

CORBY POOL Mechanical and Electrical replacement works

Electrical Services Specification

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Specification

The contractor shall supply and install new electrical supplies for the proposed electric Pool covers and new ventilation systems. The information provided below is to assist the contractor with their design and build responsibility. The contractor MUST visit site prior to submitting their tender and co-ordinate their tender submission with the specialists to form a complete working solution.

Generally all electrical work shall be carried out in compliance with BS7671 18th Edition with particular reference to Section 702- Swimming pools and other basins.

Pool Covers - Refer to drawing - 23700-KBS-ZZ-GF-DR-E-5001

The client is proposing to procure new pool covers to conserve energy.

The covers are to be stored on a mounting frame at high level circa 3m AFFL and are to be powered / driven out, assisted by their own weight using gravity and retracted via powered operation.

Control is to be via a local key operated switch and end of travel limit switches that enables the operators to monitor the operation only.

The proposed 4No pool covers which will cover the 50m pool are circa 3.5m from the wall.

The pool cover proposed for the learners pool benefits from a lower accessible ceiling with a height of circa 3.5m.

The pool cover motors each require a 32A single phase 230V electrical supply.

The pool cover supplier/specialist is Glatz Pioneer (UK) Ltd.

Tel 01582 668719.

The contractor shall install new electrical supplies from distribution board DB SFP, located within the second floor store room to supply the 5 No pool covers.

Each of the circuits shall be wired using 6.0mm twin and cpc cables, protected via a 32A type C, 30mA RCBO on new basket containment within "back of house areas" and contained with a stainless steel conduit (stainless steel grade 319) in other areas.

For isolation of each circuit a 32A Double Pole rotary Isolator shall be installed on the wall at high level adjacent to the new pool cover support frame. The final location of the isolator is to be determined in conjunction with the pool cover specialist requirements.

The pool cover specialist shall install a low voltage transformer adjacent to the isolator and containment from this location to the free standing posts, Via ELV cabling installed within flexible conduit supported via a stainless steel catenary wire. Local control for the pool covers shall be provided via the specialist installer, consisting of a key operated switch.

Ventilation - Refer to drawing - 23700-KBS-ZZ-00-DR-E-5000

The basement plantroom currently suffers from high humidity and a corrosive atmosphere. The proposal is to install new ventilation within the Basement plantroom to improve the environment and longevity of the equipment in the plantroom.

The contractor shall install a new TP&N electrical supply from the ground floor main switchboard to a new ventilation panel. From here 5No new outgoing circuits are to be installed to supply fan motors.

The cabling shall be carried out using XLPE/LSF/SWA/PVC cabling on a new GRP (Modar) cable tray, resistant to fire and corrosive environment conditions.

The cables and protective devices must provide full discrimination from the origin to final cable termination and all cables included within this document in **Appendix A** are to be considered as a minimum size only, the contractor is to determine the final cross sectional area of each cable depending upon length of run etc

The containment shall utilise the bracket work installed as part of the new ventilation systems wherever possible, co-ordinating the installation with the mechanical engineer and in other areas the new containment is to be supported from the ceiling using stainless steel rod and fixings (stainless steel grade 319) - marine resistant.

The contractor shall supply, install and terminate at each end a beldon 9723 cable or equivalent from the new Ventilation panel to each of the 5No motors.

The contractor shall employ a BAFE registered specialist fire alarm installer to supply and install a fire alarm interface, wired to the existing panel to enable the fans to be switched off in the event of a fire incident.

The contractor shall supply and install a Trend BMS cable and containment from the Ventilation panel to an adjacent outstation. The location is to be determined during the initial attendance on site by the contractor during the tender period.

Fire stopping is to be fully reinstated throughout prior to completing these works. The standard shall meet the existing as a minimum.

All works shall be co-ordinated by the contractor to form a complete and working system.

70-70-25/110 Earthing and bonding system

System outline

70-70-25/110 Earthing and bonding system

- **System performance:** [70-70-25/210 Design of earthing and bonding systems](#) and [70-70-25/220 Electricity distributor's requirements](#).
- **Main incoming earth:** Use existing.
- **Main earth electrode type:** Existing.
- **Main protective bonding conductors:** [90-55-15/334 Single core non-sheathed cables with LSHF insulation](#).
- **Supplementary bonding conductors:** [90-55-15/334 Single core non-sheathed cables with LSHF insulation](#) and [90-55-15/343 Single core non-sheathed cables with thermoplastic PVC insulation](#).
- **Circuit protective conductors:** Cable armour; Cable armour and auxiliary; and Core of cable.
- **Earth terminal type:** [90-75-50/310 Earth bars](#).
- **Electrical identification:** [90-90-55/390 Equipment labels and warning notices](#).
- **Execution:** [70-70-25/630 General installation](#); [70-70-25/660 Installing earthing conductor](#); [70-70-25/670 Installing main protective bonding conductors](#); and [70-70-25/680 Installing supplementary bonding conductors](#).
- **System completion:** [70-70-25/810 Inspection and testing](#) and [70-70-25/820 Documentation](#).

System performance

70-70-25/210 Design of earthing and bonding systems

- **Standards:** In accordance with [BS 7671](#) and [BS 7430](#).
- **Design:** Complete the design of the earthing and bonding systems.
- **Earthing conductor:** Size to [BS 7454](#).
- **Main protective bonding conductors:**
 - **Connect the following to the main earthing terminal:** Gas, water and telecommunications
 - **Size (minimum):** In accordance with [BS 7671](#), Regulation 544.1.1.
- **Supplementary bonding conductors:**
 - **Bond the following:** As per schematic layout.
 - **Size (minimum):** Minimum of 2.5 mm² if sheathed or where mechanical protection is provided, otherwise 4 mm².
- **Circuit protective conductors:** Size to [BS 7454](#).
- **Requirement:** Submit proposals including detailed design drawings, technical information, calculations and manufacturers' literature.

Products

90-55-15/334 Single core non-sheathed cables with LSHF insulation

Shared by: [70-70-25/110 Earthing and bonding system](#); [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [70-80-35/110 Hard wired general lighting system](#).

- **Manufacturer:** Draka or equal and approved.
- **Standards:** To [BS EN 50525-1](#) and [BS EN 50525-3-41](#).
- **Third party certification:** British Approvals Service for Cables (BASEC) certified.
- **Cable type:** H07Z-K.
- **Size:** See circuit schedule.
- **Execution:** [90-55-15/635 Installing low voltage cables type A](#) and [90-55-15/660 Installing low voltage cables in conduit and trunking type A](#).

90-55-15/343 Single core non-sheathed cables with thermoplastic PVC insulation

- **Manufacturer:** Draka or equal and approved.
- **Standards:** To [BS EN 50525-1](#) and [BS EN 50525-2-31](#).
- **Third party certification:** British Approvals Service for Cables (BASEC) certified.
- **Cable type:** H07V-K.
- **Size:** See circuit schedule.
- **Execution:** [90-55-15/635 Installing low voltage cables type A](#) and [90-55-15/660 Installing low voltage cables in conduit and trunking type A](#).

90-75-50/310 Earth bars

- **Manufacturer:** Eaton
- **Material:**
 - **Bar type:** Hard drawn copper to [BS EN 13601](#).
 - **Support:** PVC-U.
- **Size:**
 - **Profile:** 50 mm x 6 mm.
 - **Min Length:** 320mm` with 20% spare capacity
- **Predrilled connections (minimum):** Manufacturer's standard.
- **Disconnecting links:** Manufacturer's standard.
- **Execution:** [90-75-50/610 Installing earth bars](#).

90-90-55/390 Equipment labels and warning notices

Shared by: [70-70-25/110 Earthing and bonding system](#); [70-70-45/110 Low voltage distribution system](#); and [70-70-75/110 Hard wired low voltage small power system](#).

- **Manufacturer:** Submit proposals.
- **Material:** Engraved anodized aluminium.
- **Label size:** Manufacturer's standard.
- **Colour:**
 - **Background:** Manufacturer's standard.
 - **Lettering:** Manufacturer's standard.
- **Typography:**
 - **Font:** Manufacturer's standard.
 - **Size:** Manufacturer's standard.
- **Notice wording:** Manufacturer's standard.

Execution**70-70-25/630 General installation**

- **Standards:** In accordance with [BS 7430](#) and [BS 7671](#).

70-70-25/660 Installing earthing conductor

- **Conductor location:** Install between the main incoming earth and the main earthing terminal in one continuous length.
- **Connection:** Make with compression lugs and phosphor bronze nuts and bolts and spring washers.
- **Earthing conductor route:** Contractor's choice.
- **Connection to earth electrodes:** Heavy duty copper alloy mechanical clamps.
- **Protection to earthing conductor:** Rigid conduit.

70-70-25/670 Installing main protective bonding conductors

- **Separate and continuous connections:** Install between each service and the main earth terminal.
- **Bonding conductor routes:** Contractor's choice.
- **Bonding connections at main earth terminal:** Connect with compression lugs and phosphor bronze nuts and bolts and spring washers.

70-70-25/680 Installing supplementary bonding conductors

- **Earth connections:** Connect with compression lugs.

90-55-15/635 Installing low voltage cables type A

Shared by: [90-55-15/330 Fire resistant screened \(LSHF\) cables type A](#); [90-55-15/334 Single core non-sheathed cables with LSHF insulation](#); [90-55-15/340 Multicore screened thermosetting insulated \(LSHF\) sheathed cables](#); [90-55-15/343 Single core non-sheathed cables with thermoplastic PVC insulation](#); and 90-55-15/350 Thermosetting insulated and thermoplastic sheathed (LSHF) cables; [type A](#) and [type B](#).

