EN 62444:2013 non-metallic, cable retention, IP54; A1P.
Environment - Indoor.

Y61.3010B CABLES GLANDS - UNARMOURED CABLES, OUTDOORS:

Cable type
Flexible; wiring and power; control and auxiliary; and communications.
Standard - BS EN 62444:2013 non-metallic, cable retention, IP54; A2P.
Environment - Outdoor.

Y61.3010C CABLES GLANDS - ARMOURED CABLES, DRY INDOORS:

Cable type
Wiring and power; and control and auxiliary.
Standard - BS EN 62444:2013 metallic, cable retention Class A, protective connection to earth, IP54.
Environment - Dry indoors.

Y61.3010D CABLE GLANDS - ARMOURED CABLES, INDOORS:

Cable type
Wiring and power; and control and auxiliary.
Standard - BS EN 62444:2013 metallic, cable retention Class A, protective connection to earth, IP54.
Environment - Indoor.

Y61.3010E CABLE GLANDS - ARMOURED CABLES, OUTDOORS:

Cable type
Wiring and power; and control and auxiliary.
Standard - BS EN 62444:2013 metallic, cable retention Class A, protective connection to earth, IP54 with shroud.
Environment - Outdoor.

Y61.3030A VOLTAGE SURGE SUPPRESSORS FOR CABLES:

Provide voltage surge suppressors in accordance with cable and equipment manufacturer's recommendations.

Y61.3050A LSF INSULATING TAPE:

Standard - BS 3924:1998, LSF material.

Y61.3080A CONNECTORS FOR COAXIAL CABLES - BROADCAST RECEIVING:

Standard - BS 3041-12:1981

Y61.3110A CABLE DUCTS:

Standard
BS 65:1991, DN 90; BS 4660:2000; or NJUG 6, provided by Electricity Supply Company.

Y61.3120A CABLE SLEEVES:

Supply and hand to others for installation non ferrous cable sleeves for incorporation into the structure where cables pass through fire compartment floors and walls.
Packing material
Weak mix mortar; intumescent, plaster or mastic; solid intumescent material; or intumescent granule filled bags.

Y61.3130A CABLE COVERS AND MARKERS:

Material - Recovered plastic, integral tape.
Marking - Electricity or telephone.
Plastic marker tape
Yellow, marked electricity or telephone.

Y61.4010 CABLE INSTALLATION - GENERAL:

Use and install cables only as directed in the appropriate standard or as directed by the manufacturer in writing. Lay cables in one length unless otherwise indicated. Obtain permission from supervising officer for all through joints, and where overall length requirement exceeds practical drum size.
Install cables when ambient temperature is 5°C or greater, using cables stored at or above this temperature for not less than 24 hours.
Use drum stands, drum axles, fair leads, rollers, cable stockings and other equipment as recommended by the cable manufacturer and as appropriate to the method of installation.

Y61.4020 CABLE INSTALLATION IN LOW TEMPERATURES:

Install cables at lower installation temperatures when authorised by manufacturer in a written statement.

Y61.4030 INSTALLATION OF LSF CABLE:

Install LSF cables in accordance with manufacturer's instructions. Ensure ambient temperature is above 5°C. Ensure oversheaths are not damaged by abrasion or scuffing.

Y61.4040 INSTALLATION OF UNARMOURED CABLES:

Install and use unarmoured cable to BS 6004, BS EN 50525-1:2011 and BS 7211 in accordance with BS 7540:2005 or the manufacturer's written instructions.

Y61.4050A CABLE TRENCHES:

Ensure that trenches for cables and cable ducts are prepared, backfilled and reinstated.
Supervise all work to cable trenches by others.
Carry out walk over survey of trench route, dig trial hole in any area considered to be potentially difficult. Establish location of any other underground service adjacent to cable route.

Re-plan cable routes after survey and trial holes. Submit report of survey and trial holes.
Carry out any instructed work to adjacent services. Set out cable trenches, excavate trench carefully setting aside any materials required for backfilling or reinstatement.
Minimum cover in cable trenches
HV cables 800mm; LV cables 500mm; communications cables 500mm; all cables 800mm under roadways.
Trench
Common trench for all underground services.
Grade trench bottom to a maximum slope of 1:12.
Clear trench bottom of loose stones and place bedding to full width of trench.
Bedding
Riddled earth 6mm grid for cables; riddled earth 12mm grid for ducts; imported soft sand; or pea shingle, for ducts.
Bedding thickness - 75mm; or 100mm for ducts.
Install cables or ducts. Haunch cables or ducts in bedding material to a minimum depth of 75mm above highest cable or duct.
Cable or duct identification
Warning tape - Yellow with black legend.
Backfill trench using two layers 100mm thick hand rammed. Complete backfilling in layers and reinstate trench.
Backfill material - as excavated from trench.

Y61.4060 CABLE INSTALLATION IN TRENCHES:

Lay cables on newly prepared bedding. Ensure multiple layers of cable are separated vertically by a 50mm layer of hard rammed bedding material.
When using a power winch ensure tension on the cable is taken by element of the cable designed for that purpose, that is armour or conductor cores as appropriate and not plastic sheath, metal sheath or core insulation.
When hand pulling cable ensure no kinks are formed and that flaking, when used, is done in the correct direction.
Do not allow cable to twist during installation. Use swivels to connect pulling bond to cable stocking or equivalent fitting.
Check drum is suitable for jacking before commencing installation. If drum or reel is unsuitable for jacking, flake cable in correct direction in maximum size turns from drum or reel before commencing installation. Use skilled labour to supervise all unreeling, flaking or running of cable from a drum.
Lay cables in the formation shown, ensure spacing is not reduced below that indicated.
Bind trefoil groups at 1m intervals. Bind any associated earth or protective conductor to its cable or trefoil group at 1m intervals.
Ensure installation radii and permanent bending radii are not less than those recommended by the manufacturer.
Do not lay cables to BS 6004, BS 50525, BS 7211 or BS 7919 direct in the ground.

Y61.4070A CABLE DUCTS:

Duct work

Supervise the laying of ducts by others.

Lay ducts in the formation shown, on to newly prepared bedding. Joint ducts in accordance with the manufacturer's instructions.

Ensure that ducts slope no more than 1:60 vertically or 1:30 horizontally.

Ensure that pre-formed duct bends used at ends of duct routes meet the requirements of the cable manufacturer for bending radii.

Construct manholes, draw pits and jointing chambers.

Prove alignment of completed duct run by drawing through a mandrel 7mm diameter less than nominal duct bore for minimum length 250mm. Clean completed duct run by drawing through a circular wire brush 12mm diameter more than nominal duct bore.

Install a draw wire of corrosion resistant material and minimum breaking strength 550N in each empty duct.

Plug and seal all ducts with proprietary duct plugs, on completion.

Y61.4090A CABLE INSTALLATION IN CONDUIT AND TRUNKING:

Install cables so that they are orderly and capable of being withdrawn.

Arrange single core wiring generally using the loop-in method.

Trunking

In vertical trunking provide pin racks at 3m intervals. Use ties at 2m intervals for all wires of the same circuit reference. Mark ties with circuit reference number at 10m intervals.

Conduit

Provide cable clamps in conduit boxes at 10m intervals in vertical conduit.

Allow for full range of movement at building construction movement joints. Make all joints to wiring at terminal blocks in conduit boxes.

Y61.4120A CABLE EMBEDDED INSTALLATION:

Dress cables flat, free from twists, kinks and strain, and align parallel to building elements. When glands and clamps are not required, take sheathing of cables into accessory boxes and equipment and protect against abrasion using grommets or similar sharp edge protection.

Ensure plaster or screed over cable is a minimum of 12mm. Protect embedded cables with metal capping or PVC oval conduit.

Y61.4130A CABLE INSTALLATION - MINERAL INSULATED CABLES:

Straighten and dress cables using methods and tools recommended by cable manufacturer.

Use thermoplastic or LSF sheathed cables in location indicated, and where cables may come into direct contact with any material that may be corrosive to copper.

Do not allow extra length on installed cables to allow for cutting back of moisture affected ends. Store mineral insulated cables in the form as supplied by

manufacturer.

Y61.4140 CABLE INSTALLATION - FLEXIBLE CORDS:

Grip cords securely at connections. Where they do not form an integral part of the connected accessory or equipment, provide separate proprietary cord grips.

Y61.4150A CABLE JOINTING AND TERMINATING GENERALLY:

Ensure all joints and terminations are made by appropriately qualified cable jointers, using jointing materials, components and workmanship recommended by the cable manufacturer and the jointing accessory manufacturer. Install cable glands in accordance with BS 6121-5.

Cold pour resin and heat shrink joints.

Cut all cable ends immediately prior to jointing or terminating. Seal cables left unconnected for more that 24 hours to prevent the ingress of moisture. Seal plastic sheathed cables using proprietary shrink on end caps. Seal lead sheathed cables by a plumbed dressed lead cap with an airspace to allow conductor movement.

Strip cables to bring out the cores and expose conductors, for the minimum length required for connection, to leave no exposed length of conductor after termination. Ensure that strands are not damaged when stripping cable cores. Twist strands together. Do not reduce number of strands. Secure all strands at terminations. Clean armour thoroughly prior to jointing or terminating.

At connections to equipment and switchgear without integral cable clamping terminals, use compression or solder type lugs for bolted terminal connections, of correct bore.

Form all compression connections to components using tools that cannot be released unless the correct degree of compression has been achieved.

Install and inspect compression and mechanical connectors on conductors in accordance with BS EN 60228:2005 to BS 7609:1992+A2:2009.

Bolt core terminations with lugs to equipment using washers or proprietary shakeproof devices.

Do not bunch more than three cores at clamping terminals or bolted connections. Mark cable conductor phasing, or other core identification, at each end of all cables, and at all joints, maintaining consistency of marking with any existing system. Connect all cores, including multicore cable spare cores, at all joints and terminations. Bond any unused cores or multicore cables to earth at both ends, unless otherwise indicated.

Y61.4180A TERMINATING - MINERAL INSULATED CABLES:

Use terminations in accordance with BS EN 60702-2:2002+A1:2015 and components and materials recommended or supplied by cable manufacturer.

Use seals with maximum temperature rating indicated, stub caps to the largest size available, and drilled caps and headed sleeves for larger sizes.

Use glands of type indicated. At terminations to accessory boxes within a plaster or render finish, cable clamps fixed to accessory box and firmly gripping cable sheath may be used. Use earth tail seals with sheath grip type accessory boxes.
At equipment not provided with threaded entries secure glands using lock washers and locknuts or brass conduit bush. Use gland shrouds when plastic covered MI cables are used.
Using PVC, PIB or LSF material tape to BS 3924 or BS EN 60454 to match sheath, tape overall gland any bare copper sheath and form seal to cable sheath under all shrouds.
Mark core sleeving with appropriate identification.
Install voltage surge suppressors in accordance with manufacturer's recommendations and surge suppressors to BS 7671, Section 331-01-01.

Y61.4190A CABLE JOINTS - MINERAL INSULATED CABLES:

Joint mineral insulated cables using methods and materials recommended by cable manufacturer. Terminate cables in externally threaded glands using seals with temperature rating indicated. Join conductors using crimped connectors.
Insulate connectors using PVC tape to BS 3924 or BS EN 60454, ensuring good seal to conductor sleeving. Make off glands into either end of internally threaded brass sleeve of correct size. Protect brass sleeve using heat shrink sleeve.

Y61.4210 CABLE SLEEVES:

Pack sleeves with fire resistant material after cable installation.

Y62 BUSBAR TRUNKING

Y62.1000 GENERAL

Y62.1010 BUSBAR SYSTEMS STANDARDS:

Supply and install busbar trunking systems in accordance with BS EN 60439-1, BS EN 60439-2 and in particular the requirements of BS 7671 Requirements for Electrical Installations (The IET Wiring Regulations).

- BS 7671 Amendment 3

Y62.2010A GENERAL PURPOSE BUSBAR EXCEPT WALL/DADO:

System characteristics

Electrical Supply - Voltage between phases 400 volts; frequency 50 Hz.

Rate system to withstand a short circuit fault current of 21 kA.

Short time rating - 0.2 seconds.

Busbar

Use high conductivity busbars and connections.

Material - Copper.

Number of Poles - 3 phase and full size neutral.

Y62.2020A GENERAL PURPOSE STEEL BUSBAR TRUNKING:

Busbar trunking type

Surface; flush; bench or underfloor.

Steel enclosure

Comply with relevant sections of BS 4678.

Apply high standard of finish to busbar trunking. For a painted finish apply a minimum of one coat rust inhibiting primer, one undercoat and two semi-gloss finish coats.

Remove rust and degrease metal prior to application of selected finish. Zinc coated steel is acceptable as anti-rust treatment.

Use rust-proofed (e.g. cadmium plated) screws, bolts, nuts and washers.

Finish - Paint or Stove enamel.

Colour- Manufacturer's standard colour.

Fittings

Use trunking fittings of the same type and manufacture as the busbar trunking. Use screw fixed covers. Use manufacturer's purpose made units at changes of direction.