- **Standard:** In accordance with [BS 7671](#).
- **Timing:** Do not start internal cabling until building enclosure provides permanently dry conditions.
- **Preparation:** Store cables above 5°C for 24 hours before installation.
Clear cable path of debris.
- **Installation temperature (minimum):** 5°C.
- **Cables:** Install in one length. Dress cables flat, free from twists, kinks and strain.
- **Cable pulling:** Do not overstress. Prevent kinks and twisting of the cable.
- **Cable protection:** Cables passing through walls and floors to be sleeved with conduit or pipeduct to a minimum of 300 mm. Bush at both ends. Ensure that appropriate fire stopping materials are used to maintain the original fire integrity of the wall or floor around the penetration.
- **Concealed cable runs to wall accessories:** Run vertically from the accessory.
- **Exposed cable runs:** Direct to surface.
- **Distance from other services running parallel (minimum):** 150 mm. Position cables below heating pipes.
- **Jointing and termination:**
 - **Final circuit cables:** At electrical accessories only.
 - **Core connections:** Using compression lugs to equipment without integral clamping terminals.
 - **Terminating cables when not using glands:** Take sheathing of cables into accessory boxes and equipment and protect against abrasion with grommets.

90-55-15/660 Installing low voltage cables in conduit and trunking type A

Shared by: [90-55-15/334 Single core non-sheathed cables with LSHF insulation](#); [90-55-15/343 Single core non-sheathed cables with thermoplastic PVC insulation](#); and [90-55-15/350 Thermosetting insulated and thermoplastic sheathed \(LSHF\) cables type A](#).

- **Cable installation:** Orderly and capable of being withdrawn.
- **Single core wiring:** Arrange using the loop-in method.
- **Cables within trunking:** Tie at 2 m intervals for cables of the same circuit reference. Label ties with circuit reference number at 10 m intervals.
- **Cables in vertical conduit:** Provide cable clamps in accessible conduit boxes at 10 m intervals.
- **Extra low voltage cables:** Install within a separate partition from low voltage cables where installed in multi compartment trunking.

System completion

70-70-25/810 Inspection and testing

- **Standards:** In accordance with [BS 7430](#) and [BS 7671](#).
- **Notice before commencing tests (minimum):** 24 h.
- **Continuity of protective conductors:**
 - **Parallel earth paths:** Isolate before testing.
 - **Equipment:** Continuity tester with short circuit current not less than 200 mA, and a no load d.c. or a.c. voltage between 4 V and 24 V.
- **External earth fault loop impedance (Z_e):** Direct measurement.
- **Earth fault loop impedance (Z_s):** Calculate from measurement of the sum of the resistance of the line conductor and the resistance of the circuit protective conductor and addition to external earth loop impedance (Z_e).

70-70-25/820 Documentation

- **Operating and maintenance instructions:**
 - **Scope:** Submit for the system giving optimum settings for controls.
 - **Product information:** Include product description, date of purchase, performance characteristics, application (suitability for use), method of operation and control, and cleaning and maintenance requirements.
 - **Format:** Paper copy.
 - **Number of copies:** Two.
- **Record drawings:**
 - **Content:** Location and arrangement of plant in plant rooms; Location, size and route of earth electrodes; and Location of earth terminals.
 - **Format:** A1 paper print drawing and Electronic drawing.
 - **Number of copies:** Two.
- **Submittal date:** At handover.

70-70-40/110 Inspection and testing of new low voltage electrical installations or changes to an existing installation

System outline

70-70-40/110 Inspection and testing of new low voltage electrical installations or changes to an existing installation

- **General requirements:**
 - **Electrical test engineer:** Electrical installation contractor.
 - **Approval:** [National Inspection Council for Electrical Installation Contracting \(NICEIC\)](#).
 - **Evidence of approval:** Submit.
 - **Test equipment calibration:** UKAS approved.
- **Execution:** [70-70-40/610 Test equipment calibration](#) and [70-70-40/620 Inspection and testing electrical installations generally](#).
- **System completion:** [70-70-40/860 Electrical installation certificates](#).

Execution

70-70-40/610 Test equipment calibration

- **Test equipment calibration:** UKAS approved.

70-70-40/620 Inspection and testing electrical installations generally

- **Standards:** In accordance with [BS 7671](#) and [IET Guidance Note 3](#).
- **Notice before commencing tests (minimum):** 24 h.
- **Installed equipment standards:** Verify and confirm compliance with the relevant equipment standards.
Verify and confirm that all parts of the fixed installation are selected and erected correctly.
Verify and confirm that the fixed installation is free from visible damage or otherwise defective.
- **Electronic devices:** Isolate to prevent damage during testing.
- **Continuity of protective conductors:**
 - **Parallel earth paths:** Isolate before testing.
 - **Equipment:** Continuity tester with short circuit current of at least 200 mA, and a no load d.c. or a.c. voltage between 4 V and 24 V.
- **Insulation resistance (minimum):**
 - **SELV and PELV circuits:** 1 megohm when tested at 250 V d.c.
 - **Other circuits less than or equal to 500 V (excluding SELV and PELV):** 2 megohm when tested at 500 V d.c.
 - **Circuits above 500 V:** 2 megohm when tested at 1000 V d.c.
- **External earth fault loop impedance (Ze):** Direct measurement.
- **Connection of test equipment to existing switchgear:** Contractor's choice.
- **Earth fault loop impedance (Zs):** To be calculated from measurement of the sum of the resistance of the phase conductor and the resistance of the circuit protective conductor.
- **Measurement locations:** Origin, switchgear, fixed equipment and outlets, circuit extremities.
- **Prospective fault current:**
 - **Method:** Direct measurement.
 - **Location:** Origin, and at points where protective devices are required to operate under fault conditions.
- **Phase sequence:** Verify.
- **Cable containment:** Measure electrical continuity and insulating properties of containment. Submit results.

System completion

70-70-40/860 Electrical installation certificates

- **Standard:** In accordance with [BS 7671](#), Appendix 6 and To [National Inspection Council for Electrical Installation Contracting \(NICEIC\)](#) standard.
- **Format:** Electronic, type written results.
- **Test equipment identity:** Record on test certificates.
- **Certificates of calibration:** Submit for each test instrument.
- **Schedule of test results:** Submit two copies.

70-70-45/110 Low voltage distribution system

System outline

70-70-45/110 Low voltage distribution system

- **System performance:** [70-70-45/215 Low voltage distribution circuit cables generally](#).
- **Connection to low voltage supply:** Existing.
- **Switchgear:** [90-50-45/410 Distribution boards](#);
[90-50-45/448 Fuse-switch disconnectors](#);
and .
- **Distribution circuit cabling:** [90-55-15/334 Single core non-sheathed cables with LSHF insulation](#);
[90-55-15/324 Thermosetting insulated and thermoplastic sheathed \(LSHF\) armoured cables](#);
[90-55-15/330 Fire resistant screened \(LSHF\) cables type A](#);
and [90-55-15/350 Thermosetting insulated and thermoplastic sheathed \(LSHF\) cables type A](#).
- **Cable accessories:** [90-55-10/310 Cable cleats](#) and [90-55-10/315 Cable ties](#).
- **Containment:** [90-55-10/335 Cable trays](#);
[90-55-10/380 Rigid conduit](#);
and [90-55-10/410 Cable trunking and cable ducting for wall and floor mounting](#).
- **Containment accessories:** [90-55-10/460 Conduit fittings](#).
- **Rewireable installation:** Required.
- **Concealed installation:** Required.
- **Monitoring and metering:** [90-65-55/320 Digital metering equipment](#).
- **Power conditioning equipment:** [90-60-30/410 Surge protective devices for low voltage power supplies](#).
- **Accessories:** [90-50-45/470 Control and protective switching devices](#) and [90-50-75/310 Electrical insulating matting](#).
- **Electrical identification:** [90-90-55/390 Equipment labels and warning notices](#);
[90-90-55/395 Electrical diagrams](#);
and [90-90-55/320 Electrical shock treatment signs](#).
- **Execution:** [70-70-45/610 Removing low voltage distribution systems](#);
[70-70-45/625 Installing low voltage distribution systems](#);
and [70-70-45/650 Connection to the incoming supply](#).
- **System completion:** [70-70-45/810 Inspecting, testing and commissioning of switchgear generally](#).

System performance

70-70-45/215 Low voltage distribution circuit cables generally

- **Proposed selection of low voltage distribution cables:** Submit drawings, technical information, calculations and manufacturers' literature.
- **Conductor sizes (minimum):** Submit proposals.
- **Cable sizes not stated:** Submit.
- **Format:** Amtech and Hevacomp.

Products

90-50-45/410 Distribution boards

- **Manufacturer:** Eaton or to match existing distribution board.
- **Standards:** To [BS EN 61439-1](#) and [BS EN 61439-3](#).
- **Third party certification:** Manufacturer's standard.
- **Rated operational voltage (Ue):** 415 V.
- **Incoming device:** [90-50-45/450 Switch-disconnectors](#).
- **Outgoing devices:**
 - **Type:** [90-60-30/350 Residual current circuit breakers with integral overcurrent protection](#).
 - **Quantity:** As defined by contractor design
- **Busbars and connections:**
 - **Type:** Fully shrouded.
 - **Rated operational current (Ie):** 250 A.
 - **Rated short-time withstand current (Icw) for 1 s:** 25 kA.
- **Neutral and earth bars:** Individual terminal for each outgoing circuit.
- **Neutral terminations:** Match current carrying capacity of phase conductor.
- **Spare ways:** As Circuit schedules.
- **Enclosure:**
 - **Ingress protection (minimum):** To [BS EN 60529](#), IP20.
 - **Material:** Steel.
 - **Finish:** Manufacturer's standard.
 - **Colour:** Manufacturer's standard.
 - **Locking mechanism:** Cylinder locks with a standard key type.
- **Accessories:** Digital metering equipment.
- **Execution:** [90-50-45/665 Installing switchgear generally](#).

90-50-45/448 Fuse-switch disconnectors

- **Manufacturer:** Eaton or to match existing
- **Standards:** To [BS EN 60947-1](#) and [BS EN 60947-3](#).
- **Third party certification:** [ASTA Type test certification](#).
- **Rated operational voltage (Ue):** 415 V.
- **Rated operational current (In):** 100 A.
- **Rated operational frequency:** 50 Hz.
- **Switch arrangement:** TPSN.
- **Rated short-time withstand current (Icw) for 1 s:** Manufacturer's standard.
- **Utilization category:** Manufacturer's standard.
- **Terminals:** Manufacturer's standard.
- **Mechanical interlocking:** Manufacturer's standard.
- **Enclosure:**
 - **Ingress protection (minimum):** Manufacturer's standard.
 - **Impact protection (minimum):** Manufacturer's standard.
 - **Material:** Manufacturer's standard.
 - **Finish:** Manufacturer's standard.
 - **Colour:** Manufacturer's standard.
 - **Gland plates:** Manufacturer's standard.

- **Fuses:** Manufacturer's standard.
- **Execution:** [90-50-45/665 Installing switchgear generally.](#)

90-50-45/450 Switch-disconnectors

- **Manufacturer:** Eaton or to match existing.
- **Standards:** To [BS EN 60947-1](#) and [BS EN 60947-3](#).
- **Third party certification:** [ASTA Type test certification](#).
- **Rated operational voltage (Ue):** 415 V.
- **Rated operational current (In):** As indicated on the schematic diagrams included
- **Rated operational frequency:** Manufacturer's standard.
- **Switch arrangement:** TPN.
- **Rated short-time withstand current (Icw) for 1 s:** Manufacturer's standard.
- **Utilization category:** AC-20A.
- **Terminals:** Suitable for the connection of copper conductors.
- **Mechanical interlocking:** Manufacturer's standard.
- **Execution:** [90-50-45/665 Installing switchgear generally.](#)

90-50-45/470 Control and protective switching devices

- **Manufacturer:** Eaton or to match existing distribution board
- **Standards:** To [BS EN 60947-1](#) and [BS EN 60947-6-2](#).
- **Method of operation:** Electromagnetic.
- **Method of control:** Manufacturer's standard.
- **Reset after overload:** Local manual resetting.
- **Rearming after short-circuit:** Manual via a circuit breaker.
- **Utilization category:** Manufacturer's standard.
- **Execution:** [90-50-45/665 Installing switchgear generally.](#)

90-55-10/310 Cable cleats

- **Manufacturer:** Contractor's choice.
- **Standard:** To [BS EN 61914](#).
- **Format:** Polyethylene one piece overlapping single fixing clamps.
- **Material:** Non-metallic.
- **Resistance to impact:** Medium.
- **Type of retention or resistance to electromechanical forces:** Manufacturer's standard.
- **Environmental influences:**
 - **Non-metallic and composite components:** Resistant to ultraviolet light.
 - **Metallic and composite components:** Manufacturer's standard.
 -

90-55-10/315 Cable ties

Shared by: [70-70-45/110 Low voltage distribution system](#); and [70-70-75/110 Hard wired low voltage small power system](#).

- **Manufacturer:** Submit proposals.
- **Standard:** To [BS EN 62275](#).
- **Format:** Wrap around self locking non-releasable.
- **Material:** Metal.

- **Loop tensile strength (minimum):** Manufacturer's standard.
- **Contribution to fire:** Non-flame propagating.
- **Environmental influences:**
 - **Non-metallic and composite components:** Resistant to ultraviolet light.
 - **Metallic and composite components:** Resistant to corrosion.

90-55-10/335 Cable trays

- **Manufacturer:** Legrand or equal and approved.
- **Standard:** To [BS EN 61537](#).
- **Material:** Carbon steel / GRP.
- **Resistance against flame propagation:** Flame propagating.
- **Electrical properties:**
 - **Continuity characteristics:** With electrical continuity.
 - **Conductivity characteristics:** With electrical conductive system component.
- **Coating material:** Hot dip galvanized.
- **Mechanical properties:**
 - **Cable tray free base area:** Manufacturer's standard.
 - **Resistance to impact:** Manufacturer's standard.
- **Width:** 100 mm and 200 mm.
- **Features:**
 - **Flange type:** Return.
 - **Segregation:** Manufacturer's standard.
 - **Protective cover:** Submit proposals.
- **Execution:** [90-55-10/620 Installing cable tray and cable ladder](#).

90-55-10/380 Rigid conduit

Shared by: [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [70-80-35/110 Hard wired general lighting system](#).

- **Manufacturer:** Legrand or equal and approved.
- **Standards:** To [BS EN 61386-1](#) and [BS EN 61386-21](#).
- **Mechanical properties:**
 - **Resistance to compression:** Medium.
 - **Resistance to impact:** Heavy.
- **Resistance to bending:** Rigid.
- **Electrical characteristics:** With electrical continuity properties.
- **Resistance to external influences:**
 - **Protection against ingress of solid objects (minimum):** To [BS EN 60529](#), IP3X.
 - **Protection against ingress of water (minimum):** To [BS EN 60529](#), IPX0.
- **Resistance to corrosion:** Medium protection, inside and outside.
- **Tensile strength:** Heavy.
- **Resistance to flame propagation:** Flame propagating.
- **Suspended load capacity:** Heavy.
- **Colour:** Galvanised
- **Sizes (OD):** 20 mm and 25 mm.
- **Execution:** [90-55-10/720 Installing rigid metallic conduit](#) and [90-55-10/735 Installing conduit connections to equipment](#).

90-55-10/410 Cable trunking and cable ducting for wall and floor mounting

Shared by: [70-70-45/110 Low voltage distribution system](#); and [70-70-75/110 Hard wired low voltage small power system](#).

- **Manufacturer:** Cable Duct
- **Standards:** To [BS EN 50085-1](#) and [BS EN 50085-2-1](#).
- **Installation position:** Surface mounted on the wall.
- **Format:** Manufacturer's standard.
- **Resistance to compression:** Manufacturer's standard.
- **Resistance to impact:** Manufacturer's standard.
- **Temperature properties:**
 - **Storage and transport temperature (minimum):** Manufacturer's standard.
- **Resistance to flame propagation:** Non-flame propagating.
- **Electrical properties:** With electrical continuity characteristics.
- **Protection by enclosure:**
 - **Protection against ingress of solid objects (minimum):** To [BS EN 60529](#), IP4X.
 - **Protection against ingress of water (minimum):** To [BS EN 60529](#), IPX1.
 - **Protection against access to hazardous parts (minimum):** To [BS EN 60529](#), IPXXD.
- **Access method:** With tools.
- **Screening:** Required.
- **Sizes:** 150 x 50 mm.
- **Compartments:** Two.
- **Accessories and fittings:**
 - **Generally:** Factory made by the cable trunking or ducting manufacturer and of the same material type and finish as the cable trunking or ducting.
 - **Types:** Manufacturer's standard.
- **Execution:** [90-55-10/740 Installing trunking generally](#).

90-55-10/460 Conduit fittings

Shared by: [70-70-45/110 Low voltage distribution system](#); and [70-70-75/110 Hard wired low voltage small power system](#).

- **Manufacturer:** To match conduit.
- **Standards:** To [BS EN 61386-1](#) and to [BS EN 61386-21](#), [BS EN 61386-22](#), or [BS EN 61386-23](#) as appropriate; or to [BS 4607-1](#).
- **Material:**
 - **Type:** Malleable iron where non-corrosive. Stainless were corrosive.
 - **Finish:** Malleable iron where non-corrosive. Stainless were corrosive.
- **Conduit boxes:** Fit covers of same material and finish as boxes. Include brass earthing terminals in PVC-U boxes.
- **Plugs:**
 - **For metallic boxes:** Hexagonal malleable iron.
 - **For non metallic boxes:** Hexagon screwed PVC-U.
- **Locknuts.:**
 - **For metallic boxes:** Hexagonal carbon steel.
 - **For non metallic boxes:** Hexagonal PVC-U.
- **Execution:** [90-55-10/700 Installing conduit, trunking and ducting](#).

90-55-15/324 Thermosetting insulated and thermoplastic sheathed (LSHF) armoured cables

- **Manufacturer:** Draka or equal and approved.
- **Standard:** To [BS 6724](#).
- **Third party certification:** British Approvals Service for Cables (BASEC) certified.
- **Size:** As Circuit Schedule
- **Insulation:** Manufacturer's standard.
- **Sheath colour:** Black.
- **Execution:** [90-55-15/680 Installing low voltage armoured cables](#) and [90-55-15/735 Cable installation on channel cable supports, cable tray, cable ladder and cable basket type B](#).

90-55-15/330 Fire resistant screened (LSHF) cables type A

- **Manufacturer:** Pirelli FP200 Gold.
- **Standard:** To [BS 7629-1](#).
- **Third party certification:** British Approvals Service for Cables (BASEC) certified and LPCB.
- **Size:** As Circuit Schedule.
- **Insulation:** Manufacturer's standard.
- **Fire resistance category:** STANDARD 120
- **Screen:** Aluminium tape.
- **Execution:** [90-55-15/635 Installing low voltage cables type A](#);
[90-55-15/660 Installing low voltage cables in conduit and trunking type B](#);
and [90-55-15/735 Cable installation on channel cable supports, cable tray, cable ladder and cable basket type A](#).

90-55-15/334 Single core non-sheathed cables with LSHF insulation

Shared by: [70-70-25/110 Earthing and bonding system](#); [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [70-80-35/110 Hard wired general lighting system](#).

- **Manufacturer:** Draka or equal and approved.
- **Standards:** To [BS EN 50525-1](#) and [BS EN 50525-3-41](#).
- **Third party certification:** British Approvals Service for Cables (BASEC) certified.
- **Cable type:** H07Z-K.
- **Size:** See circuit schedule.
- **Execution:** [90-55-15/635 Installing low voltage cables type A](#) and [90-55-15/660 Installing low voltage cables in conduit and trunking type A](#).

90-55-15/350 Thermosetting insulated and thermoplastic sheathed (LSHF) cables type A

- **Manufacturer:** Draka or equal and approved.
- **Standard:** To [BS 7211](#).
- **Third party certification:** British Approvals Service for Cables (BASEC) certified.
- **Cable type:** Manufacturer's standard.
- **Size:** As Circuit Schedule.
- **Execution:** [90-55-15/635 Installing low voltage cables type A](#);
[90-55-15/660 Installing low voltage cables in conduit and trunking type A](#);
and [90-55-15/735 Cable installation on channel cable supports, cable tray, cable ladder and cable basket type B](#).

90-60-30/350 Residual current circuit breakers with integral overcurrent protection

- **Manufacturer:** Eaton or to match existing distribution board .
- **Standard:** Manufacturer's standard.
- **Operating characteristic:** AC.
- **Tripping characteristic:** As Circuit Schedule.
- **Rated operational current (In):** As Circuit schedules.
- **Rated operational voltage (Ue):** 230 V a.c.
- **Number of poles:** As Circuit schedules.
- **Rated short-circuit capacity (Icn):** As Circuit schedules.
- **Rated residual operating current:** As Circuit schedules.
- **Time delay:** Manufacturer's standard.
- **Mounting:** Manufacturer's standard.