Supply termination

Provide facilities for the correct termination of supply cable.

Fixings

Provide external fixing brackets at not greater than 2m intervals. In accordance with manufacturer's instructions and recommendations.

Marking

Provide clear marking of busbars and tap-off outlet sockets with phase colours to

enable sequence identification throughout system.

Y62.2040A INTERNAL PROTECTIVE CONDUCTORS:

•Standard BS EN 61534-1:2011+A1:2014
Provide protective conductor throughout busbar system length to manufacturer's standard.
Busbar pole with tap-off at each socket for wall/dado type with integral socket outlets.
Install protective conductor internally to busbar enclosure.
Bond protective conductor to trunking enclosure using a method in accordance with BS 7430 at 1.2m maximum intervals.
Use high tensile brass bolts and locking nuts.
Complete trunking system before installing the protective conductor.
Ensure the continuity of protective circuits.

Y62.3010 GENERAL:

Install busbar trunking in accordance with manufacturer's instructions and the relevant standards.
Check total length of busbar system required on site prior to manufacture commencing.
Fit covers at end of each run or provide proprietary end boxes.

Y62.3020 BONDING:

Bond between adjacent lengths of busbar trunking with approved mechanical means to maintain conductivity, where two or more parallel runs of busbar trunking occur.
Tighten bolted connections between adjacent lengths of busbars to correct torque setting. Avoid damage to conductors.

Y62.3030 EXPANSION:

Anchor busbars rigidly in a minimum of one position and provide means of absorbing maximum expansion and contraction likely to occur in busbars under normal operating conditions.
Provide expansion joints in each length of run

Y62.3040 LABELS:

Fix identification and warning labels throughout system length.

Y62.3050 FIRE BARRIERS:

Provide barriers of fire-resisting materials within the busbar trunking where vertical runs pass through floors and horizontal runs pass through fire break walls to prevent spread of fire. (BS 7671 Chapter 527).

Y63 SUPPORT COMPONENTS – CABLES

Y63.1000 GENERAL

Y63.1010 APPLICATION:

Cables referred to in this section are only those types that can be installed without further mechanical protection.

Y63.2010A CABLE SUPPORTS AND FINISHES:

Cable supports

Support all cables throughout their length using conduit; or trunking and enclosures; or cable tray; or cable racking; or special support systems; or cleat or clip fixing direct to building fabric as indicated on the drawings/schedules.

Ensure tray, racking and special support systems are continuous and firmly fixed to building fabric. Allow space for additional cables as indicated on the drawings/schedules.

Ensure cable support system allows for spacing in accordance with BS 7671 for the design current of the cable.

Fixings finishes

Ensure finish for all support components, fixings, hangers and accessories is as cable support system or manufacturer's standard.

Y63.2020A CABLE SUPPORT SYSTEM - PERFORATED TRAY:

Type - Flanged or return flanged.

Perforations

Admiralty pattern for light or medium duty; GDCD pattern standard 23; or manufacturer's standard pattern.

Thickness - Manufacturer's standard thickness for type.

Fittings

Use factory made fittings throughout of same material, type, pattern, finish and thickness as cable tray.

Use reducers, inside angles and outside angles as manufacturer's standard.

Use flat bends, equal tees, unequal tees and crosses with corners gusseted.

Join lengths of tray and fittings using manufacturer's standard shouldered ends, fish plates, or couplers, with galvanized or zinc plated slotted domed head `roofing' bolts, nuts, washers and shakeproof washers.

Material

Hot rolled steel galvanized after manufacture to BS EN ISO 1461:2009; or bending and profiling quality hot dipped galvanized steel to BS EN 1026:2016, BS EN 10327:2014 or BS EN 10143:2014.

Finish - Self colour galvanized.

Y63.2020B CABLE SUPPORT SYSTEM - CABLE RACK:

Proprietary system of channel sections with return lip and compatible jointing and fixing accessories
Fittings
Use factory made fittings throughout of same material finish and section as rack, for risers, bends, reducers, tees, crosses and drop outs.
Material
Hot rolled steel galvanized after manufacture to BS EN ISO 1461:2009; or bending and profiling quality hot dipped galvanized steel to BS EN 1026:2016, BS EN 10327:2014 or BS EN 10143:2014.
Finish - Self colour galvanized.

Y63.2020C CABLE SUPPORT SYSTEM - CABLE CLEATS:

One piece or single way pattern or claw pattern or two bolt pattern.
Material
Die cast aluminium alloy; moulded black polyethylene; or nylon.
Finish - Self finish.

Y63.2025A CABLE SUPPORT SYSTEM - PROPRIETARY CABLE TIES:

Two piece cable tray pattern, on cable tray only. Wrap round self locking non releasable pattern on everything except cable trays.

Y63.2025C CABLE SUPPORT SYSTEM - TWO WAY SADDLES:

Bright copper for unsheathed mineral insulated cables. PVC covered bright copper for sheathed mineral insulated cables.

Y63.2025D CABLE SUPPORT SYSTEM - CABLE BASKET:

Proprietary system of wire basket with compatible jointing and fixing accessories.
Fittings
Use factory made fittings throughout of same material finish as basket, for risers, bends, reducers, tees, crosses and drop outs.

Y63.3010 CABLE TRAY INSTALLATION:

Support from building fabric with minimum clearance behind of 20mm. Install fixings at regular intervals to prevent visible sagging when loaded, with maximum spacing 1.2m and 230mm from fittings.
Keep cutting of cable tray to a minimum. Cut along a line of unperforated metal. Make good finish with zinc rich paint, primer and top coat, or two pack epoxy paste, as appropriate to tray material and finish.

Fit holes cut in tray for passage of cables with grommets, bushes or other lining. Install all bolts, fixings and hangers with threaded portion away from cables.

Y63.3020A CABLE CLEATS, TIES, SADDLES AND CLIPS INSTALLATION:

For cables on horizontal tray use ties for each circuit. Use tie manufacturer's special tensioning tool where available. Crop off tie ends.
For cables on vertical tray use cleats bolted to tray for paper, plastic or elastomeric insulated cables and saddles or clips for mineral insulated cables. Use cleats sized to grip cables firmly without undue pressure or strain on cable, but preventing slipping.
For cables on vertical or horizontal rack use proprietary fixings to rack for paper, plastic or elastomeric insulated cables and saddles or clips for mineral insulated cables. On continuous flat surfaces of wood, plaster, brick etc.

Use polypropylene surface fixing clips with prefixed hardened steel pin for PVC insulated and sheathed cables and sheathed or bright mineral insulated cables. Use round or flat or flat twin pattern as appropriate, manufactured specifically for cable being fixed.

Use one hole 'P' clips or two way saddles of bright copper for unsheathed mineral insulated cable. Use PVC covered for sheathed mineral insulated cables.

Space cleats, ties, saddles and clips

As of Guidance Notes `Selection & Erection' published by the IET.

Y71 LV SWITCHGEAR AND DISTRIBUTION BOARDS

Y71.1000 GENERAL

Y71.1020A 3 PHASE ELECTRICITY SUPPLY:

Ensure all electrical equipment supplied and installed is suitable for 3 phase power supply to BS 7697.

Y71.1020B SINGLE PHASE ELECTRICITY SUPPLY:

Ensure all electrical equipment supplied and installed is suitable for single phase power supply to BS 7697.

Y71.2010A CUBICLE SWITCHBOARD - LV SWITCHGEAR AND CONTROL GEAR ASSEMBLY:

Standard - BS EN 60439-1.
External design - Cubicle type assembly.
Usage - Switchboard.
Conditions of installation - Indoors.
Electrical characteristics
  Rated operational voltage 400V +10% -6%
Service conditions
  Ambient air temperature and altitude as BS EN 60439.

Y71.2010B CUBICLE CONTROL PANEL - LV SWITCHGEAR AND CONTROL GEAR ASSEMBLY:

Standard - BS EN 60439-1.
External design - Cubicle type assembly.
Usage - Control panel.
Conditions of installation - Indoors.
Electrical characteristics
  Rated operational voltage 400V +10% -6%
Service conditions
  Ambient air temperature and altitude as BS EN 60439.

Y71.2010C MULTI-BOX SWITCHBOARD - LV SWITCHGEAR AND CONTROL GEAR ASSEMBLY:

Standard - BS EN 60439-1.
External design - Multi-box type assembly.
Usage - Switchboard.

Conditions of installation - Indoors.
Electrical characteristics
Rated operational voltage 400V +10% -6%
Service conditions
Ambient air temperature and altitude as BS EN 60439.

Y71.2010D MULTI-BOX CONTROL PANEL - LV SWITCHGEAR AND CONTROL GEAR ASSEMBLY:

Standard - BS EN 60439-1.
External design - Multi-box type assembly.
Usage - Control panel.
Conditions of installation - Indoors.
Electrical characteristics
Rated operational voltage 400V +10% -6%
Service conditions
Ambient air temperature and altitude as BS EN 60439.

Y71.2020A FLOOR STANDING ASSEMBLY CONSTRUCTION:

Enclosure standard - BS EN 62208:2011.
Material of enclosure - Manufacturer's standard.
Terminals for external conductors, main power circuits
Accommodate cross-sectional area of copper cables in accordance with BS EN 60439-1.
Terminals for external conductor, control and auxiliary circuits
Terminal block. Mounting as manufacturer's standard.
Size of neutrals on three phase supplies - Full sized.
Degree of protection to BS EN 60529:1992+A2:2013, IP31 for assembly.
Protection against direct and indirect contact
Manufacturer's standard.
Accessibility for inspection
Arrange for following operations to be performed when assembly is in service and under voltage
Visual inspection of switching devices and other apparatus; settings and indicators of relays and releases; conductor connections and markings.
Adjusting and re-setting of relays, releases and electronic devices.
Replacement of fuse links and indicating lamps.
Fault location by voltage and current measuring.
Accessibility for maintenance
Provide space between functional unit or group and adjacent functional units or groups. Provide retainable fastening means for parts likely to be removed for maintenance.
Removable parts and withdrawable parts as manufacturer's standard.
Internal separation - Form 4.
Input voltage variations for electronic equipment supply - BS EN 60439.
Supply frequency deviation - BS EN 60439.
Mounting - Floor standing.

Y71.2020B WALL MOUNTED ASSEMBLY CONSTRUCTION:

Enclosure standard - BS EN 62208.
Material of enclosure - Manufacturer's standard.
Terminals for external conductors, main power circuits
Accommodate cross-sectional area of copper cables in accordance with BS EN 60439-1.
Terminals for external conductor, control and auxiliary circuits
Terminal block. Mounting as manufacturer's standard.
Size of neutrals on three phase supplies - Full sized.
Degree of protection to BS EN 60529:1992+A2:2013, IP31 for assembly.
Protection against direct and indirect contact
Manufacturer's standard.
Accessibility for inspection
Arrange for following operations to be performed when assembly is in service and under voltage
Visual inspection of switching devices and other apparatus; settings and indicators of relays and releases; conductor connections and markings.
Adjusting and re-setting of relays, releases and electronic devices.
Replacement of fuse links and indicating lamps.
Fault location by voltage and current measuring.
Accessibility for maintenance
Provide space between functional unit or group and adjacent functional units or groups. Provide retainable fastening means for parts likely to be removed for maintenance.
Removable parts and withdrawable parts as manufacturer's standard.
Internal separation - Form 4.
Input voltage variations for electronic equipment supply - BS EN 60439.
Supply frequency deviation - BS EN 60439.
Mounting - Wall mounted.

Y71.2030A ENCLOSURE FINISH:

Apply high standard finish to enclosure and supporting metalwork. Degrease metal and remove rust prior to applying finish.
Comply with paint manufacturer's recommendations regarding preparation, stoving times, temperatures, mixing of finishes, application and coat thickness.
Finish - Manufacturer's standard.
Colour - Manufacturer's standard colour.

Y71.2040A TYPE TESTS:

Provide certificates of verification.

Y71.2060 SITE BUILT ASSEMBLIES:

Ensure that components of site assemblies are part of a proprietary system and type tested as appropriate.
Install assemblies in accordance with manufacturer's drawings and instructions.

Y71.2070 SITE MODIFICATION:

Do not make site alterations unless authorised. Where site modifications to assemblies are authorised make in accordance with manufacturer's certified drawings and instructions. Ensure that modifications made comply with type test certificate obtained for arrangement of components.

Y71.2080A WALL MOUNTED, TOP ENTRY BATTERY CHARGER AND BATTERY UNIT:

Supply a unit for tripping.
Input Supply - 230 V single phase 50 Hz.
DC Output
Voltage - 50 Volt -20% +10%
Operating temperature range - -10ºC - 45ºC.
Charger type - Thyristor or transistor.
Battery type
Lead acid (sealed) or Nickel Cadmium (maintenance free).
Cubicle (sheet steel) - Wall mounted.
Cable entry - Top.
Finish - Manufacturer's standard.
Colour - Manufacturer's standard.
Ventilation - Natural.
Facilities - MCB input protection; float charge.
Battery over-discharge protection
Fuses for battery protection; MCB's for outgoing circuits; automatic selection of boost charge.
Meters
Battery voltage; charging current (dual scale for float and boost); output current.
Lamp indications
Supply on; supply fail (monitor input terminals); floatcharge; boost charge; no charge (when supply is on); battery voltage low; battery voltage high.
Alarms (connected to operate a relay with shrouded 230V3A a.c. or 0.5A d.c. N/C volt free contacts, closed on any alarm, for remote indication circuit)
Supply failed; no charge (when supply is on); battery voltage low; battery voltage high.

Y71.2080B WALL MOUNTED, BOTTOM ENTRY, BATTERY CHARGER AND BATTERY UNIT:

Supply a unit for tripping.

Input Supply - 230 V single phase 50 Hz.
DC Output
Voltage - 50 Volt -20% +10%
Operating temperature range - -10ºC - 45ºC.
Charger type - Thyristor or transistor.
Battery type
Lead acid (sealed) or Nickel Cadmium (maintenance free).
Cubicle (sheet steel) - Wall mounted.
Cable entry - bottom.
Finish - Manufacturer's standard.
Colour - Manufacturer's standard.
Ventilation - Natural.
Facilities - MCB input protection; float charge.
Battery over-discharge protection
Fuses for battery protection; MCB's for outgoing circuits; automatic selection of boost charge.
Meters
Battery voltage; charging current (dual scale for float and boost); output current.
Lamp indications
Supply on; supply fail (monitor input terminals); floatcharge; boost charge; no charge (when supply is on); battery voltage low; battery voltage high.
Alarms (connected to operate a relay with shrouded 230V 3A a.c. or 0.5A d.c. N/C volt free contacts, closed on any alarm, for remote indication circuit)
Supply failed; no charge (when supply is on); battery voltage low; battery voltage high.

Y71.2080C FLOOR STANDING, TOP ENTRY, BATTERY CHARGER AND BATTERY UNIT:

Supply a unit for tripping.
Input Supply - 230 V single phase 50 Hz.
DC Output
Voltage - 50 Volt -20% +10%
Operating temperature range - -10ºC - 45ºC.
Charger type - Thyristor or transistor.
Battery type - Lead acid (sealed) or Nickel Cadmium (maintenance free).
Cubicle (sheet steel) - Floor standing.
Cable entry - Top.
Finish - Manufacturer's standard.
Colour - Manufacturer's standard.
Ventilation - Natural.
Facilities - MCB input protection; float charge.
Battery over-discharge protection
Fuses for battery protection; MCB's for outgoing circuits; automatic selection of boost charge.
Meters
Battery voltage; charging current (dual scale for float and boost); output current.
Lamp indications
Supply on; supply fail (monitor input terminals); float charge; boost charge; no

charge (when supply is on); battery voltage low; battery voltage high.
Alarms (connected to operate a relay with shrouded 230V 3A a.c.or 0.5A d.c. N/C volt free contacts, closed on any alarm, for remote indication circuit)
Supply failed; no charge (when supply is on); battery voltage low; battery voltage high.

Y71.2080D FLOOR STANDING, BOTTOM ENTRY, BATTERY CHARGER AND BATTERY UNIT:

Supply a unit for tripping.
Input Supply - 230 V single phase 50 Hz.
DC Output
Voltage - 50 Volt -20% +10%
Operating temperature range - -10ºC - 45ºC.
Charger type - Thyristor or transistor.
Battery type - Lead acid (sealed) or Nickel Cadmium (maintenance free).
Cubicle (sheet steel) - Floor standing.
Cable entry - bottom.
Finish - Manufacturer's standard.
Colour - Manufacturer's standard.
Ventilation - Natural.
Facilities - MCB input protection; float charge.
Battery over-discharge protection
Fuses for battery protection; MCB's for outgoing circuits; automatic selection of boost charge.
Meters
Battery voltage; charging current (dual scale for float and boost); output current.
Lamp indications
Supply on; supply fail (monitor input terminals); float charge; boost charge; no charge (when supply is on); battery voltage low; battery voltage high.
Alarms (connected to operate a relay with shrouded 230V 3A a.c.or 0.5A d.c. N/C volt free contacts, closed on any alarm, for remote indication circuit)
Supply failed; no charge (when supply is on); battery voltage low; battery voltage high.

Y71.2090A UTILISATION A, WITHDRAWABLE AIR BREAK CIRCUIT BREAKERS:

Provide circuit breakers in accordance with BS EN 60947:2009+A2:2015. Ensure that uninterrupted current rating indicated applies when unit is enclosed and in operating environment at rated operational voltage.
Standard - BS EN 60947-2
Details of equipment - Circuit breaker.
Characteristics of circuit breakers
a.c. Interrupting medium - Air.
Rated and limiting values for the main circuit.
Rated voltage (Volts) - operational, 400.
Rated frequency 50 Hertz.

Circuit breaker Utilisation category - A.
Enclosure degree of protection IP 31.
Circuit breakers and switches
Provide metal clad withdrawable isolating removable type circuit breakers with provision for safe maintenance.
Closing mechanism
Independent manual spring operated.
Provide automatic shutters to cover all live contacts when circuit breaker is isolated, withdrawn or removed from housing.
Provide a padlock to lock circuit breaker in isolated/withdrawn position, and to lock automatic shutters covering live contacts when removed from housing.
Provide moulded case circuit breakers with provision for safe maintenance.

Y71.2090B UTILISATION A, MCCB AIR BREAK CIRCUIT BREAKERS:

Provide circuit breakers in accordance with BS EN 60947. Ensure that uninterrupted current rating indicated applies when unit is enclosed and in operating environment at rated operational voltage.
Standard - BS EN 60947-2
Details of equipment - Circuit breaker.
Characteristics of circuit breakers
a.c. Interrupting medium - Air.
Rated and limiting values for the main circuit.
Rated voltage (Volts) - operational, 400.
Rated frequency 50 Hertz.
Circuit breaker Utilisation category - A.
Enclosure degree of protection IP 31.
Circuit breakers and switches
Provide manual closing air-break circuit breakers, (MCCB).
Closing mechanism
Independent manual spring operated.
Provide automatic shutters to cover all live contacts when circuit breaker is isolated, withdrawn or removed from housing.
Provide a padlock to lock circuit breaker in isolated/withdrawn position, and to lock automatic shutters covering live contacts when removed from housing.
Provide moulded case circuit breakers with provision for safe maintenance.

Y71.2090C UTILISATION B, WITHDRAWABLE AIR BREAK CIRCUIT BREAKERS:

Provide circuit breakers in accordance with BS EN 60947. Ensure that uninterrupted current rating indicated applies when unit is enclosed and in operating environment at rated operational voltage.
Standard - BS EN 60947-2
Details of equipment - Circuit breaker.
Characteristics of circuit breakers

a.c. Interrupting medium - Air.
Rated and limiting values for the main circuit.
Rated voltage (Volts) - operational, 400.
Rated frequency 50 Hertz.
Circuit breaker Utilisation category - B.
Enclosure degree of protection IP 31.
Circuit breakers and switches
Provide metal clad withdrawable isolating removable type circuit breakers with provision for safe maintenance.
Closing mechanism
Independent manual spring operated.
Provide automatic shutters to cover all live contacts when circuit breaker is isolated, withdrawn or removed from housing.
Provide a padlock to lock circuit breaker in isolated/withdrawn position, and to lock automatic shutters covering live contacts when removed from housing.
Provide moulded case circuit breakers with provision for safe maintenance.

Y71.2090D UTILISATION B, MCCB AIR BREAK CIRCUIT BREAKERS:

Provide circuit breakers in accordance with BS EN 60947. Ensure that uninterrupted current rating indicated applies when unit is enclosed and in operating environment at rated operational voltage.
Standard - BS EN 60947-2
Details of equipment - Circuit breaker.
Characteristics of circuit breakers
a.c. Interrupting medium - Air.
Rated and limiting values for the main circuit.
Rated voltage (Volts) - operational, 400.
Rated frequency 50 Hertz.
Circuit breaker Utilisation category - B.
Enclosure degree of protection IP 31.
Circuit breakers and switches
Provide manual closing air-break circuit breakers, (MCCB).
Closing mechanism
Independent manual spring operated.
Provide automatic shutters to cover all live contacts when circuit breaker is isolated, withdrawn or removed from housing.
Provide a padlock to lock circuit breaker in isolated/withdrawn position, and to lock automatic shutters covering live contacts when removed from housing.
Provide moulded case circuit breakers with provision for safe maintenance.

Y71.2100A SWITCH DISCONNECTORS:

Supply switch disconnectors in accordance with BS EN 60947.
Standard - BS EN 60947-3
Details of equipment - Switch-disconnector.
a.c. Interrupting medium - Air.

Rated and limiting values for the main circuit.
Rated voltage (Volts) 230/400.
Rated frequency 50 Hertz.
Utilisation category - AC 23A.
Enclosure degree of protection IP 65.
Fit each switch with facility to padlock in OFF position.
Provide switches with auxiliary contacts as indicated. Where switches isolate final connections between a starter and its motor, fit one set of contacts to open starter coil circuit when switch is opened.

Y71.2100B FUSE COMBINATION UNITS:

Supply fuse combination units in accordance with BS EN 60947. Fit fuse combination units with cartridge fuse links in accordance with BS EN 60269
Standard - BS EN 60947-3.
Details of equipment - Fuse combination unit.
a.c. Interrupting medium - Air.
Rated and limiting values for the main circuit
Rated voltage (Volts) 230/400.
Rated frequency 50 Hertz.
Utilisation category - AC23A Relay
Enclosure degree of protection IP 31.
Fit removable neutral link in switches controlling circuits with neutral conductor.
Fit solid links in isolating switches.
Fit each switch with facility to padlock in OFF position.
Ensure that withdrawable chassis isolating type switches are provided with fully shrouded fixed contacts or insulated coverplates, to prevent accidental contact with live parts.
Ensure that switches in individual enclosures have an earth terminal, meet the degree of protection for the switchboard and have operating mechanisms interlinked with access door.
Provide switches with auxiliary contacts as indicated. Where switches isolate final connections between a starter and its motor, fit one set of contacts to open starter coil circuit when switch is opened.

Y71.2110A AUTOMATIC RESET PROTECTION DEVICES INTERPOSING RELAYS AND INTER-TRIPPING RELAYS:

Standard - BS EN 61810.
Housing
Flush panel mounting type. House all protection relays, excluding motor protection relays, in draw out cases.
Reset type - Automatic reset type.
Overcurrent tripping device
Provide overcurrent tripping device with overcurrent characteristic similar to a high voltage cartridge fuse, sized to protect the equipment/load.

Y71.2110B MANUAL RESET PROTECTION DEVICES INTERPOSING RELAYS AND INTERTRIPPING RELAYS:

Standard - BS EN 61810.
Housing
Flush panel mounting type. House all protection relays, excluding motor protection relays, in draw out cases.
Reset type - Manual reset type.
Overcurrent tripping device
Provide overcurrent tripping device with overcurrent characteristic similar to a high voltage cartridge fuse, sized to protect the equipment/load.

Y71.2120 VOLTAGE SENSING RELAYS:

Provide single phase inverse time undervoltage type voltage sensing relays to monitor the voltage between respective phases of supply.
Mounting
Supply suitable for flush panel mounting with relay trip indication.
Voltage settings
50-90% in five equal steps with automatic resetting at 105% of voltage setting.
Inverse time characteristics
When voltage increases from zero to rated voltage with time multiplier set at 1.0, set relay resetting times as follows:-

Relay setting %	50	60	70	80	90
Resetting time (secs)	2	4	5	10	12

Y71.2130 TRIP/CLOSE SWITCHES AND CONTROL SELECTOR SWITCHES:

Provide a panel mounted heavy duty, spring return trip/close switch on each circuit breaker fitted with solenoid or motorized spring closing mechanisms.
Ensure contacts have a continuous rating of 10A minimum at between 30V to 250V ac and dc, and make and break duty rating of 30A at 250V ac or dc for a minimum period of 3 secs.
Where remote trip/close control is indicated, supply a panel mounted selector switch to select circuit breaker for local or remote closing. Ensure that selection of remote or local closing does not prevent circuit breaker tripping under operation of local or remote trip switch.

Y71.2140 CURRENT TRANSFORMERS:

Comply with BS EN 61869-2:2012. Provide separate current transformers for each protection device and instrumentation. Ensure current transformers provide appropriate accuracy and are compatible with over current factors, characteristics, performance and VA rating required for satisfactory operation of protection devices, instruments and meters indicated.
Ensure that current transformers are capable of withstanding maximum short time

withstand current of value and duration indicated for assembly.
Provide test links in secondary connections of all current transformers to facilitate testing of instruments, meters and protection devices.