90-60-30/410 Surge protective devices for low voltage power supplies

Shared by: [70-70-45/110 Low voltage distribution system](#); and [70-70-75/110 Hard wired low voltage small power system](#).

- **Manufacturer:** Eaton or to match existing distribution board.
- **Standard:** Manufacturer's standard.
- **Operating voltage and frequency (nominal):** Manufacturer's standard.
- **Number of poles:** Manufacturer's standard.
- **Maximum continuous operating voltage (Uc):** Manufacturer's standard.
- **Mode of protection:** Lines to earth, lines to neutral, neutral to earth.
- **Lightning impulse current (Iimp):** Manufacturer's standard.
- **Nominal discharge current (In):** Manufacturer's standard.
- **Maximum discharge current 8/20µs (Imax):** Manufacturer's standard.
- **Minimum short-circuit current rating (Iscrr):** Manufacturer's standard.
- **Voltage protection level (Up):** Manufacturer's standard.
- **Open circuit voltage (Uoc):** Manufacturer's standard.
- **Thermal overload protection:** Manufacturer's standard.
- **Protection status indicators:** Manufacturer's standard.
- **Remote monitoring:** Manufacturer's standard.
- **Ingress protection (minimum):** To [BS EN 60529](#), IP20.
- **Mounting arrangement:** 35 mm DIN rail.
- **Execution:** [90-60-30/610 Installing surge protective devices for low voltage power supplies](#).

90-65-55/320 Digital metering equipment

- **Manufacturer:** Eaton or to match existing.
- **Standard:** To [BS EN 50470-1](#).
- **Display:** Manufacturer's standard.
- **Metering functions:** Manufacturer's standard.
- **Mounting:** Surface mounted.
- **Enclosure:** Manufacturer's standard.
- **Outputs:** Manufacturer's standard.
- **Execution:** [90-65-55/620 Installing electrical monitoring and metering equipment](#).

90-90-55/320 Electrical shock treatment signs

- **Manufacturer:** Contractor's choice.
- **Format:** Plastics encapsulated.

90-90-55/390 Equipment labels and warning notices

Shared by: [70-70-25/110 Earthing and bonding system](#); [70-70-45/110 Low voltage distribution system](#); and [70-70-75/110 Hard wired low voltage small power system](#).

- **Manufacturer:** Submit proposals.
- **Material:** Engraved anodized aluminium.
- **Label size:** Manufacturer's standard.
- **Colour:**
 - **Background:** Manufacturer's standard.
 - **Lettering:** Manufacturer's standard.
- **Typography:**
 - **Font:** Manufacturer's standard.
 - **Size:** Manufacturer's standard.
- **Notice wording:** Manufacturer's standard.

90-90-55/395 Electrical diagrams

Shared by: [70-70-45/110 Low voltage distribution system](#); and [70-80-25/120 Amenity lighting system](#).

- **Material:** Paper print, glazed frame.
- **Format:** Single line engineering drawings to [BS EN 61082-1](#).
- **Information to be included:** Supply characteristics. Maximum demand. Cable types and sizes. Switchgear ratings. Protective device types, ratings and function.
Prospective fault current values at each item of switchgear.
Earth fault loop impedance values at each item of switchgear.
Circuits containing equipment vulnerable to testing.

Execution**70-70-45/610 Removing low voltage distribution systems**

- **Scope:** Complete installation.

70-70-45/625 Installing low voltage distribution systems

- **Standard:** In accordance with [BS 7671](#).
- **Layout:** Position cabling and equipment to provide safe and easy access for operation and maintenance.

70-70-45/650 Connection to the incoming supply

- **Customer's installation:** Contractor's choice.

90-50-45/665 Installing switchgear generally

Shared by: [90-50-45/410 Distribution boards](#); [90-50-45/448 Fuse-switch disconnectors](#); [90-50-45/450 Switch-disconnectors](#); and [90-50-45/470 Control and protective switching devices](#).

- **General requirements:** [90-50-45/675 Labelling switchgear](#).
- **Switchgear cubicles:** Arrange in modular form to facilitate future extension.
- **Clearance (minimum):**
 - **Front access switchgear:** 1000 mm in front of switchgear.
 - **Rear access switchgear:** 1000 mm in front of and behind switchgear.
- **Fixing equipment:**
 - **Generally:** Fix independently of wiring installation with zinc electroplated fasteners.
 - **Indoor equipment:** Fix using internal lugs.
 - **Outdoor equipment:** Fix using external lugs.
- **Orientation:** Accurate and square to vertical and horizontal axes. Align adjacent items of switchgear on the same horizontal axis.
- **Extension boxes:** Provide where necessary.

- **Gland plates:** Non-ferrous for single core cables.
- **Interconnection of close coupled switchgear:**
 - **Cable type:** Single core PVC insulated cables for switchgear and controlgear; Copper busbar links; and LSZH insulated cables for switchgear and control gear..
 - **Containment:** Cable trunking and cable ducting for wall and ceiling mounting.
- **Identification:**
 - **Neutral and earth bar terminals:** Label with the outgoing circuit reference.
 - **Cable terminations:** Label with circuit reference, with push-on plastics markers.

90-50-45/675 Labelling switchgear

- **Switchgear terminals:** To [BS EN 60445](#).
- **Anti-condensation heaters:** Provide caution notices advising against accidental switching off.
- **Standby power:** Provide danger warning notices stating that assemblies may be energized from more than one source.
- **Indicator lamps:** Label each lamp describing its function.
- **Fuses, terminal blocks and other assembly components:** Label describing their purpose.
- **Spare fuses:** Label, describe their rating and associated outgoing ways.

90-55-10/620 Installing cable tray and cable ladder

- **Standards:** In accordance with [BS 7671](#) and [IET Guidance Note 1](#).
- **Preparation:**
 - **Burrs and sharp edges:** Make smooth.
 - **Cutting:** Minimize and make good edges. Cuts to cable tray to be square along an unperforated line.
 - **Treatment of cut surface:** Extend 25 mm beyond the cut. Match finish of cable supports.
- **Access:** Provide space around cable ladder and tray to permit access for installing and maintaining cables.
- **Joints and expansion couplers:**
 - **Position:** Locate between the bracket support and the quarter point.
 - **Number of joints:** Minimize.
 - **Lengths of cable ladder and tray:** Maximize.
 - **Ends:** Blank with end plates.
- **Changes of size and direction:** Manufacturer's accessories of the same material type, pattern, finish and thickness as cable supports.
- **Fire barriers:** Provide where required to maintain fire performance of fabric.
- **Protective covers:** Provide to cables requiring mechanical protection.
- **Support:**
 - **Fixing arrangement:** Independently fix and support from building structure using threaded rod fixed to channel cable support with shake proof washers and hex nuts.
 - **Clearance from building fabric (minimum):** 20 mm.
- **Components:** Avoid contact between dissimilar metals.
- **Routing of cable ladder and tray:** Submit drawings showing the proposed routes of cable ladder and cable tray.

90-55-10/700 Installing conduit, trunking and ducting

Shared by: [90-55-10/460 Conduit fittings](#); [90-55-10/720 Installing rigid metallic conduit](#); and [90-55-10/735 Installing conduit connections to equipment](#).

- **Standards:** In accordance with [BS 7671](#) and [IET Guidance Note 1](#).
- **Preparation:** Cut square. Remove burrs and sharp edges to make smooth.
- **Protection of metallic conduit, trunking and ducting:**
 - **Joints and ends:** Remove grease, oil, dirt and rust before applying protective paint. Paint immediately following installation.
 - **Protective paint:**
 - Generally:** Compatible with conduit, trunking and ducting finish.
 - Type:** Match factory finish.
- **Cross-sectional area:** Maintain throughout the conduit, trunking and ducting length.
- **Arrangement:** Position vertically and horizontally in line with equipment served, and parallel with building lines.
- **Spare containment:** Install one spare 25 mm diameter conduit from each distribution board to the nearest accessible void space, terminating in a conduit box with lid.
- **Draw wires:** Install nylon tapes galvanized soft iron wires within spare conduit, trunking and ducting.
- **Distance from other services running parallel (minimum):**
 - **Generally:** 150 mm.
 - **Above radiators:** 1000 mm.
 - **Steam services:** 300 mm.
- **Drainage of conduit, trunking and ducting:** Locate drainage outlets at lowest points in conduit, trunking and ducting installed externally, and where condensation may occur.
- **Fire barriers:** Provide to maintain integrity of fire compartments.
- **Rewireable installations:** Enable rewiring from accessible boxes or accessories only.
- **Support:** Independently fix and support conduit, trunking and ducting from building structure.
- **Cleaning:** Clean insides of conduit, trunking and ducting before installing cables.
- **Cabling:** Install when conduit, trunking and ducting enclosure is complete.
- **Submittals:** Submit manufacturer's technical information. Submit drawings showing the proposed routes of conduit, trunking and ducting and the location of service outlets.

90-55-10/710 Installing conduit generally

Shared by: [90-55-10/720 Installing rigid metallic conduit](#); and [90-55-10/735 Installing conduit connections to equipment](#).

- **Fixing:** Fix securely. Fix boxes independently of conduit.
- **Changes of direction:** Conduit boxes or bends site formed by machine. Do not use elbows, tees or inspection bends.
- **Joints:**
 - **Generally:** Manufacturer's jointing fittings.
 - **Number of joints:** Minimize.
 - **Lengths of conduit:** Maximize.
 - **Open ends:** Plug.
 - **At movement joints in structure:** Manufactured expansion coupling. Install adaptable boxes on both sides of joint at a maximum distance of 300 mm.
- **Connections to boxes, trunking, equipment and accessories:** Screwed couplings with rubber bushes at open ends.

- **Conduit boxes:**
 - **Generally:** Install flush with finished surfaces. Provide extension rings if required.
 - **Fixing screws:** Countersunk, or round-headed screws.
 - **Number of fixings (minimum):** Two.
 - **Lids:** Fasten with brass slot pan head screws.
- **Rear outlet boxes:** Locate where surface conduits pass through walls to external equipment.
- **Draw-in boxes:**
 - **Spacing (maximum):** 10 m.
 - **Number of bends between draw-in boxes (maximum):** Two.
 - **Floors:** Do not install draw-in boxes in floors.
- **Conduit in walls:** Avoid concealed horizontal runs.
- **Suspended ceiling installations:** Fasten outlet boxes to structure above ceiling.

90-55-10/720 Installing rigid metallic conduit

- **General requirements:** [90-55-10/710 Installing conduit generally](#) and [90-55-10/700 Installing conduit, trunking and ducting](#).
- **Fixings:** Saddle.
- **Joints:** Screwed.
- **Threaded conduits:** Tightly screw to ensure electrical continuity, with no thread showing.
- **Conduit connections to boxes and items of equipment, other than those with threaded entries:** Earthing coupling with male brass bush and protective conductor.

90-55-10/735 Installing conduit connections to equipment

- **General requirements:** [90-55-10/710 Installing conduit generally](#) and [90-55-10/700 Installing conduit, trunking and ducting](#).
- **Surface mounted equipment:**
 - **Concealed conduit:** Conceal the final connection.
 - **Exposed conduit:** Contain the final connection from the conduit box within flexible metal conduit.
- **Equipment subject to vibration:** Flexible metal conduit of adequate length to facilitate removal of equipment for maintenance. Final termination in swivel connectors.
- **Connections to external equipment:** Flexible conduit.

90-55-10/740 Installing trunking generally

- **Changes of direction:** Manufacturer's bends and tees.
- **Joints:**
 - **Generally:** Manufacturer's jointing fittings. Maintain rigidity of trunking across joint.
 - **Number of joints:** Minimize.
 - **Lengths of trunking:** Maximize.
 - **Open ends:** Blank using manufacturer's removable end caps.
 - **Metal edging:** Protect with PVC edging strip.
 - **Electrical continuity:** Maintain at each joint with a copper link fitted on the outside of the trunking.
- **Connections to conduit, boxes, equipment and accessories:** Screwed couplings, adaptors, connectors and glands, with rubber bushes at open ends.
- **Connections to trunking covers:** Minimize.
- **Electrical continuity of covers:** Electrically continuous with the trunking or provide protective conductors.

- **Access:** Provide space around trunking to permit access for installing and maintaining cables. Set out access with covers on a continuous face to allow cabling to be laid in throughout its entire length.
- **Trunking passing through building fabric openings:** Provide fixed trunking covers. Extend covers 50 mm from both sides of the opening.
- **Cable retaining straps:** Required except when trunking cover is on top.

90-55-15/635 Installing low voltage cables type A

Shared by: [90-55-15/330 Fire resistant screened \(LSHF\) cables type A](#); [90-55-15/334 Single core non-sheathed cables with LSHF insulation](#); [90-55-15/340 Multicore screened thermosetting insulated \(LSHF\) sheathed cables](#); [90-55-15/343 Single core non-sheathed cables with thermoplastic PVC insulation](#); and 90-55-15/350 Thermosetting insulated and thermoplastic sheathed (LSHF) cables; [type A](#) and [type B](#).

- **Standard:** In accordance with [BS 7671](#).
- **Timing:** Do not start internal cabling until building enclosure provides permanently dry conditions.
- **Preparation:** Store cables above 5°C for 24 hours before installation.
Clear cable path of debris.
- **Installation temperature (minimum):** 5°C.
- **Cables:** Install in one length. Dress cables flat, free from twists, kinks and strain.
- **Cable pulling:** Do not overstress. Prevent kinks and twisting of the cable.
- **Cable protection:** Cables passing through walls and floors to be sleeved with conduit or pipeduct to a minimum of 300 mm. Bush at both ends. Ensure that appropriate fire stopping materials are used to maintain the original fire integrity of the wall or floor around the penetration.
- **Concealed cable runs to wall accessories:** Run vertically from the accessory.
- **Exposed cable runs:** Direct to surface.
- **Distance from other services running parallel (minimum):** 150 mm. Position cables below heating pipes.
- **Jointing and termination:**
 - **Final circuit cables:** At electrical accessories only.
 - **Core connections:** Using compression lugs to equipment without integral clamping terminals.
 - **Terminating cables when not using glands:** Take sheathing of cables into accessory boxes and equipment and protect against abrasion with grommets.

90-55-15/635 Installing low voltage cables type B

Shared by: [90-55-15/330 Fire resistant screened \(LSHF\) cables type B](#); [90-55-15/665 Installing flexible cables](#); and [90-55-15/680 Installing low voltage armoured cables](#).

- **Standard:** In accordance with [BS 7671](#).
- **Timing:** Do not start internal cabling until building enclosure provides permanently dry conditions.
- **Preparation:** Store cables above 5°C for 24 hours before installation.
Clear cable path of debris.
- **Installation temperature (minimum):** 5°C.
- **Cables:** Install in one length. Dress cables flat, free from twists, kinks and strain.
- **Cable pulling:** Do not overstress. Prevent kinks and twisting of the cable.
- **Cable protection:** Cables passing through walls and floors to be sleeved with conduit or pipeduct to a minimum of 300 mm. Bush at both ends. Ensure that appropriate fire stopping materials are used to maintain the original fire integrity of the wall or floor around the penetration.
- **Concealed cable runs to wall accessories:** Run vertically from the accessory.
- **Exposed cable runs:** Minimum 25 mm between cable face and structure.
- **Distance from other services running parallel (minimum):** 150 mm. Position cables below heating pipes.
- **Jointing and termination:**

- **Final circuit cables:** At electrical accessories only.
- **Core connections:** Using compression lugs to equipment without integral clamping terminals.
- **Terminating cables when not using glands:** Take sheathing of cables into accessory boxes and equipment and protect against abrasion with grommets.

90-55-15/660 Installing low voltage cables in conduit and trunking type A

Shared by: [90-55-15/334 Single core non-sheathed cables with LSHF insulation](#); [90-55-15/343 Single core non-sheathed cables with thermoplastic PVC insulation](#); and [90-55-15/350 Thermosetting insulated and thermoplastic sheathed \(LSHF\) cables type A](#).

- **Cable installation:** Orderly and capable of being withdrawn.
- **Single core wiring:** Arrange using the loop-in method.
- **Cables within trunking:** Tie at 2 m intervals for cables of the same circuit reference. Label ties with circuit reference number at 10 m intervals.
- **Cables in vertical conduit:** Provide cable clamps in accessible conduit boxes at 10 m intervals.
- **Extra low voltage cables:** Install within a separate partition from low voltage cables where installed in multi compartment trunking.

90-55-15/660 Installing low voltage cables in conduit and trunking type B

- **Cable installation:** Orderly and capable of being withdrawn.
- **Single core wiring:** Arrange using the loop-in method.
- **Cables within trunking:** Tie at 2 m intervals for cables of the same circuit reference. Label ties with circuit reference number at 10 m intervals.
- **Cables in vertical conduit:** Provide cable clamps in accessible conduit boxes at 5 m intervals.
- **Extra low voltage cables:** Install within a separate partition from low voltage cables where installed in multi compartment trunking.

90-55-15/680 Installing low voltage armoured cables

- **General requirements:** [90-55-15/685 Jointing and terminating low voltage armoured cables](#) and [90-55-15/635 Installing low voltage cables type B](#).
- **Earthing:** Bond armour to equipment and main earthing system.
- **Connections to apparatus:** Moisture proof, sealed glands and shrouds.

90-55-15/685 Jointing and terminating low voltage armoured cables

- **Preparation:**
 - **Cable ends:** Cut immediately before jointing or terminating.
 - **Cables left unconnected for more than 24 h:** Seal to prevent moisture ingress.
- **Cable stripping:**
 - **Length of exposed cores and conductors:** Minimize. Leave no exposed conductor after termination.
 - **Strands:** Do not damage when stripping cable cores. Twist together. Do not reduce number. Secure at terminations.
- **Cable glands:** To [BS EN 62444](#) and fitted with shroud.
- **Cold pour resin and heat shrink joints:** To [BS EN 50393](#).
- **Insulating tape:** To [BS EN 60454-1](#).
- **Plastics sheathed cables:** Seal with proprietary shrink-on end caps.

- **Bolted terminal connections to equipment and switchgear without integral cable clamping terminals:** Compression type lugs, of correct bore.
- **Compression joints:** Provide in accordance with [BS 7609](#).
- **Conductor labelling:** Identify cable conductor cores at each end of cable and at joints.
- **Unused cable cores:** Connect to earth.

90-55-15/735 Cable installation on channel cable supports, cable tray, cable ladder and cable basket type A

- **Cabling:** Install when cable supports are complete.
- **Position:** Place single and multicore cables side by side.
- **Fastening:**
 - **Fastenings generally:** Secure cables, do not indent sheaths. Position to enable any submain cable to be individually removed.
 - **Submain cables <95 mm²:** Cable bands at 400 mm (maximum) horizontal spacing and 550 mm (maximum) vertical spacing and Cable cleats at 400 mm (maximum) horizontal spacing and 550 mm (maximum) vertical spacing.
 - **Submain cables >95 mm²:** Cable bands at 900 mm (maximum) horizontal spacing and 1100 mm (maximum) vertical spacing and Cable cleats at 900 mm (maximum) horizontal spacing and 1100 mm (maximum) vertical spacing.
 - **Final circuit cabling:** Cable ties at 250 mm (maximum) spacing.
 - **Extra low voltage, communications and fibre optic cabling:** Cable ties at 250 mm (maximum) spacing.

90-55-15/735 Cable installation on channel cable supports, cable tray, cable ladder and cable basket type B

Shared by: [90-55-15/324 Thermosetting insulated and thermoplastic sheathed \(LSHF\) armoured cables](#); [90-55-15/340 Multicore screened thermosetting insulated \(LSHF\) sheathed cables](#); and [90-55-15/350 Thermosetting insulated and thermoplastic sheathed \(LSHF\) cables type A](#).