Y71.2150A INSTRUMENTS AND METERS:

Standards
Comply with BS EN 60051-1 for voltmeters, ammeters, watt meters, frequency indicators and power factor indicators.
Comply with BS 7856:2013, BS EN 62053-11, BS EN 62053-22 or BS EN 62053-21 for kWh meters, kVA and kW maximum demand meters and polyphase reactive kVA meters, and BS EN 62053-23:2013 for KVAhr meters.
Protect wiring to voltmeters by separate fuses.
Protect potential coils of watt meters, frequency indicators, power factor indicators and kWh meters, kVA and kW maximum demand meters and polyphase reactive kVA meters by separate fuses.
Supply instruments and meters suitable for flush mounting and type, size and accuracy as indicated.
Ensure that indicating scales for all instruments comply with BS 3693:1992.
Supply so that normal indication is 50% to 75% of full scale deflection.
Completely segregate all instruments in instrument compartments. Panel mount meters on front of instrument compartment.

Y71.2160A ELECTRICAL RECORDING INSTRUMENTS:

Provide electrical recording instruments.
Standard - BS EN 61143.

Y71.2170A INDICATOR LIGHTS:

Supply lamps of same type throughout. Provide indicator lamps with lamp test facility.
Lamps
Supply interchangeable indicators for respective units.
Protect wiring to indicator lamp units by separate cartridge fuses.
Lens Colour in accordance with BS EN 60073:2002.

Y71.2180 LOW VOLTAGE COILS RATING:

Ensure coils for switching relays, contactors and other applications are capable of withstanding inherent voltage drop within system without armature or switching apparatus dropping out of position.

Y71.2190A FRAMEWORK:

Construct framework for supporting electrical equipment from mild steel plate and strip, cold and hot rolled steel sections or slotted angles, in accordance with BS EN 10210:2006. Comply with BS EN 1011-2:2001 for metal arc welding.
Finish
Frameworks mounted inside building manufacturer's standard finish.
Frameworks mounted outside building hot dip galvanized to BS EN ISO 1461:2009.
Supply cadmium or zinc electroplated bolts, nuts, washers and screws.

Y71.2200A FUSES:

Supply cartridge fuse links including fuse carrier, bases and associated components that comply with BS EN 60269, fusing factor category gG, unless otherwise indicated.

Y71.2210A DISTRIBUTION BOARDS:

Comply with BS EN 60439-1 or BS EN 60439-3 as appropriate. Make internal separation Form 1 unless otherwise indicated. Make fuseboards fully shrouded. Fit each distribution board with an isolating switch.
Install busbars in same position relative to their fuse carriers or miniature circuit-breakers (MCBs) for each pole. In TPN distribution boards supply neutral busbars with one outgoing terminal for each outgoing circuit.
Provide a multi-terminal earthing bar for circuit protective conductors for both insulated and metal-cased boards, with one terminal for each outgoing circuit. Connect directly to earthing terminal without dependence on exposed conductive parts of enclosure.
Identify each fuseway and MCB way by numbering. Identify each terminal on neutral busbar and earthing bar with its respective fuseway or MCB way.
Where specific ratings are indicated incorporate fuses or MCBs, otherwise leave ways blank for future additions.
Enclosures finish
Finish - Manufacturer's standard.
Colour - Manufacturer's standard colour.

Y71.2220A CONSUMER UNITS:

Comply with BS EN 60439-3. Supply consumer units with minimum degree of protection in accordance with BS EN 60947-1,IP 31.
Provide fuses or miniature circuit-breakers and means of isolation.

Y71.2230A MINIATURE CIRCUIT BREAKERS:

Standard - BS EN 60898-1.
Supply miniature circuit-breakers with voltage and current ratings, type according to instantaneous tripping current, energy limiting class, category of duty and frequency in accordance with BS EN 60898-1.

Y71.2240A RESIDUAL CURRENT DEVICE:

Comply with BS EN 61008. Supply residual current devices (RCCDs) with rated voltage, rated current, rated tripping current, rated tripping time and rated breaking capacity as indicated.
DC component
Ensure dc component does not affect operation.
Overcurrent protection
Fit RCDs with integral overcurrent protection.

Y71.2242 RESIDUAL CURRENT MONITORS:

Supply residual current monitors.
Standard - BS EN 62020.

Y71.2245 COMBINED RESIDUAL CURRENT/OVER CURRENT OPERATED CIRCUIT BREAKERS:

Supply combined residual current/over current operated circuit breakers (RCBOs) in accordance with BS EN 61009-1:2012+A12:2016.

Y71.2250 CABLE TERMINATIONS:

Ensure that switchgear and distribution boards are provided with facilities to terminate size, number and type of cable indicated. Where necessary use fabricated steel extension boxes for glanding large and multiple cables.
Provide non-ferrous metal glanding plates for single core cable terminations.

Y71.3010 FIXING:

Fix all equipment independently of wiring system. Use cadmium or zinc electroplated bolts, nuts, washers and screws.

Y71.3020 MOUNTING HEIGHT:

Mount single items of equipment 1450mm above finished floor level to centre of equipment, unless otherwise indicated.
Arrange groups of equipment, other than floor mounted assemblies, so that all parts

of equipment requiring access for operation or maintenance are at least 500mm and no more than 2000mm above finished floor level, unless otherwise indicated.

Y71.3030 ACCESS:

Ensure that clearance in front of switchgear and controlgear is not less than 1m, or as indicated.

Y71.3040A MARKING AND DRAWING:

Number terminals, cables and component parts to correspond with manufacturer's certified drawings.

Y71.3050 CABLE TERMINATIONS:

Terminate paper-insulated cable by means of switchboard manufacturer's standard compound filled cable boxes.
Terminate PVC SWA PVC and MICS cables inside enclosure by securing cables to switchboard with glanding plates or glanding brackets; and outside enclosure with glanding plates or fabricated steel extension boxes.

Y71.3060A INSTALLATION AND COMMISSIONING:

Install and commission switchgear and controlgear in accordance with the appropriate standard and the manufacturer's recommendations. Include CT Polarity check in commission tests.

Y72 CONTACTORS AND STARTERS

Y72.1020B INSTALLER FITTED SURGE SUPPRESSORS:

Supply surge suppressors to star connected motors and to all motors subject to star-delta starting to limit peak voltage to 1200 volts. Fitted by installer.

Y72.1030A MANUFACTURER FITTED TRANSIENT SUPPRESSORS:

Supply transient suppressors in the form of resistor and capacitor networks across the starter contactor coils. Fitted by Manufacturer.

Y72.2010A CONTROLGEAR ASSEMBLY:

Standard - BS EN 60439-1.
External design - Cubicle type assembly.
Usage - Control panel, motor control centre or single starter enclosure.
Conditions of installation - Indoors.
Electrical characteristics
Rated operational voltage, 400 V. Rated short-time withstand current, 20 times rated current.
Service conditions - Ambient air temperature and altitude as BS EN 60439.

Y72.2020A ASSEMBLY CONSTRUCTION:

Enclosure standard - BS EN 62208.
Material of enclosure - Manufacturer's standard.
Terminals for external conductors, main power circuits
Accommodate cross-sectional area of copper cables in accordance with BS EN 60439-1, Appendix A.
Terminals for external conductor, control and auxiliary circuits
Terminal block. Mounting - top hat rails (35mm)
Size of neutrals on three phase supplies
Full current-carrying capacity of phase conductor.
Degree of protection to BS EN 60529
IP 31 for units installed inside buildings excluding boiler rooms and pump rooms.
IP 55 for units installed in boiler rooms, pump rooms and outside buildings.
Protection against direct and indirect contact as Manufacturer's standard.
Accessibility for inspection
Arrange for following operations to be performed when assembly is in service and under voltage.
Visual inspection of switching devices and other apparatus; settings and indicators of relays and releases; conductor connections and markings.
Adjusting and re-setting of relays, releases and electronic devices.
Replacement of fuselinks and indicating lamps.
Fault location by voltage and current measuring.

Accessibility for maintenance
Provide space between functional unit or group and adjacent functional units or groups. Provide retainable fastening means for parts likely to be removed for maintenance.
Use barrier protected sub-sections for each functional unit or group.
Use compartments for each functional unit or group.
Removable parts and withdrawable parts
Degree of protection of assembly after removal or withdrawal of part as manufacturer's standard.
Internal separation - Manufacturer's standard.
Input voltage variations for electronic equipment supply - BS EN 60439, Section 7.9.1.
Supply frequency deviation - BS EN 60439, Section 7.9.4.
Mounting - Floor standing or wall mounted.

Y72.2030A ENCLOSURE FINISH:

Apply high standard finish to enclosure and supporting metalwork. Degrease metal and remove rust prior to applying finish.
Comply with paint manufacturer's recommendations regarding preparation, stoving times, temperatures, mixing of finishes, application and coat thickness.
Finish - Manufacturer's standard.
Colour - Manufacturer's standard colour.

Y72.2040 SITE MODIFICATION:

Do not make site alterations unless authorised. Where site modifications to assemblies are authorised make in accordance with manufacturer's certified drawings and instructions. Ensure that modifications made comply with type test certificate obtained for arrangement of components.

Y72.2050C CONTINUOUS LV CONTACTORS AND MOTOR STARTERS:

Standard - BS EN 60947-4-1 or BS EN 60947-4-2.
Type of equipment - A.c. mechanical contactor. Interrupting medium, air.
Operating condition.
Method of operation - Electromagnetic.
Method of control - Automatic.
Rated and limiting values for the main circuit.
Rated voltage (Volts) - Operational, 400.
Rated duty - Continuous.
Operational performance.
One rotation direction, with motor stopping between operations.
Control circuits
Electrical - ac; rated frequency (Hertz), 50; rated voltage (Volts), 230.
Co-ordination with short-circuit protective devices - Type1
Enclosure degree of protection to BS EN 60529, IP 31.

Minimum mechanical and electrical endurance
Mechanical 0.3 million; electrical 15,000.
Provide mechanical and electrical interlocks to prevent simultaneous closure of paired contactors.

Y72.2060A CONTROL CIRCUIT DEVICES:

Standard - BS EN 60947-5-1
Type of equipment.
a.c. control circuit device
Manual control switches; emergency stop; control relays; pilot switches; position switches; associated equipment; auxiliary contacts and indicating lamps.
Interrupting medium, Air.
Operating condition.
Method of operation - electromagnetic.
Method of control - automatic.
Rated and limiting values for the main circuit.
Rated voltage (Volts) - operational, 230.
Rated frequency (Hertz), 50.
Contact element classification.
Enclosure degree of protection IP 31.

Y72.2070A ISOLATING SWITCHES:

•Isolation as shown on drawings/schedules
Standard - BS EN 60947-3.
Provide independent manual operation type isolating switches with rated duty, rated operational current and utilization category compatible with contactor.

Y72.2080A CONTROL SELECTOR SWITCHES:

Standard - BS EN 60947-5-1
Provide panel mounting independent manual operation rotary type switch to select local/off/remote control.
Ensure switch rated thermal current, rated operational current, and utilization category are compatible with contactor control circuit characteristics and circuit protection device.

Y72.2090A IN-BUILT PUSH BUTTONS:

Provide panel mounting type push buttons with actuator colours to BS EN 60073.
Standard- BS EN 60947-5-1.
Pattern
Supply flush button type start/on and reset push buttons. Supply mushroom actuator type stop/off push buttons released by turning the actuator.

Ensure rated thermal current, rated operational current and utilization category of push button contacts are compatible with contactor control circuit characteristics and circuit protection device.

Y72.2100A INDICATOR LIGHTS:

Supply lamps of same type throughout. Provide indicator lamps with lamp test facility.
Standard - BS EN 842:1996+A1:2008 and BS EN 60947-5-1.
Details
Supply interchangeable indicators for respective units. Provide neon indicators.
Provide 230V indicator circuits and lamps.
Protect wiring to indicator lamp units by separate cartridge fuses.
Lens colour - In accordance with BS EN 60073.

Y72.2110A CONTACTOR CONTROL RELAYS:

Standard BS EN 60947-5-1, install relays in contactor enclosure.
Relay enclosure protection to BS EN 60529
Compatible with contactor enclosure.

Y72.2120A CONTROL AND INDICATOR LIGHT CIRCUIT FUSES:

Provide in contactor enclosure separate low voltage fuse bases, fuse carriers and cartridge fuses for protection of control circuits and indicator light circuits.
Fuses
Fully shrouded impact resistant moulded plastic fuse bases and carriers in accordance with BS EN 60269. Supply category gG cartridge fuses to BS EN 60269.

Y72.2190B MOTOR CONTROL CENTRE INVERTER MOTOR STARTERS:

Supply inverters to control speed of standard AC Squirrel cage motors.
Inverter type - Digital PWM.
Location - Motor control centre.
Control range - 0.5 to 120 Hz Power factor - 0.95 or better.
Starting current - Not to exceed 1 x FLC.
Characteristics
Ensure acceleration and deceleration ramps are independently adjustable.
Allow connection to a turning motor without braking to a standstill.
Allow connection to a reverse windmilling fan without causing tripping and return fan to correct speed. Ensure inverters require no additional means for starting.
Supply inverters that do not require electrical matching to motor. Ensure inverters are capable of running motors in parallel.
EMC characteristics to BS EN 61800.
Mains interruption

Ensure inverter does not cause tripping through a mains interruption of 200 msec.
Protection
Ensure inverter incorporates the following protection to cause electronic shut down without operating circuit protective devices.
Motor phase to phase fault; motor phase to earth fault; overvoltage; undervoltage; inverter overheat; motor overheat; loss of control signal; loss of auxiliary control voltage; current limit.
Inverter controls - Local/remote facility.
Display
Make provision for inverter to display externally, external and internal faults following a failure.
Show 1st, 2nd and 3rd up sequential faults.
Provide digital readout to show output frequency Hz; reference 1 (Hand); reference 2 (Auto); motor current (% or Amps); fault memory.
Provide volt free remote signalling contacts to indicate common fault; running/stopped conditions; healthy/tripped conditions.
Ensure parameters can be set and fault memory interrogated with door closed, and without additional instrumentation.