- **Cabling:** Install when cable supports are complete.
- **Position:** Place single and multicore cables side by side.
- **Fastening:**
 - **Fastenings generally:** Secure cables, do not indent sheaths. Position to enable any submain cable to be individually removed.
 - **Submain cables <95 mm²:** Cable bands at 400 mm (maximum) horizontal spacing and 550 mm (maximum) vertical spacing and Cable cleats at 400 mm (maximum) horizontal spacing and 550 mm (maximum) vertical spacing.
 - **Submain cables >95 mm²:** Cable bands at 900 mm (maximum) horizontal spacing and 1100 mm (maximum) vertical spacing and Cable cleats at 900 mm (maximum) horizontal spacing and 1100 mm (maximum) vertical spacing.
 - **Final circuit cabling:** Cable ties at 250 mm (maximum) spacing.
 - **Extra low voltage, communications and fibre optic cabling:** Cable ties at 250 mm (maximum) spacing.

90-60-30/610 Installing surge protective devices for low voltage power supplies

- **Standards:** In accordance with [BS 7671](#) and [DD CLC/TS 61643-12](#).
- **Point of installation:** At main low voltage switchboard.
- **Interconnecting cable:**
 - **Cable type:** Device manufacturer's standard.
 - **Cable size:** Device manufacturer's standard.
 - **Cable length (maximum):** 500 mm.
 - **Cable installation:** Tightly bind connecting leads together.

90-65-55/620 Installing electrical monitoring and metering equipment

- **Standard:** In accordance with [BS 7671](#).
- **Digital metering equipment:** Connect to building management system.

System completion**70-70-45/810 Inspecting, testing and commissioning of switchgear generally**

- **Standard:** In accordance with [BS 7671](#).
- **Notice before testing and commissioning:** 7 days.
- **Switches and circuit breakers:** Clean to remove all visible traces of dust.
- **Protective devices settings:** Configure to match the grading study.
- **Switchboard monitoring:** Continuous for 30 minutes following first energizing.
- **Additional inspecting and testing:** Check levelling and alignment of assembly.
 Check operation of instruments and metering devices.
 Check and adjust tightness of busbar connections and supports.
 Check tightness of bolted connections.
 Check busbar joints with duct or resistance measurements.
 Check earth connections at compartments, switches and earth electrodes.
 Check clearance of live parts from direct contact.
 Check polarity and phase sequence of protective devices.
 Check operation of protective devices using secondary and primary current injection.
 Manually operate protective devices.
 Carry out earth fault protection simulation tests.
 Check functional operation of circuit breakers.
 Check operation of switch tripping devices.
 Carry out harmonic analysis of site in use, and provide recommendation for harmonic filter as applicable
 Carry out analysis of power factor correction in use, and provide a recommendation for installation as applicable
- **Testing and commissioning results:** Submit one copy. PDF/Electronic format.
- **Certificates of calibration for meters and instruments:** Submit.

70-70-75/110 Hard wired low voltage small power system

System outline

70-70-75/110 Hard wired low voltage small power system

- **Connection to low voltage supply:** Submit proposals.
- **Final circuit cabling:** [90-55-15/334 Single core non-sheathed cables with LSHF insulation](#); [90-55-15/322 Thermosetting insulated and PVC sheathed armoured cables](#); [90-55-15/330 Fire resistant screened \(LSHF\) cables type B](#); [90-55-15/340 Multicore screened thermosetting insulated \(LSHF\) sheathed cables](#); and [90-55-15/350 Thermosetting insulated and thermoplastic sheathed \(LSHF\) cables type B](#).
- **Cable accessories:** [90-55-10/315 Cable ties](#).
- **Containment:** [90-55-10/380 Rigid conduit](#) and [90-55-10/410 Cable trunking and cable ducting for wall and floor mounting](#).
- **Containment accessories:** [90-55-10/460 Conduit fittings](#).
- **Rewireable installation:** Required.
- **Concealed installation:** Required.
- **Final connections:** [90-55-15/390 Ordinary duty PVC insulated and sheathed flexible cables](#).
- **Partial installation:** Required.
- **Power conditioning equipment:** [90-60-30/410 Surge protective devices for low voltage power supplies](#).
- **Electrical accessories and outlets:** [90-60-25/345 Standard socket outlets](#)
- **Electrical identification:** [90-90-55/390 Equipment labels and warning notices](#).
- **Execution:** [70-70-75/610 Removing small power systems](#); [70-70-75/620 Small power installation](#); [70-70-75/630 Installing cabling to socket outlets](#); and [70-70-75/650 Partial installation](#).
- **System completion:** [70-70-75/820 Documentation](#) and [70-70-75/830 Spares](#).

Products

90-55-10/315 Cable ties

Shared by: [70-70-45/110 Low voltage distribution system](#); and [70-70-75/110 Hard wired low voltage small power system](#).

- **Manufacturer:** Submit proposals.
- **Standard:** To [BS EN 62275](#).
- **Format:** Wrap around self locking non-releasable.
- **Material:** Metal.
- **Loop tensile strength (minimum):** Manufacturer's standard.
- **Contribution to fire:** Non-flame propagating.
- **Environmental influences:**
 - **Non-metallic and composite components:** Resistant to ultraviolet light.
 - **Metallic and composite components:** Resistant to corrosion.

90-55-10/380 Rigid conduit

Shared by: [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [70-80-35/110 Hard wired general lighting system](#).

- **Manufacturer:** Legrand.
- **Standards:** To [BS EN 61386-1](#) and [BS EN 61386-21](#).
- **Mechanical properties:**

- **Resistance to compression:** Medium.
- **Resistance to impact:** Heavy.
- **Resistance to bending:** Rigid.
- **Electrical characteristics:** With electrical continuity properties.
- **Resistance to external influences:**
 - **Protection against ingress of solid objects (minimum):** To [BS EN 60529](#), IP3X.
 - **Protection against ingress of water (minimum):** To [BS EN 60529](#), IPX0.
- **Resistance to corrosion:** Medium protection, inside and outside.
- **Tensile strength:** Heavy.
- **Resistance to flame propagation:** Flame propagating.
- **Suspended load capacity:** Heavy.
- **Colour:** Galvanised
- **Sizes (OD):** 20 mm and 25 mm.
- **Execution:** [90-55-10/720 Installing rigid metallic conduit](#) and [90-55-10/735 Installing conduit connections to equipment](#).

90-55-10/410 Cable trunking and cable ducting for wall and floor mounting

Shared by: [70-70-45/110 Low voltage distribution system](#); and [70-70-75/110 Hard wired low voltage small power system](#).

- **Manufacturer:** Cable Duct
- **Standards:** To [BS EN 50085-1](#) and [BS EN 50085-2-1](#).
- **Installation position:** Surface mounted on the wall.
- **Format:** Manufacturer's standard.
- **Resistance to compression:** Manufacturer's standard.
- **Resistance to impact:** Manufacturer's standard.
- **Temperature properties:**
 - **Storage and transport temperature (minimum):** Manufacturer's standard.
- **Resistance to flame propagation:** Non-flame propagating.
- **Electrical properties:** With electrical continuity characteristics.
- **Protection by enclosure:**
 - **Protection against ingress of solid objects (minimum):** To [BS EN 60529](#), IP4X.
 - **Protection against ingress of water (minimum):** To [BS EN 60529](#), IPX1.
 - **Protection against access to hazardous parts (minimum):** To [BS EN 60529](#), IPXXD.
- **Access method:** With tools.
- **Screening:** Required.
- **Sizes:** As design by contractor
- **Compartments:** Two.
- **Accessories and fittings:**
 - **Generally:** Factory made by the cable trunking or ducting manufacturer and of the same material type and finish as the cable trunking or ducting.
 - **Types:** Manufacturer's standard.
- **Execution:** [90-55-10/740 Installing trunking generally](#).

90-55-10/460 Conduit fittings

Shared by: [70-70-45/110 Low voltage distribution system](#); and [70-70-75/110 Hard wired low voltage small power system](#).

- **Manufacturer:** Match conduit galvanised or stainless steel.
- **Standards:** To [BS EN 61386-1](#) and to [BS EN 61386-21](#), [BS EN 61386-22](#), or [BS EN 61386-23](#) as appropriate; or to [BS 4607-1](#).
- **Conduit boxes:** Fit covers of same material and finish as boxes. Include brass earthing terminals in PVC-U boxes.
- **Plugs:**
 - **For metallic boxes:** Hexagonal malleable iron.
 - **For non metallic boxes:** Hexagon screwed PVC-U.
- **Locknuts.:**
 - **For metallic boxes:** Hexagonal carbon steel.
 - **For non metallic boxes:** Hexagonal PVC-U.
- **Execution:** [90-55-10/700 Installing conduit, trunking and ducting](#).

90-55-15/322 Thermosetting insulated and PVC sheathed armoured cables

Shared by: [70-70-75/110 Hard wired low voltage small power system](#); and [70-80-25/120 Amenity lighting system](#).

- **Manufacturer:** Submit proposals.
- **Standard:** To [BS 5467](#).
- **Third party certification:** British Approvals Service for Cables ([BASEC](#)) certified.
- **Size:** Design by contractor.
- **Insulation:** Manufacturer's standard.
- **Sheath colour:** Black.
- **Reaction to fire class:**
 - **Fire behaviour:** Manufacturer's standard.
 - **Additional classification for smoke production:** Manufacturer's standard.
 - **Additional classification for flaming droplets and/ or particles:** Manufacturer's standard.
 - **Additional classification for acidity:** Manufacturer's standard.

90-55-15/330 Fire resistant screened (LSHF) cables type B

- **Manufacturer:** Pirelli FP200 Gold.
- **Standard:** To [BS 7629-1](#).
- **Third party certification:** British Approvals Service for Cables ([BASEC](#)) certified and Loss Prevention Certification Board ([LPCB](#)) certified.
- **Size:** Design by contractor
- **Insulation:** Manufacturer's standard.
- **Fire resistance category:** ENHANCED 120.
- **Screen:** Manufacturer's standard.
- **Execution:** [90-55-15/635 Installing low voltage cables type B](#).

90-55-15/334 Single core non-sheathed cables with LSHF insulation

Shared by: [70-70-25/110 Earthing and bonding system](#); [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [70-80-35/110 Hard wired general lighting system](#).