Y72.2220 CONTROL CIRCUIT TRANSFORMERS:

Provide control circuit transformers to supply power at voltages to suit control components.
Standard
Use transformers in accordance with BS EN 61558-2-9 or BS EN 61558-1 and provide an external label of approved type and size.
Protection - Primary and secondary fuses.

Y72.2230A SWITCHING AND INDICATION:

Provide switches, indicating lamps, instruments and controls of uniform appearance and physically protected.
Switches and indicators
Fit on panel or access doors Stop/Start/Reset push buttons; Auto/Off/Manual control selector switch; run and trip indicator lights.

Y72.2240 AUDIBLE ALARMS:

Ensure that operation of any starter trip lamp, safety circuit lamp or alarm lamp operates a common audible alarm with mute and test facilities and terminals for remote alarm signal.
When an alarm condition has had the audible alarm muted, ensure that terminals for a remote "alarm accepted" light are energised. The audible alarm circuit and terminals for remote alarm signal must still be capable of indicating another fault occurring even though original fault has not been cleared. The test facilities are to test momentarily both the audible alarm and all alarm indicator lamps, whilst the push button is depressed.

Use alarms that interface with a sensor or controller to sense set-point and measured value. Provide adjustable upper and lower limits on face of unit. Provide unit with indicating lamps to show which limit has been exceeded. Provide each unit with connections for remote alarm.

Y72.2250A PROGRAMMABLE LOGIC CONTROLLERS:

Provide programmable logic controllers in accordance with the manufacturer's recommendations and the specified control requirements.
Standard - BS EN 61131.
Provide fuse and isolator for the Programmable Logic Controller. Install PLC with control components.
Programming language standard - BS EN 61131-3

Y72.2260A STARTER AND CONTROL PANEL INTERNAL WIRING:

Standard - BS 6231:2006.
Wiring coding - Random colours and CPC green/yellow.
Control wiring
Segregate control wiring from power circuits. Contain control wiring in ventilated plastic trunking. Identify each end of each wire with a unique number.
Power wiring
Take account of thermal effects of grouping when routing power wiring. Identify each end of each wire with a unique number.

Y72.2270A COMPONENT MOUNTING:

Mount all components of the switchgear and controlgear in accordance with the manufacturer's instructions.
Mount control components on top hat rails (35mm)

Y72.2280A CONTROL SYSTEM FUNCTION CHARTS:

Prepare function charts for the control system in accordance with BS EN 60848:2013. Obtain approval of function chart before design of system hardware or writing control software.
Function chart format - Combined function chart/circuit diagram.

Y73 LUMINAIRES AND LAMPS

Y73.1000 GENERAL

Y73.1010 STANDARDS:

Supply luminaires and lamps to standards as appropriate.

Y73.2005 LAMP EFFICACY:

The system is designed to achieve an average initial circuit of at least 65 lumens/watt for fixed lighting equipment within the building.

Y73.2010A LUMINAIRES - GENERAL PURPOSE:

Standards
Supply luminaires with photometric data in accordance with BS EN 13032-1:2004+A1:2012.
Supply luminaires in accordance with BS EN 60598.
Classification - To BS EN 60598-1.
Safety Support for Components
Provide secondary support for translucent covers, diffusers and gear trays so they are prevented from falling when their primary fixing is released.
Photometric performance
Ensure luminaires of similar type have same photometric performance as published data within the tolerances defined by BS EN 13032-1.
Electromagnetic compatibility
Ensure luminaires comply with BS EN 61547 for EMC immunity.

Y73.2010B LUMINAIRES - GENERAL PURPOSE WITH SAFETY GLASS:

Standards
Supply luminaires with photometric data in accordance with BS EN 13032-1:2004+A1:2012.
Supply luminaires in accordance with BS EN 60598.
Classification - To BS EN 60598-1.
Safety
Fit luminaire with cover glass to protect against ultra-violet emission and risk from explosion of lamps.
Safety Support for Components
Provide secondary support for translucent covers, diffusers and gear trays so they are prevented from falling when their primary fixing is released.
Photometric performance
Ensure luminaires of similar type have same photometric performance as published data within the tolerances defined by BS EN 13032-1:2004+A1:2012.
Electromagnetic compatibility

Ensure luminaires comply with BS EN 61547 for EMC immunity.

Y73.2010C LUMINAIRES - SPECIAL APPLICATIONS:

- Emergency lighting
  - 2020A EMERGENCY LIGHTING LUMINAIRES:
    Comply with BS EN 60598-2-22.
    Comply with ICEL:1001. Ensure emergency lighting luminaires are marked with ICEL certification label.
- 2030 EXIT SIGNS:
  Comply with BS ISO 3864-1:2011
- Hazardous areas
  - 2040A HAZARDOUS AREA LUMINAIRES:
    BS EN 60079-6:2015; BS EN 60079-5:2015; BS EN 60079-11:2012; BS EN 60079-0; BS EN 60079-1; BS EN 60079-14; BS EN 60079-15 or BS EN 60079-25 as appropriate.
    4070 INSTALLATION IN POTENTIALLY EXPLOSIVE ATMOSPHERES:
      Comply with BS EN 60079-14.
- Signs and high voltage installations.
  - 2050A SIGNS AND HIGH VOLTAGE INSTALLATIONS:
    Comply with BS 559:2009 and BS EN 50107-1:2002.
    Neon transformers
      Supply transformers for tubular discharge lamps with no-load output voltage exceeding 1000 V in accordance with BS EN 61050:1992.
  - 4090 SIGNS & HIGH-VOLTAGE INSTALLATION:
    Comply with BS 559:2009 and BS EN 50107-1:2002.

Standards

Supply luminaires with photometric data in accordance with BS EN 13032-1:2004+A1:2012.

Supply luminaires in accordance with BS EN 60598.

Classification - To BS EN 60598-1.

Electromagnetic compatibility

Ensure luminaires comply with BS EN 61547 for EMC immunity.

Y73.2020A EMERGENCY LIGHTING LUMINAIRES:

Comply with BS EN 60598-2-22.
Comply with ICEL:1001. Ensure emergency lighting luminaires are marked with ICEL certification label.

Y73.2030 EXIT SIGNS:

Comply with BS ISO 3864-1:2011

Y73.2040A HAZARDOUS AREA LUMINAIRES:

BS EN 60079-6:2015; BS EN 60079-5:2015; BS EN 60079-11:2012; BS EN 60079-0; BS EN 60079-1; BS EN 60079-14; BS EN 60079-15 or BS EN 60079-25 as appropriate.

Y73.2060A LAMPHOLDERS - GENERALLY:

Lamp caps - BS EN 60061-1 -1:1993+A53:2015.
Lamp holders - BS EN 60061-2:1993+A50:2015.
Lampholders with enhanced safety features - BS 7895:1997.
Bayonet lampholders - BS EN 61184:2008+A1:2011.
Lampholders for tubular fluorescent lamps and starter holders - BS EN 60400:2008+A2:2014.
Edison screw lampholders - BS EN 60238:2004+A2:2011.
Interchangeability
Ensure lampholders in luminaires of similar type and rating are identical.
Earthing
Ensure metal lampholders incorporate an earthing terminal.

Y73.2070 LAMPHOLDERS - TUNGSTEN FITTINGS:

Use following lampholders for tungsten filament lamps unless indicated otherwise.

Lamp	Lampholder
up to 150 W	bayonet B22d
200 W	Edison screw E27 2A
300 W	Edison screw 16A

Shade rings
Provide a shade carrier ring for separately mounted lampholders for GLS tungsten filament lamps.
Polarity of Edison Screw Lampholders
Ensure phase conductor is connected to centre contact.

Y73.2080A LAMPHOLDERS - MOUNTING:

Securely mount lampholder in luminaire when it is sole support for lamp.
Cord grip
Provide integral cord grip type when lampholders are suspended by cord.
Conduit Mounted
When mounted directly to conduit system use backplate lampholder for conduit box.

Y73.2090A CONTROL GEAR AND COMPONENTS:

Compatibility
Ensure control gear and components are suitable for lamp type, wattage and starting characteristics. Obtain from manufacturers written confirmation of

compatibility.

Y73.2095 CIRCUIT LOSSES:

Use high frequency ballasts to ensure the installed circuit load does not exceed 3 W/m^2/ 100 lux.

Y73.2100A FLUORESCENT LAMP BALLASTS AND STARTERS:

Ballasts
BS EN 61347-2-8:2001+A1:2006 and BS EN 60921:2004.
BS EN 61347-2-3:2011 and BS EN 61347-2-7:2012 for d.c.supplied electronic ballasts.
BS EN 61347-2-3:2011 for fluorescent lamps to BS EN 60081:1998+A5:2013 and BS EN 60901:1996+A5:2012.
Supply thermal protectors for ballasts for tubular fluorescent lamps to BS EN 60730-2-3:2007.
Starters - BS EN 61347-2-1:2001+A2:2014 and BS EN 60927:2007+A1:2013.
Use low distortion type.

Y73.2110A DISCHARGE LAMP BALLASTS AND STARTERS:

Ballasts - BS EN 61347-2-9:2013 and BS EN 60923:2005.
Starters - BS EN 61347-2-1:2001+A2:2014 and BS EN 60927:2007+A1:2013.

Y73.2120A CAPACITORS:

Use capacitors in accordance with BS EN 61048:2006+A1:2016 and BS EN 61049:1993 in tubular fluorescent, high pressure mercury and low pressure sodium vapour discharge lamp circuits.

Y73.2130 SUPPLY TERMINALS:

Use screw terminals for supply cables and circuit protective conductors, sized to terminate up to three 2.5mm^2 conductors. Provide separate terminal blocks for each incoming circuit, with marking to identify each circuit.

Y73.2140 FUSE:

Include a fuse holder and BS 1362 fuse in each incoming circuit phase connection.

Y73.2150 INTERFERENCE:

Comply with BS EN 55015:2013+A1:2015.

Y73.2160 REMOTE GEAR:

Locate control gear in separate lockable cabinet of sheet steel with same degree of protection and finish specified for luminaire. Comply with manufacturer's recommendations for maximum cable length between gear and lamp.

Y73.2165 TYPES OF HIGH EFFICIENCY LAMP FOR NON-DAY LIT AREAS:

Light source	Type
High pressure sodium	All ratings above 70W
Metal halide	All ratings above 70W
Tubular fluorescent	All 26mm diameter (T) lamps and 16mm (T5) lamps rated above 11W, provided with low loss or high frequency control gear. 38mm diameter (T12) linear fluorescent lamps 2400mm in length
Compact fluorescent	All ratings above 26W

Y73.2170A TUNGSTEN FILAMENT LAMPS:

Comply with BS EN 60064:1995+A5:2009, BS EN 60432-1:2000+A2:2012 and BS EN 60630:1998+A7:2015. Supply electronic step-down converters for filament lamps to BS EN 61047:2004 and BS EN 61347-2-2:2012. Comply with BS EN 61549:2003+A3:2012 for double capped and ELV lamps.

Y73.2180A FLUORESCENT LAMPS:

Internationally specified tubular fluorescent lamps to BS EN 60081:1998+A5:2013.
UK tubular fluorescent lamps to BS 1853-2:1995.
Single capped fluorescent lamps to BS EN 60901:1996+A5:2012 and BS EN 61199:2011+A2:2015.
Double capped fluorescent lamps to BS EN 60081:1998+A5:2013 and BS EN 61195:1999+A2:2015.
Self ballasted lamps to BS EN 60969:1993 and BS EN 60968:2015.

Y73.2185A TUNGSTEN HALOGEN LAMPS:

Comply with BS EN 60432-2:2000+A2:2012 or BS EN 60357:2003+A11:2016.

Y73.2190 HIGH PRESSURE MERCURY VAPOUR LAMPS:

Comply with BS EN 60188:2001 and BS EN 62035:2014.

Y73.2195 METAL HALIDE LAMPS:

Comply with BS EN 62035:2014 where appropriate.

Y73.2200 HIGH PRESSURE SODIUM VAPOUR LAMPS:

Comply with BS EN 62035:2014.

Y73.2210 LOW PRESSURE SODIUM VAPOUR LAMPS:

Comply with BS EN 60192:2001 and BS EN 62035:2014.

Y73.2230 LAMP MANUFACTURER:

Ensure that lamps of each type are from same manufacturer.

Y73.2240A SUPPORT SYSTEM - CONDUIT:

Use not less than 20mm conduit of same type as main conduit system.
Material - steel.

Y73.2250A SUPPORT SYSTEM - ROD:

Use continuously threaded rods with matching washers and nuts.
Diameter - 6mm.
Material - Cadmium plated steel.

Y73.2260A SUPPORT SYSTEM - CHAIN:

Use cadmium plated steel chain with load carrying capacity of not less than twice weight of complete luminaire.

Y73.2270A SUPPORT SYSTEM - FLEXIBLE CORD:

Use size and type as indicated.
Confirm temperature rating is suitable for operating temperature of luminaire or lampholder. Confirm that cord is adequate for mass to be supported.

Y73.2280A SUPPORT SYSTEM - WALL BRACKETS:

Provide wall brackets. Confirm wall brackets are suitable for supporting luminaire.

Y73.2290 SUPPORT SYSTEM - BALL AND SOCKET:

•Installation
4160 SUSPENSION:
Suspend luminaires at height indicated. Ensure suspensions hang vertically unless otherwise indicated.
4200 SUSPENSION BY BALL AND SOCKET:
Install cable through ball and socket connected to conduit box.
•Height
Provide ball and socket as top support, complete with cover fixed to circular conduit box.

Y73.2295 SUPPORT SYSTEM - WIRE ROPE:

•Installation
4160 SUSPENSION:
Suspend luminaires at height indicated. Ensure suspensions hang vertically unless otherwise indicated.

Y73.2300A STEEL COLUMNS AND BOLLARDS:

•Finish as shown on drawings/schedules
Standards - BS EN 40-2:2004 and BS EN 40-5:2002.
Material - Steel.
Bracket - Match column.
Earthing
Include earthing terminal fixed within service compartment.
Column base plate - Standard.

Y73.2300C ALUMINIUM COLUMNS AND BOLLARDS:

Standards - BS EN 40-2:2004 and BS EN 40-6:2002.
Material - Aluminium.
Bracket - Match column.
Earthing
Include earthing terminal fixed within service compartment.
Column base plate - Standard.

Y73.3010A TRACK LIGHTING:

•Class, poles and current rates as indicated on drawings/schedules
Where indicated provide track for fixing fittings in accordance with BS EN 60570:2003.

Y73.3020 INTEGRAL PHOTO-CELLS:

Incorporate integral photo-cell on luminaire where indicated.

Y73.3030A AIR HANDLING LUMINAIRES:

Provide assembly of luminaire and exhaust air device or luminaire and supply air device to meet design requirements for illumination and air flow. Ensure assembly can be integrated into a false ceiling, flush mounted.
Diffuser
Allow for the path of exhaust air in the diffuser.
Exhaust air outlet
Provide an outlet for the air via a series of circular openings in top of assembly casing.
Supply air diffuser
Supply the air diffuser as a component of the assembly.
Fixing
Ensure the fixing is capable of carrying the weight of the whole assembly.

Y73.4010 ORIENTATION:

Install luminaires in positions indicated, and in horizontal plane unless otherwise indicated.

Y73.4020 CLEANLINESS:

Ensure luminaires are clean and grease free on handover.

Y73.4030 INSTALLATION OF RECESSED FITTINGS:

Install luminaires flush with finished ceiling level.

Y73.4040A INSTALLATION OF SEMI-RECESSED FITTINGS:

Install luminaires as manufacturer's detail.

Y73.4050 INSTALLATION OF WALL MOUNTED FITTINGS:

Install luminaires at height indicated.

Y73.4060 MATERIAL OF SUPPORTING SURFACE:

Ensure classification of luminaires is appropriate. Do not mount luminaires on readily flammable surfaces.

Y73.4100 INSTALLATION OF EXTRA LOW VOLTAGE TUNGSTEN HALOGEN LAMPS:

Use same wattage lamp on luminaires fed from common transformer. Supply each luminaire on common transformer by separate cable of same cross-sectional area.

Y73.4110 SUPPORT

Ensure support is adequate for weight of luminaires.

Number

Provide the following minimum number of supports for each luminaire longer than 600mm.

Luminaire width (mm)	Minimum number of supports
Up to and including 300	2
Over 300	4

Y73.4120 SUPPORT FROM CONDUIT:

Where luminaire is supported from conduit provide a conduit box forming an integral part of conduit system at each point of suspension. Ensure suspensions are vertical. Where conduit enters luminaire use back-nuts and washers to secure luminaire body to conduit support. Provide tube with corrosion resistance equal to conduit system. Do not support luminaires directly from conduit boxes made from non-metal or heat sensitive materials, where the temperature of the material may exceed 60°C or the mass suspended exceeds 3kg.

Y73.4130 SUPPORT FROM TRUNKING:

Where luminaire is supported from trunking use proprietary clamps or brackets appropriate to the luminaire and trunking.

Do not support luminaires directly from trunking made from non-metal or heat sensitive materials, where the temperature of the material may exceed 60°C or the mass suspended exceeds 3kg.

Y73.4140A SUPPORT BY DIRECT FIXING:

Refer to fixing methods, use luminaire supporting coupler to BS 7001:1998 or follow manufacturer's recommendations.

Y73.4150A SUPPORT IN SUSPENDED CEILING:

Support luminaires directly from building fabric.

Y73.4160 SUSPENSION:

Suspend luminaires at height indicated. Ensure suspensions hang vertically unless otherwise indicated.

Y73.4170 SUSPENSION BY ROD:

Use washers, nut and lock-nut at top and bottom of rod. Paint cut ends with calcium plumbate primer or zinc rich paint.

Y73.4180 SUSPENSION BY CHAIN:

Use hook cover for suspension from circular conduit box. For connection to luminaires use luminaire manufacturer's own chain hook, but if not available use hook with standard screw threaded body to be secured to luminaire body with nuts and washers. Where indicated use captive hooks.

Y73.4190 SUSPENSION BY FLEXIBLE CORD:

Suspend cord from ceiling rose.

Y73.4200 SUSPENSION BY BALL AND SOCKET:

Install cable through ball and socket connected to conduit box.

Y73.4210A COLUMNS AND BOLLARDS:

Location - Confirm location before excavation.
Bases - Install bases in accordance with bollard or column manufacturer's instructions.
Mounting
Mount column or bollard on base as recommended by manufacturer.
Ensure columns and bollards are vertical unless otherwise indicated.
Earthing
Install circuit protective conductor to connect luminaire to earthing terminal in service compartment; size circuit protective conductor same as live conductors.
Bond accessible metal parts of column or bollard to earthing terminal.

Y73.4220 CONNECTIONS TO LUMINAIRES

Cable Protection
Use appropriate size of grommet where cables enter through hole in luminaire body.
Earthing
Ensure that the earthing terminal of Class 1 luminaires is connected to the conduit protective conductor of the supply circuit.
Loose Wiring
Clip or tie back with suitable proprietary devices loose wiring within luminaire, at 300mm intervals.

Y73.4230A CONNECTIONS TO LUMINAIRES - DIRECT TO CONDUIT - TERMINAL BOX:

Terminate circuit wiring in terminal block within supporting conduit box. Use flexible cord from terminal block to luminaire.

Y73.4230B CONNECTIONS TO LUMINAIRES - DIRECT TO CONDUIT - AT LUMINAIRE:

Terminate circuit wiring at supply terminals of luminaire. Take all conductors through same cable entry into luminaire.

Y73.4240B CONNECTIONS TO LUMINAIRES - DIRECT TO TRUNKING - AT LUMINAIRE:

Terminate circuit wiring at supply terminals of luminaire. Take all conductors through same cable entry into luminaire.

Y73.4260A CONNECTIONS TO LUMINAIRES - RECESSED FITTINGS - PLUG AND SOCKET:

Where luminaires are recessed in a suspended ceiling, terminate circuit wiring at plug and socket to BS 546:1950, located not more than 500mm from the access through the ceiling. Use flexible cord from plug of ceiling rose to supply terminals of luminaire.

Y73.4270 CONNECTIONS TO LUMINAIRES - CONDUIT SUSPENSION:

Terminate circuit wiring in terminal block within supporting conduit box. Use flexible cable from terminal block to luminaire, installed within tube.

Y73.4280 CONNECTIONS TO LUMINAIRES - ROD OR CHAIN SUSPENSION:

Terminate circuit wiring in terminal block within supporting conduit box. Use flexible cord from terminal block to luminaire and clip cable to one of the rods or chains, do not weave cable through links of the chain.

Y73.4290 CONNECTIONS TO LUMINAIRES - MICS CABLE:

Fix cable gland to luminaire and continue conductors to supply terminals of luminaire.

Y73.4300A SEPARATE LIGHTING SWITCHES ON DIFFERENT PHASES:

Install lighting switches on different phases at least 2m apart.

Y73.4300B PHASE BARRIER LIGHTING SWITCHES ON DIFFERENT PHASES:

When lighting switches on different phases are in a common box, use phase barrier switches in accordance with BS 7671:2008+A3:2015.

Y74 ACCESSORIES FOR ELECTRICAL SERVICES

Y74.1000 GENERAL:

Y74.1010 APPLICATION:

Supply fixed electrical wiring accessories for use with fixed and portable peripheral equipment using either power or signalling cables.

Y74.1020 SAMPLES:

Where indicated submit samples of proposed materials and equipment for approval before work is started. Label each sample with name, catalogue number and services in connection with item.

Y74.2010A ACCESSORIES COMMON REQUIREMENTS - WHITE PLASTIC PLATES, FLUSH INSTALLATION:

Area of installation - Interior.
Enclosure pattern - Flush.
Accessory mounting
  Adjustable steel grid for grid switches or direct to enclosure for all other accessories.
Enclosure material- Pressed steel.
Enclosure finish - Galvanized.
Coverplate finish, all accessories to match
  Moulded plastic, colour - white.
Coverplate pattern - Overlapping; with architrave where indicated.
Ancillaries
  Earthing terminal integral within switch box.
  Neon indicator with red lens, illuminated in "ON" position, for connection units.
  Switch rocker bar colour - white.
  Operating keys for key operated switches, minimum number 2.
  Fuses to BS 1362.
  Blank inserts for spare ways on grid switches.
Marking
  Method - engraving. Mark front plate to indicate equipment served on connection units.
Conduit and cable entries
  Knockouts side, top and rear.
Cable termination - Manufacturer's standard.

Y74.2010B ACCESSORIES COMMON REQUIREMENTS - MATT FINISH METAL PLATES, FLUSH INSTALLATION:

Area of installation - Interior.
Enclosure pattern - Flush.
Accessory mounting
Adjustable steel grid for grid switches or direct to enclosure for all other accessories.
Enclosure material - Pressed steel.
Enclosure finish - Galvanized.
Coverplate finish, all accessories to match
Brass with matt chrome surface.
Coverplate pattern - Overlapping; with architrave where indicated.
Ancillaries
Earthing terminal integral within switch box.
Neon indicator with red lens, illuminated in "ON" position, for connection units.
Switch rocker bar colour as indicated.
Operating keys for key operated switches, minimum number 2.
Fuses to BS 1362.
Blank inserts for spare ways on grid switches.
Marking
Method - engraving. Mark front plate to indicate equipment served on connection units.
Conduit and cable entries
Knockouts side, top and rear.
Cable termination - Manufacturer's standard.

Y74.2010C ACCESSORIES COMMON REQUIREMENTS - WHITE PLASTIC PLATES, EMBEDDED CABLES, SURFACE INSTALLATION:

Area of installation - Interior.
Enclosure pattern - Surface.
Accessory mounting - Direct to enclosure.
Enclosure material - White moulded plastic.
Coverplate finish, all accessories to match
Moulded plastic, colour - white.
Coverplate pattern - Surface type.
Ancillaries
Earthing terminal integral within switch box.
Neon indicator with red lens, illuminated in "ON" position, for connection units.
Switch rocker bar colour as indicated.
Operating keys for key operated switches, minimum number 2.
Fuses to BS 1362.
Marking
Method - engraving. Mark front plate to indicate equipment served on connection units.
Conduit and cable entries
Knockouts side, top and rear.
Cable termination - Manufacturer's standard.

Y74.2010D ACCESSORIES COMMON REQUIREMENTS - METAL CLAD PLATES, SURFACE STEEL CONDUIT INSTALLATION:

Area of installation - Interior.
Enclosure pattern - Surface.
Accessory mounting - Direct to enclosure.
Enclosure material
Pressed steel or cast iron.
Enclosure finish
As conduit system or galvanized.
Coverplate finish, all accessories to match
Metal clad.
Coverplate pattern - Surface type.
Ancillaries
Earthing terminal integral within switch box.
Neon indicator with red lens, illuminated in "ON" position, for connection units.
Switch rocker bar colour as indicated.
Operating keys for key operated switches, minimum number 2.
Fuses to BS 1362.
Marking
Method - engraving. Mark front plate to indicate equipment served on connection units.
Conduit and cable entries
Threaded entries, top, bottom or side to suit conduit system.
Cable termination - Manufacturer's standard.