- **Manufacturer:** Draka or equal and approved.
- **Standards:** To [BS EN 50525-1](#) and [BS EN 50525-3-41](#).
- **Third party certification:** British Approvals Service for Cables (BASEC) certified.
- **Cable type:** H07Z-K.
- **Size:** Design by contractor.
- **Execution:** [90-55-15/635 Installing low voltage cables type A](#) and [90-55-15/660 Installing low voltage cables in conduit and trunking type A](#).

90-55-15/340 Multicore screened thermosetting insulated (LSHF) sheathed cables

- **Manufacturer:** Submit proposals.
- **Standard:** To [BS 8436](#).
- **Third party certification:** British Approvals Service for Cables ([BASEC](#)) certified.
- **Size:** Design by contractor.
- **Sheath colour:** White.
- **Reaction to fire class:**
 - **Fire behaviour:** Manufacturer's standard.
 - **Additional classification for smoke production:** Manufacturer's standard.
 - **Additional classification for flaming droplets and/ or particles:** Manufacturer's standard.
 - **Additional classification for acidity:** Manufacturer's standard.
- **Execution:** [90-55-15/635 Installing low voltage cables type A](#) and [90-55-15/735 Cable installation on channel cable supports, cable tray, cable ladder and cable basket type B](#).

90-55-15/350 Thermosetting insulated and thermoplastic sheathed (LSHF) cables type B

- **Manufacturer:** Draka or equal and approved
- **Standard:** To [BS 7211](#).
- **Third party certification:** British Approvals Service for Cables ([BASEC](#)) certified.
- **Cable type:** Manufacturer's standard.
- **Size:** Design by contractor
- **Reaction to fire class:**
 - **Fire behaviour:** Manufacturer's standard.
 - **Additional classification for smoke production:** Manufacturer's standard.
 - **Additional classification for flaming droplets and/ or particles:** Manufacturer's standard.
 - **Additional classification for acidity:** Manufacturer's standard.
- **Execution:** [90-55-15/635 Installing low voltage cables type A](#).

90-55-15/390 Ordinary duty PVC insulated and sheathed flexible cables

Shared by: [70-70-75/110 Hard wired low voltage small power system](#); and [70-80-35/110 Hard wired general lighting system](#).

- **Manufacturer:** Draka or equal and approved
- **Standards:** To [BS EN 50525-1](#) and [BS EN 50525-2-11](#).
- **Third party certification:** British Approvals Service for Cables (BASEC) certified.
- **Cable type:** H05VV-F.
- **Size:** Design by contractor

- **Sheath colour:** White.
- **Execution:** [90-55-15/665 Installing flexible cables.](#)

90-60-25/345 Standard socket outlets

- **Manufacturer:** MK Electric.
- **Standard:** To [BS 1363-2](#).
- **Ingress protection (minimum):** To [BS EN 60529](#), IP 2X.
- **Arrangement:** Twin.
- **Control:**
 - **Type:** Unswitched.
 - **Switch position:** Not applicable.
 - **Indicator lamp:** Not required.
- **Interlock:** 3 pin equal pressure.
- **Accessories:** Dual earth terminals.
- **Mounting:** Direct enclosure mounted;
Flush;
and Surface.
- **Cable termination:** Screw.
- **Plate:**
 - **Material:** Metal Clad
 - **Finish:** Manufacturer's standard.
- **Insert colour:** Grey
- **Execution:** [90-60-25/610 Installing electrical accessories.](#)

90-60-30/410 Surge protective devices for low voltage power supplies

Shared by: [70-70-45/110 Low voltage distribution system](#); and [70-70-75/110 Hard wired low voltage small power system](#).

- **Manufacturer:** Eaton or to match distribution board.
- **Standard:** Manufacturer's standard.
- **Operating voltage and frequency (nominal):** Manufacturer's standard.
- **Number of poles:** Manufacturer's standard.
- **Maximum continuous operating voltage (Uc):** Manufacturer's standard.
- **Mode of protection:** Lines to earth, lines to neutral, neutral to earth.
- **Lightning impulse current (Iimp):** Manufacturer's standard.
- **Nominal discharge current (In):** Manufacturer's standard.
- **Maximum discharge current 8/20µs (Imax):** Manufacturer's standard.
- **Minimum short-circuit current rating (Iscrr):** Manufacturer's standard.
- **Voltage protection level (Up):** Manufacturer's standard.
- **Open circuit voltage (Uoc):** Manufacturer's standard.
- **Thermal overload protection:** Manufacturer's standard.
- **Protection status indicators:** Manufacturer's standard.
- **Remote monitoring:** Manufacturer's standard.
- **Ingress protection (minimum):** To [BS EN 60529](#), IP20.
- **Mounting arrangement:** 35 mm DIN rail.
- **Execution:** [90-60-30/610 Installing surge protective devices for low voltage power supplies.](#)

90-90-55/390 Equipment labels and warning notices

Shared by: [70-70-25/110 Earthing and bonding system](#); [70-70-45/110 Low voltage distribution system](#); and [70-70-75/110 Hard wired low voltage small power system](#).

- **Manufacturer:** Submit proposals.
- **Material:** Engraved anodized aluminium.
- **Label size:** Manufacturer's standard.
- **Colour:**
 - **Background:** Manufacturer's standard.
 - **Lettering:** Manufacturer's standard.
- **Typography:**
 - **Font:** Manufacturer's standard.
 - **Size:** Manufacturer's standard.
- **Notice wording:** Manufacturer's standard.

Execution**70-70-75/610 Removing redundant small power systems**

- **Scope:** Complete installation.

70-70-75/620 Small power installation

- **Standard:** In accordance with [BS 7671](#).

70-70-75/630 Installing cabling to socket outlets

- **General:** Wire socket outlets in ring final circuits without spurs where hard wiring is employed.

70-70-75/650 Partial installation

- **Equipment to be installed only:** Hand Dryers
Liaise with Intruder Alarm and CCTV company for final connections.
- **Equipment requiring power supplies and final connection only:** All Mechanical Equipment and Security including Intruder Alarm and CCTV system.
- **Containment:**
 - **Provide for the following systems:** Conduit and Trunking as required.
 - **Draw cords:** Required.

90-55-10/700 Installing conduit, trunking and ducting

Shared by: [90-55-10/460 Conduit fittings](#); [90-55-10/720 Installing rigid metallic conduit](#); and [90-55-10/735 Installing conduit connections to equipment](#).

- **Standards:** In accordance with [BS 7671](#) and [IET Guidance Note 1](#).
- **Preparation:** Cut square. Remove burrs and sharp edges to make smooth.
- **Protection of metallic conduit, trunking and ducting:**
 - **Joints and ends:** Remove grease, oil, dirt and rust before applying protective paint. Paint immediately following installation.
 - **Protective paint:**
 - Generally:** Compatible with conduit, trunking and ducting finish.
 - Type:** Match factory finish.
- **Cross-sectional area:** Maintain throughout the conduit, trunking and ducting length.
- **Arrangement:** Position vertically and horizontally in line with equipment served, and parallel with building lines.

- **Spare containment:** Install one spare 25 mm diameter conduit from each distribution board to the nearest accessible void space, terminating in a conduit box with lid.
- **Draw wires:** Install nylon tapes galvanized soft iron wires within spare conduit, trunking and ducting.
- **Distance from other services running parallel (minimum):**
 - **Generally:** 150 mm.
 - **Above radiators:** 1000 mm.
 - **Steam services:** 300 mm.
- **Drainage of conduit, trunking and ducting:** Locate drainage outlets at lowest points in conduit, trunking and ducting installed externally, and where condensation may occur.
- **Fire barriers:** Provide to maintain integrity of fire compartments.
- **Rewireable installations:** Enable rewiring from accessible boxes or accessories only.
- **Support:** Independently fix and support conduit, trunking and ducting from building structure.
- **Cleaning:** Clean insides of conduit, trunking and ducting before installing cables.
- **Cabling:** Install when conduit, trunking and ducting enclosure is complete.
- **Submittals:** Submit manufacturer's technical information. Submit drawings showing the proposed routes of conduit, trunking and ducting and the location of service outlets.

90-55-10/710 Installing conduit generally

Shared by: [90-55-10/720 Installing rigid metallic conduit](#); and [90-55-10/735 Installing conduit connections to equipment](#).

- **Fixing:** Fix securely. Fix boxes independently of conduit.
- **Changes of direction:** Conduit boxes or bends site formed by machine. Do not use elbows, tees or inspection bends.
- **Joints:**
 - **Generally:** Manufacturer's jointing fittings.
 - **Number of joints:** Minimize.
 - **Lengths of conduit:** Maximize.
 - **Open ends:** Plug.
 - **At movement joints in structure:** Manufactured expansion coupling. Install adaptable boxes on both sides of joint at a maximum distance of 300 mm.
- **Connections to boxes, trunking, equipment and accessories:** Screwed couplings with rubber bushes at open ends.
- **Conduit boxes:**
 - **Generally:** Install flush with finished surfaces. Provide extension rings if required.
 - **Fixing screws:** Countersunk, or round-headed screws.
 - **Number of fixings (minimum):** Two.
 - **Lids:** Fasten with brass slot pan head screws.
- **Rear outlet boxes:** Locate where surface conduits pass through walls to external equipment.
- **Draw-in boxes:**
 - **Spacing (maximum):** 10 m.
 - **Number of bends between draw-in boxes (maximum):** Two.
 - **Floors:** Do not install draw-in boxes in floors.
- **Conduit in walls:** Avoid concealed horizontal runs.
- **Suspended ceiling installations:** Fasten outlet boxes to structure above ceiling.

90-55-10/720 Installing rigid metallic conduit

- **General requirements:** [90-55-10/710 Installing conduit generally](#) and [90-55-10/700 Installing conduit, trunking and ducting](#).
- **Fixings:** Saddle.
- **Joints:** Screwed.
- **Threaded conduits:** Tightly screw to ensure electrical continuity, with no thread showing.
- **Conduit connections to boxes and items of equipment, other than those with threaded entries:** Earthing coupling with male brass bush and protective conductor.

90-55-10/735 Installing conduit connections to equipment

- **General requirements:** [90-55-10/710 Installing conduit generally](#) and [90-55-10/700 Installing conduit, trunking and ducting](#).
- **Surface mounted equipment:**
 - **Concealed conduit:** Conceal the final connection.
 - **Exposed conduit:** Contain the final connection from the conduit box within flexible metal conduit.
- **Equipment subject to vibration:** Flexible metal conduit of adequate length to facilitate removal of equipment for maintenance. Final termination in swivel connectors.
- **Connections to external equipment:** Flexible conduit.