Y74.2010E ACCESSORIES COMMON REQUIREMENTS - SURFACE, STEEL CONDUIT, WEATHERPROOF INSTALLATION:

Area of installation - Exterior.
Enclosure pattern - Surface and weatherproof.
Accessory mounting - Direct to enclosure.
Enclosure material - Cast iron.
Enclosure finish - As conduit system or galvanized.
Coverplate finish, all accessories to match
As enclosure.
Coverplate pattern - Surface type.
Ancillaries
Earthing terminal integral within switch box.
Neon indicator with red lens, illuminated in "ON" position, for connection units.
Screwed weathering cap and chain for socket outlets.
Operating keys for key operated switches, minimum number 2.
Fuses to BS 1362.
Marking
Method - engraving. Mark front plate to indicate equipment served on connection units.
Conduit and cable entries

Threaded entries, top, bottom or side to suit conduit system.
Cable termination - Manufacturer's standard.

Y74.2010F ACCESSORIES COMMON REQUIREMENTS - SURFACE, PLASTIC, WEATHERPROOF INSTALLATION:

Area of installation - Exterior.
Enclosure degree of protection to BS EN 60529:1992+A2:2013, IP 54.
Enclosure pattern - Surface and weatherproof.
Accessory mounting - Direct to enclosure.
Enclosure material - Impact resistant plastic.
Enclosure finish - Natural or self coloured.
Coverplate finish, all accessories to match
Moulded plastic, colour as indicated.
Coverplate pattern - Surface type.
Ancillaries
Earthing terminal integral within switch box.
Neon indicator with red lens, illuminated in "ON" position, for connection units.
Protective shrouds to rocker bars.
Screwed weathering cap and chain for socket outlets.
Switch rocker bar colour as indicated.
Operating keys for key operated switches, minimum number 2.
Fuses to BS 1362.
Conduit and cable entries
Threaded entries to suit cable/conduit system.
Cable termination - Manufacturer's standard.

Y74.2010G ACCESSORIES COMMON REQUIREMENTS - BRONZE FINISH METAL PLATES, FLUSH INSTALLATION:

Area of installation - Interior.
Enclosure pattern - Flush.
Accessory mounting
Adjustable steel grid for grid switches or direct to enclosure for all other accessories.
Enclosure material - Pressed steel.
Enclosure finish - Galvanized.
Coverplate finish, all accessories to match
Brass with BMA/bronze surface.
Coverplate pattern - Overlapping; with architrave where indicated.
Ancillaries
Earthing terminal integral within switch box.
Neon indicator with red lens, illuminated in "ON" position, for connection units.
Switch rocker bar colour as indicated.
Operating keys for key operated switches, minimum number 2.
Fuses to BS 1362.
Blank inserts for spare ways on grid switches.
Marking

Method - engraving. Mark front plate to indicate equipment served on connection units.
Conduit and cable entries
Knockouts side, top and rear.
Cable termination - Manufacturer's standard.

Y74.2020A INTERIOR LIGHTING SWITCHES - GENERAL PURPOSE MOULDED PLASTIC:

Standard - BS EN 60669-1:1999+A2:2008, enclosure box to BS 4662:2010.
Switch type - Rocker bar - moulded plastic.
Rating - 5A or 15A.
Gangs as indicated.
Switch mechanism - Snap action microgap.
Pole configurations
Single pole, double pole, 2 way or intermediate as indicated.

Y74.2020B INTERIOR LIGHTING SWITCHES - GRID MOULDED PLASTIC:

Standard - BS EN 60669-1:1999+A2:2008, enclosure box to BS 4662:2010.
Switch type - Rocker bar - moulded plastic.
Rating - 5A or 15A.
Switch mechanism - Snap action microgap.
Pole configurations
Single pole, 1 way, 2 way or intermediate as indicated.

Y74.2020C INTERIOR LIGHTING SWITCHES - PULL CORD:

Standard - BS EN 60669-1:1999+A2:2008, enclosure box to BS 4662:2010.
Switch type - Cord to BS EN 61058-2-1:2011.
Rating - 5A.Pole configurations - Single pole.

Y74.2020D INTERIOR LIGHTING SWITCHES - GENERAL PURPOSE SECRET KEY:

Standard - BS EN 60669-1:1999+A2:2008, enclosure box to BS 4662:2010.
Switch type - Rocker bar - secret key.
Rating - 5A or 15A.
Gangs as indicated.
Switch mechanism - Snap action microgap.
Pole configurations - Single pole, double pole, 2 way or intermediate as indicated.

Y74.2020F INTERIOR LIGHTING SWITCHES - GRID SECRET KEY:

Standard - BS EN 60669-1:1999+A2:2008, enclosure box to BS 4662:2010.

Switch type - Rocker bar - secret key.
Rating - 5A or 15A.
Switch mechanism - Snap action microgap.
Pole configurations - Single pole, 1 way, 2 way or intermediate as indicated.

Y74.2030A EXTERIOR LIGHTING SWITCHES - METAL CLAD ROTARY:

Standard - BS EN 60669-1:1999+A2:2008, enclosure box to BS 4662:2010.
Switch type - Rotary disc or lever operating through sealing gland.
Rating - 5A.
Gangs as indicated.
Action - Two position.
Pole configurations as indicated.

Y74.2030B EXTERIOR LIGHTING SWITCHES - SEALED ROCKER BAR:

Standard - BS EN 60669-1:1999+A2:2008, enclosure box to BS 4662:2010.
Switch type - Rocker bar with sealed in plastic membrane.
Rating - 5A.
Gangs as indicated.
Action - Two position.
Pole configurations as indicated.

Y74.2040B TIME SWITCHES - 7 DAY:

Wire timer and switch circuits to separate terminals.
Standard - BS EN 60730-2-7:2010.
Time switch type
  Quartz stabilized solid state 50 hour nickel cadmium battery backup.
Contacts duty - Inductive.
Contacts rating - 15A.
Special programme facilities
  Number of "ON" and "OFF" operations - 4
Programme repeat cycle - 7 day.

Y74.2060A LAMPHOLDERS - BC TYPE:

Standard - BS EN 61184:2008+A1:2011.
Lampholder type - Bayonet clip - B22.
Fixing - Bracket - straight or angle, or suspension as indicated.
Finish - Manufacturer's standard.
Material - Heat resistant moulded plastic.
Ancillaries
  Cord grip, lampshade ring or protective lampshade ring as indicated.

Y74.2060B LAMPHOLDERS - ES TYPE:

Standard - BS EN 60238:2004+A2:2011.
Lampholder type - Edison screw - E27.
Fixing - Bracket - straight or angle, or suspension as indicated.
Finish - Manufacturer's standard.
Material - Heat resistant moulded plastic.
Ancillaries
Cord grip, lampshade ring or protective lampshade ring as indicated.

Y74.2070A ISOLATING SWITCHES - BS EN 60669-1:1999+A2:2008:

Provide isolating switches for fixed appliances.
Utilization category as indicated.
Making capacity as indicated.
Standard - BS EN 60669-1:1999+A2:2008, enclosure box to BS 4662:2010.
Switch type - Rocker bar.
Rating as indicated.
Pole configuration - DP, three pole or TPN as indicated.

Y74.2070B ISOLATING SWITCHES - BS EN 60947-3:2009+A2:2015:

Provide isolating switches for fixed appliances.
Utilization category as indicated.
Making capacity as indicated.
Standard - Enclosure box to BS 4662:2010, BS EN 60947-3:2009+A2:2015.
Switch type - Rocker bar.
Rating as indicated.
Pole configuration - DP, three pole or TPN as indicated.

Y74.2080A FUSE CONNECTION UNITS - SWITCHED:

Standard - BS 1363-4:2016, enclosure box to BS 4662:2010 and switched.
Unit type - Rocker bar - plastic.
Pole configuration - DP.
Ancillaries
Cord outlet or cord grip and fuse as indicated.

Y74.2080B FUSE CONNECTION UNITS - UNSWITCHED:

Standard - BS 1363-4:2016, enclosure box to BS 4662:2010 and unswitched.
Pole configuration - DP.
Ancillaries
Cord outlet or cord grip and fuse as indicated.
Lockable fuse carrier.

Y74.2090A SOCKET-OUTLETS - SINGLE, SWITCHED:

Standard - 13A socket-outlet to BS 1363:2016, enclosure box to BS 4662:2010.
Switching - Switched.
Switch type - Rocker bar - plastic.
Rating - 13A.
Ancillaries
Plug tops 25% of number of sockets, fused as indicated.
Gangs - 1

Y74.2090B SOCKET-OUTLETS - SINGLE WITH INTEGRAL RCD, SWITCHED:

Standard - Enclosure box to BS 4662:2010, BS 7288:2016.
Switching - Switched
Switch type - Rocker bar - plastic.
Rating - 13A.
Ancillaries
RCD, BS 7288:2016. Mains failure trip, sensitivity as indicated. Plug tops 25% of number of sockets, fused as indicated.
Gangs - 1

Y74.2090C SOCKET-OUTLETS - DOUBLE SWITCHED:

Standard - 13A socket-outlet to BS 1363:2016, enclosure box to BS 4662:2010.
Switching - Switched
Switch type - Rocker bar - plastic.
Rating - 13A.
Ancillaries
Plug tops 25% of number of sockets, fused as indicated.
Gangs – 2

Y74.2090D SOCKET-OUTLETS - SINGLE, UNSWITCHED:

Standard - 13A socket-outlet to BS 1363:2016, enclosure box to BS 4662:2010.
Switching - Unswitched.
Rating - 13A.
Gangs - 1

Y74.2090E SOCKET-OUTLETS - SINGLE WITH INTEGRAL RCD, UNSWITCHED:

Standard - Enclosure box to BS 4662:2010, BS 7288:2016.
Switching - Unswitched.
Rating - 13A.
Ancillaries
RCD, BS 7288:2016. Mains failure trip, sensitivity as indicated.
Gangs - 1

Y74.2130A TELEPHONE AND DATA OUTLET SOCKETS - GENERAL PURPOSE:

Standard
For jack socket to BS 6312 and enclosure box to BS 4662:2010.
Size - Standard.
Circuit configurations as indicated.

Y74.2140A TELEPHONE CORD OUTLETS - GENERAL PURPOSE:

Standard - BABT approved.
Circuit configurations - Single or twin as indicated.

Y74.2190A SHAVER POINTS - BATHROOM AND WASHROOM USE:

Provide shaver points, internally switched by plug insertion.
Standard
BS EN 61558-2-9, BS EN 61558-1 and BS EN 61558-2-23, enclosure box to BS 4662:2010.
Rating - 20VA.
Components
Double wound single phase transformer 240/240V and 110V to BS EN 61558-2-9, BS EN 61558-1 and BS EN 61558-2-23.
Internal overload protection.
Marking - Input and output voltages and "SHAVERS ONLY".

Y74.2200A INDICATOR LAMPS - GENERAL PURPOSE NEON:

Lamp - Neon.
Lamp rating - 230V supply.
Lens cover - Moulded plastic.
Lens colour - BS EN 60073:2002.
Lens retaining rings - Moulded plastic.

Y74.3010 EARTHING:

Ensure metal framework of equipment is bonded to main earth point. Ensure that cable CPC's are connected to earth bar.
Provide earth CPC between earth lug on metal box and accessory casing except where accessory is encased in plastic.

Y74.3020 PROTECTION:

Ensure there is no physical or electrical damage to accessories when they are removed from their packaging and during installation.
Provide masking covers for surface mounted accessories to protect surface from

paint.
Where accessories are flush mounted install front plate after painting is finished.

Y74.3030 FIXING:

Align accessories horizontally and vertically. Where accessories are grouped, mount horizontally in line and parallel to each other and equidistant.
Fix cover plates to boxes with brass fixing screws.

Y74.3040 MEASURING MOUNTING HEIGHTS:

Take measurement for position of electrical accessories to the centre line of equipment from either finished floor or worktop. Where specified height coincides with top of tiling, leave a clear gap of 50mm above tiling.
Mount equipment below a worktop 100mm below underside of worktop.

Y74.3050 STANDARD ACCESSORIES MOUNTING HEIGHTS:

Accessory	Location	Height (mm)
Lighting switch		1200
Socket outlet	General	450
	Kitchen	1000
	Above worktop	200
Shaver socket outlet		1000
Fused connection unit	General	450
	Above worktop	200
Fused connection unit controlling		
Radiator heater, wall		1800
Radiator heater, focal point		450
Tubular heater		450
Clock		1900
Cooker control unit	Above worktop	200
Cooker connection unit		600
Safety isolating transformer		1200
Room thermostat		1400
Telephone outlet		450
Radio/TV outlet		450
Push button		1200
Fire alarm manual call point		1200
Bell or buzzer		2000
Visible alarm indicator		2000

In car parks and garages comply with appropriate petroleum regulation for mounting heights of socket outlets.

Y74.3070 ACCESSORIES MOUNTING HEIGHTS:

Provide switches and socket outlets for lighting and other equipment in habitable rooms at appropriate heights between 450mm and 1200mm from finished floor level, in accordance with Building Regulations Approved Document M and BS 8300:2009+A1:2010.

Y80 EARTHING AND BONDING COMPONENTS

Y80.1000 GENERAL

Y80.1010 MATERIALS GENERALLY:

Use materials and installations methods in accordance with BS 6651, BS 7671, BS 7430, Electricity, Safety, Quality and Supply Regulations and Local Electricity Supply Authority Requirements as appropriate.

Y80.2040B ROD EARTH ELECTRODES FOR SYSTEM EARTHING:

Standard - BS 7430.
Form - rod with female thread each end.
Dimensions
Rod Diameter - 15 mm - nominal.
Rod Length - 2.4m (2 x 1.2) minimum.
Earth electrode couplings
Use high strength driving cap in contact with driven rod and couplings of compatible material fully enclosing the rod threads.
Interconnect electrodes using bare copper tape 25mm x 6mm.
Earth electrodes in drawpits
Provide concrete cover, permanently labelled, for electrodes installed through cable drawpit bases.
Main earth conductor connection
Connect main earth conductor to first electrode using heavy duty purpose made silicon aluminium bronze body conductor clamp and high tensile phosphor bronze bolt.
Material, minimum size as BS 7430 Table 4 - Copper.
Accessories
Rod to tape clamp. Sized to suit earth rod and connector.

Y80.2040D BUILDING OR STRUCTURAL ELEMENT EARTH ELECTRODES FOR SYSTEM EARTHING:

Standard - BS 7430.
Form - Building or structural element.
Earth electrode couplings
Use high strength driving cap in contact with driven rod and couplings of compatible material fully enclosing the rod threads.
Interconnect electrodes using bare copper tape 25mm x 6mm.
Earth electrodes in drawpits
Provide concrete cover, permanently labelled, for electrodes installed through cable drawpit bases.
Main earth conductor connection
Connect main earth conductor to first electrode using heavy duty purpose made silicon aluminium bronze body conductor clamp and high tensile phosphor bronze

bolt.
Material, minimum size as BS 7430 Table 4 - Copper.
Accessories
Rod to tape clamp. Sized to suit earth rod and connector.

Y80.2060A EARTH ELECTRODE CLAMPS:

Connect tape to electrode head using heavy duty purpose made silicon aluminium bronze body connector clamps or leaded gunmetal body connector clamps, and high tensile phosphor bronze bolts to BS EN 12163:2016.

Y80.2070A EARTH ELECTRODE INSPECTION FACILITIES:

Provide enclosure for each connection between earth conductor and associated earth electrode system. Install so that top is flush with finished ground or floor level. Ensure enclosure provides adequate access for testing purposes. Provide pit details for builders work.
Labelling - Wording, Earth.

Y80.2090A MAIN EQUIPOTENTIAL BONDS:

Provide main equipotential bonds in accordance with BS 7430 and BS 7671.
Material - Insulated cable, single core to BS 6004.
Use no joints in main equipotential bonds.

Y80.2100A SUPPLEMENTARY EQUIPOTENTIAL BONDS:

Provide supplementary equipotential bonds to BS 7430 and BS 7671. Joints not allowed in these bonds.
Material - Insulated cable, single core to BS 6004.

Y80.2110A CIRCUIT PROTECTIVE CONDUCTORS:

Material
Insulated cable, single core to BS 6004 as indicated; metallic screwed conduits (excluding flexible); metallic trunking with tinned copper links; armouring and/or metallic sheathing of armoured cables or integral conductor of multi-core cable.
Size
Provide protective conductors sized in accordance with BS 7671 (IET Regulations) 543-01-03 and Tables 54.2, 54.3, 54.4, 54.5 and 54.6 or provide protective conductors sized in accordance with BS 7671 (IET Regulations) 543-01-04 and Table 54.7.

Y80.2120 EARTHING CLAMPS:

Use clamps complying with BS 951, for bonding pipes and lead sheathed cables.

Y80.2130A EARTH BUSBARS:

Material
Manufacture earth busbars from hard drawn, tinned, high conductivity copper bar.
Substation Earth busbar
75 x 13mm cross section 600mm minimum length.
Main Earth Terminal busbar
25 x 6 mm minimum for incoming live conductor not exceeding 50mm and 50 x 6 mm minimum for incoming live conductor over 50mm^2.

Y80.2140 TEST LINKS:

Provide two test links, in connections between main earth conductors and earth busbar. Fabricate each from two additional sections of earth busbar. Mount one section on stand-off insulators matching earth busbar; use remaining section as removable test link. Secure 12mm high tensile brass studs to fixed sections of busbar and drill corresponding clearance holes in test links and provide brass washers, nuts and locking devices to secure frame/neutral earthing and test links.

Y80.2150 LUGS/TAGS:

Provide lugs or tags to enable connection of bonding conductors to equipment earth terminals.

Y80.2160 PROTECTIVE CABLE TERMINATIONS:

For bolted connections use crimp type lugs compressed by automatic tool to achieve correct pressure and crimp depth.

Y80.2170 PROTECTIVE CONDUCTOR WARNING NOTICES/LABELS:

Provide a permanent label durably marked in letters 4.75mm minimum height "SAFETY ELECTRICAL CONNECTION - DO NOT REMOVE", in visible position, at each bonding conductor connection to extraneous conductive parts.

Y80.2180 MAIN EARTH CONDUCTOR - WARNING TAPES:

Provide green/yellow PVC tapes labelled "EARTHING CONDUCTOR" over complete external lengths of main earth conductors at 300mm depth below finished ground.

Y80.2190 EARTH BAR LABEL:

Label earth bar "SAFETY ELECTRICAL CONNECTION - DO NOT REMOVE" with wall mounted laminated plastic tablet engraved in 10mm high red letters on white ground.

Y80.3010 CLEAN EARTH DISTRIBUTION:

Install clean earth distribution in double insulated cables from earth electrodes to equipment points. Mount all busbars with insulators and separate from other earthing systems.

Y80.3020 DISSIMILAR METALS:

Ensure, where dissimilar metals are used for system, that purpose made jointing materials are used such that corrosion and deterioration of the electrical connection are not caused. Ensure bonding connections to other metal parts of building are electrolytically compatible with those metal parts. Use the guidance given in BS 7430 Table 8 when bonding dissimilar materials.

Y80.3030A COPPER TAPE JOINTS:

Provide waterproof protection at joints subject to moisture.
Joint copper tapes by brazing, using zinc-free brazing metal with melting point at least 600^{o}C or thermic welding.

Y80.3030B ALUMINIUM TAPE JOINTS:

Provide waterproof protection at joints subject to moisture.
Joint aluminium tapes by welding to BS EN 1011-4:2000.

Y80.3040 STRANDED CONDUCTOR JOINTS:

Provide waterproof protection at joints subject to moisture.
Joint copper stranded conductors with compression joints to BS EN 61284:1998.

Y80.3050A PROTECTIVE CABLE TERMINATIONS:

For bolted connections use crimp type lugs compressed by automatic tool to achieve correct pressure and crimp depth.
Make connections between tape and equipment using high tensile grade brass bolts with brass nuts, washers and locking devices. Use phosphor bronze bolts, nuts and

washers where connections are liable to corrosion.

Y80.3060A EARTH ELECTRODES:

Location

Locate electrodes not less than 2m distant from building/structure protected, and away from telecommunication and pilot cables and metallic fences.

Driving

Drive rods vertically into ground with purpose designed electric hammer. (Where impenetrable strata encountered at shallow depth, drive at 30^{o} to horizontal).

Depth of rod

2.4m minimum below finished ground surface.

Depth of Electrode heads

Locate electrode heads just below ground level.

Spacing

Where electrodes are installed in a group ensure minimum distance between electrodes is twice depth of rods. Where rods for clean earth are installed ensure distance from any other system rods is six times depth of clean rods.

Tape Depth

Install interconnecting or electrode tape 750mm below finished ground level, rising vertically at each electrode.

Connect groups of electrodes to main earth conductor via bolted link in inspection pit as BS 7430 for test purposes.

Y81 TESTING AND COMMISSIONING OF ELECTRICAL SERVICES:

Y81.1000 GENERAL

Y81.1010 INSPECTION AND TEST PROCEDURE:

Comply with BS 7671 Requirements for Electrical Installations (the IET Wiring Regulations), IET Guidance Notes Number 3 Inspection & Testing and other British Standards as appropriate.

Y81.1020 SUPPLY CHARACTERISTICS:

Obtain information called for in BS 7671 about supply characteristics from Supplier, other than where to be measured as part of testing procedure.

Y81.1030 DESIGN INFORMATION:

Obtain all design assumptions, calculations and any other information to enable compliance with BS 7671 to be verified.

Y81.2010A INCORPORATED EQUIPMENT CHARACTERISTICS:

Obtain and use information from manufacturers of equipment provided.
Use information provided, for equipment supplied by others and incorporated into installation.

Y81.2020A PROSPECTIVE SHORT CIRCUIT CURRENT:

Determine values of I_P by measurement, unless other means are indicated.
Determine I_P at all necessary points within installation to confirm correct equipment selections.
Obtain from supply undertaker written confirmation of maximum and minimum values of I_P at origin of installation. Adjust subsequent measured values of I_P accordingly.

Y81.2030A INITIAL VERIFICATION:

Carry out detailed inspection to verify the requirements of BS 7671, in the order given in clause for New Installation or Altered or Added Installation as appropriate.

Y81.2040A TEST EQUIPMENT AND CONSUMABLES:

Provide test equipment and consumables to complete tests satisfactorily, and to retest any failed installations following corrective measures.

Test equipment quality assurance requirements to BS EN ISO 10012.

Y81.2050A TESTING

Carry out in the same order as published the tests required by BS 7671, for New Installation or Altered or Added Installation as appropriate.

Y81.2060A CONTINUITY OF PROTECTIVE CONDUCTORS:

Confirm continuity. Use ac source or dc source.

Y81.2070A EARTH FAULT LOOP IMPEDANCE:

Use 25 A test current. Measure and record source impedance (Z_E).
If alternative LV supply arrangements are available, measure Z_S when using supply with highest impedance.
Measure Z_S with main equipotential bonding conductors connected. Do not summate values of several parts of each loop.

Y81.2080 SETTINGS AND ADJUSTMENTS:

Confirm characteristics and settings of protective devices are within maximum and minimum specified tripping times. Check correct operation of devices. Confirm interlocks and sequences operate safely and as indicated.

Y81.2090A STANDBY GENERATORS:

Perform works tests on standby generators and provide test certificates. Comply with BS 5000-3 and BS 5000-11 or BS EN 60034-3:2008 as appropriate.

Y81.2100A HV AND LV TRANSFORMERS:

Perform works tests on HV and LV switchgear in accordance with BS EN 62271-200:2004 and BS EN 60439, as appropriate, and provide test certificates.

Y81.2110A HV POWER TRANSFORMERS:

Perform works tests on HV power transformers in accordance with BS EN 60076-3:2013, BS EN 60076-4:2002 and BS EN 60076-5:2006. Provide test certificates. Perform all routine tests.

Y81.2120A FIRE DETECTION AND ALARM INSTALLATIONS:

Carry out site testing and inspection and provide test certificates for fire detection and alarm systems in accordance with BS 5839-1:2013.

Y81.2120E EMERGENCY LIGHTING INSTALLATIONS:

Carry out site testing and inspection and provide test certificates for emergency lighting installations in accordance with BS 5266 and BS EN 50172.

Y81.2130 CALIBRATION:

Provide current certificates of calibration for all instruments used during test procedures. Record particular instrument identity on record sheets.

Y81.2140A CERTIFICATION AND REPORTING:

Complete and hand over to the Client a Completion and Inspection Certificate to BS 7671 for New Installation or Altered or Added Installation as appropriate.

Y81.2150A INSTALLATION CERTIFICATES:

Provide installation certificates for electrical installations in accordance with BS 7671 (IET Regulations).
Record details of departures from BS 7671 (IET Wiring Regulations) on certificate.
Provide copies of calculations justifying departure from BS 7671 (IET Wiring Regulations) and attach to certificates.

Y81.2160 RECORDS:

Record all results and instrument readings on approved Record Sheets and hand over to the client two copies for each inspection and test.

Y81.3010 CONDUCTIVE PARTS:

Test conductive parts simultaneously accessible with exposed conductive parts of extraneous conductive parts. Establish that they are either not an extraneous conductive part, or that they are reliably connected by metal to main equipotential bonding.

Confirm conductive parts which are not extraneous conductive parts are separated from earth by an impedance greater than 50,000 ohms. Confirm other conductive parts are bonded to equipotential zone earthbar by an impedance not exceeding 0.1 ohms.

Y81.3020 PHASE SEQUENCE:

Check and confirm correct polarity of all conductors in all circuits.

Y81.3030A HIGH VOLTAGE TESTS:

Conduct high voltage tests for equipment indicated. Comply with BS 923:2015, BS EN 61180:2016 and BS EN 60060-2:2011. Comply with BS EN 61180:2016.

Y81.3040A LV BURIED CABLES:

Test continuity and insulation of buried cables immediately after back-filling. Test continuity and insulation of buried cables prior to handover.

Y81.3050 CONDUIT, TRUNKING AND DUCTING:

Test and confirm electrical continuity before installing cables.