90-55-10/740 Installing trunking generally

- **Changes of direction:** Manufacturer's bends and tees.
- **Joints:**
 - **Generally:** Manufacturer's jointing fittings. Maintain rigidity of trunking across joint.
 - **Number of joints:** Minimize.
 - **Lengths of trunking:** Maximize.
 - **Open ends:** Blank using manufacturer's removable end caps.
 - **Metal edging:** Protect with PVC edging strip.
 - **Electrical continuity:** Maintain at each joint with a copper link fitted on the outside of the trunking.
- **Connections to conduit, boxes, equipment and accessories:** Screwed couplings, adaptors, connectors and glands, with rubber bushes at open ends.
- **Connections to trunking covers:** Minimize.
- **Electrical continuity of covers:** Electrically continuous with the trunking or provide protective conductors.
- **Access:** Provide space around trunking to permit access for installing and maintaining cables. Set out access with covers on a continuous face to allow cabling to be laid in throughout its entire length.
- **Trunking passing through building fabric openings:** Provide fixed trunking covers. Extend covers 50 mm from both sides of the opening.
- **Cable retaining straps:** Required except when trunking cover is on top.

90-55-15/635 Installing low voltage cables type A

Shared by: [90-55-15/330 Fire resistant screened \(LSHF\) cables type A](#); [90-55-15/334 Single core non-sheathed cables with LSHF insulation](#); [90-55-15/340 Multicore screened thermosetting insulated \(LSHF\) sheathed cables](#); [90-55-15/343 Single core non-sheathed cables with thermoplastic PVC insulation](#); and 90-55-15/350 Thermosetting insulated and thermoplastic sheathed (LSHF) cables; [type A](#) and [type B](#).

- **Standard:** In accordance with [BS 7671](#).
- **Timing:** Do not start internal cabling until building enclosure provides permanently dry conditions.
- **Preparation:** Store cables above 5°C for 24 hours before installation.
Clear cable path of debris.

- **Installation temperature (minimum):** 5°C.
- **Cables:** Install in one length. Dress cables flat, free from twists, kinks and strain.
- **Cable pulling:** Do not overstress. Prevent kinks and twisting of the cable.
- **Cable protection:** Cables passing through walls and floors to be sleeved with conduit or pipeduct to a minimum of 300 mm. Bush at both ends. Ensure that appropriate fire stopping materials are used to maintain the original fire integrity of the wall or floor around the penetration.
- **Exposed cable runs:** Direct to surface.
- **Distance from other services running parallel (minimum):** 150 mm. Position cables below heating pipes.
- **Jointing and termination:**
 - **Final circuit cables:** At electrical accessories only.
 - **Core connections:** Using compression lugs to equipment without integral clamping terminals.
 - **Terminating cables when not using glands:** Take sheathing of cables into accessory boxes and equipment and protect against abrasion with grommets.

90-55-15/635 Installing low voltage cables type B

Shared by: [90-55-15/330 Fire resistant screened \(LSHF\) cables type B](#); [90-55-15/665 Installing flexible cables](#); and [90-55-15/680 Installing low voltage armoured cables](#).

- **Standard:** In accordance with [BS 7671](#).
- **Timing:** Do not start internal cabling until building enclosure provides permanently dry conditions.
- **Preparation:** Store cables above 5°C for 24 hours before installation.
Clear cable path of debris.
- **Installation temperature (minimum):** 5°C.
- **Cables:** Install in one length. Dress cables flat, free from twists, kinks and strain.
- **Cable pulling:** Do not overstress. Prevent kinks and twisting of the cable.
- **Cable protection:** Cables passing through walls and floors to be sleeved with conduit or pipeduct to a minimum of 300 mm. Bush at both ends. Ensure that appropriate fire stopping materials are used to maintain the original fire integrity of the wall or floor around the penetration.
- **Concealed cable runs to wall accessories:** Run vertically from the accessory.
- **Exposed cable runs:** Minimum 25 mm between cable face and structure.
- **Distance from other services running parallel (minimum):** 150 mm. Position cables below heating pipes.
- **Jointing and termination:**
 - **Final circuit cables:** At electrical accessories only.
 - **Core connections:** Using compression lugs to equipment without integral clamping terminals.
 - **Terminating cables when not using glands:** Take sheathing of cables into accessory boxes and equipment and protect against abrasion with grommets.

90-55-15/660 Installing low voltage cables in conduit and trunking type A

Shared by: [90-55-15/334 Single core non-sheathed cables with LSHF insulation](#); [90-55-15/343 Single core non-sheathed cables with thermoplastic PVC insulation](#); and [90-55-15/350 Thermosetting insulated and thermoplastic sheathed \(LSHF\) cables type A](#).

- **Cable installation:** Orderly and capable of being withdrawn.
- **Single core wiring:** Arrange using the loop-in method.
- **Cables within trunking:** Tie at 2 m intervals for cables of the same circuit reference. Label ties with circuit reference number at 10 m intervals.
- **Cables in vertical conduit:** Provide cable clamps in accessible conduit boxes at 10 m intervals.
- **Extra low voltage cables:** Install within a separate partition from low voltage cables where installed in multi compartment trunking.

90-55-15/665 Installing flexible cables

- **General requirements:** [90-55-15/635 Installing low voltage cables type B](#).
- **Cables:** Grip securely at connections. Where cord grips do not form an integral part of the accessory or equipment, provide separate proprietary cord grips.

90-55-15/735 Cable installation on channel cable supports, cable tray, cable ladder and cable basket type B

Shared by: [90-55-15/324 Thermosetting insulated and thermoplastic sheathed \(LSHF\) armoured cables](#); [90-55-15/340 Multicore screened thermosetting insulated \(LSHF\) sheathed cables](#); and [90-55-15/350 Thermosetting insulated and thermoplastic sheathed \(LSHF\) cables type A](#).

- **Cabling:** Install when cable supports are complete.
- **Position:** Place single and multicore cables side by side.
- **Fastening:**
 - **Fastenings generally:** Secure cables, do not indent sheaths. Position to enable any submain cable to be individually removed.
 - **Submain cables <95 mm²:** Cable bands at 400 mm (maximum) horizontal spacing and 550 mm (maximum) vertical spacing and Cable cleats at 400 mm (maximum) horizontal spacing and 550 mm (maximum) vertical spacing.
 - **Final circuit cabling:** Cable ties at 250 mm (maximum) spacing.
 - **Extra low voltage, communications and fibre optic cabling:** Cable ties at 250 mm (maximum) spacing.

90-60-25/610 Installing electrical accessories

Shared by: [90-60-25/345 Standard socket outlets](#).

- **Standard:** In accordance with [BS 7671](#).
- **Accessory faceplates:** Free from any traces of plaster, grout, paint or similar.
- **Positioning:** Coordinate with other wall or ceiling mounted equipment.
- **Alignment:** Align adjacent accessories on the same vertical or horizontal axis.
- **Fixing:** Fix securely, plumb and level to vertical and horizontal axes.
- **Mounting heights:**
 - **Generally:** Measure from finished floor level to centre line of accessory.
 - **Light switches:** 1100-1400mm AFFL.
 - **Socket outlets:** Within designated trunking & Surface Mounted @ 900mm

90-60-30/610 Installing surge protective devices for low voltage power supplies

- **Standards:** In accordance with [BS 7671](#) and [DD CLC/TS 61643-12](#).
- **Point of installation:** At main low voltage switchboard.
- **Interconnecting cable:**
 - **Cable type:** Device manufacturer's standard.
 - **Cable size:** Device manufacturer's standard.
 - **Cable length (maximum):** 500 mm.
 - **Cable installation:** Tightly bind connecting leads together.

System completion

70-70-75/820 Documentation

- **Operating and maintenance instructions:**
 - **Scope:** Submit for the system giving optimum settings for controls.
 - **Product information:** Include product description, date of purchase, performance characteristics, application (suitability for use), method of operation and control, and cleaning and maintenance requirements.
 - **Format:** Paper copy.
 - **Number of copies:** Two.
- **Record drawings:**
 - **Content:** For all low voltage final circuits, the cable origin, circuit designation, route, loading, conductor material and c.s.a, insulation type and colour, number of cores per cable, number of cables in trunking and conduit.
 - **Format:** A1 paper print drawing and Electronic drawing.
 - **Number of copies:** Two.
- **Submittal date:** At handover.

70-70-75/830 Spares

- **Plugs:** Supply two for each socket outlet type.
- **Fuse links:** Supply ten of each rating.

Appendix A – Cable Schedules

Proposed cables sizes and protection are arbitrary and subject to contractor design as part of their works.

Pool Cover Electrical supplies

DB SFP

WAY	PROTECTION	DESCRIPTION	Cable
7L1	32A Type C;30mA	Pool Cover 1	6mm2 Twin and Earth Cable PVC
7L2	32A Type C;30mA	Pool Cover 3	6mm2 Twin and Earth Cable PVC
7L3	32A Type C;30mA	Pool Cover 2	6mm2 Twin and Earth Cable PVC
8L1	32A Type C;30mA	Pool Cover 4	6mm2 Twin and Earth Cable PVC
8L2	32A Type C;30mA	Pool Cover 5	6mm2 Twin and Earth Cable PVC

Ventilation

DB VENT

WAY	PROTECTION	DESCRIPTION	Cable	kW/Phase	FLC
Supply cable	80A BS88	Fan Control Panel	25mm5C XLPE/PVC/SWA/PVC	n/a	n/a
1L1,L2,L3	16A Type C	ZONE 1 FAN	2.5mm 5c XLPE/PVC/SWA/PVC	3.4kW/3Ph	4.2A
2L1,L2,L3	16A Type C	ZONE 1 EXTRACT FAN	2.5mm 5c XLPE/PVC/SWA/PVC	3.4kW/3Ph	4.2A

A copper conductor is to be used as a supplementary earth wire due to the corrosive environment.
Cable glands and equipment/cabling to have a suitable IP rating to prevent damage.
Final fan selection to be confirmed with supplier