

KJ TAIT

ENGINEERS

MRC LABORATORY OF MOLECULAR BIOLOGY

NEW IT ROOM IS001

CAMBRIDGE

SPECIFICATION – VOLUME 3

**ELECTRICAL SERVICES MATERIALS AND WORKMANSHIP
SPECIFICATION**

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30-85-30/140 Individual services penetrations fire stopping system

System outline

30-85-30/140 Individual services penetrations fire stopping system

- **Description:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **System performance:** [30-85-30/220 Fire performance](#).
- **System manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Penetration seal:** [45-45-70/433 Flexible intumescent gap sealer](#);
[45-55-75/375 Intumescent foam fillers](#);
[45-55-50/325 Intumescent mortar](#);
and [45-55-75/405 Intumescent putties](#).
- **Capping sealant:**
 - **Sealant type:** Submit proposals.
 - **Primer:** As Manufacturers recommendations
- **Samples required:** TO BE COMPLETED
- **Execution:** [30-85-30/610 Fire stopping systems workmanship generally](#);
[30-85-30/630 Installing flexible intumescent gap sealer](#);
[30-85-30/640 Applying intumescent foam](#);
[30-85-30/650 Applying intumescent mortar](#);
[30-85-30/670 Applying intumescent putty](#);
and [30-85-30/720 Applying fire stopping capping sealant](#).
- **System completion:** [30-85-30/810 Cleaning after installation of fire stopping systems](#) and
[30-85-30/820 Inspection of fire stopping systems](#).

System performance

30-85-30/220 Fire performance

Shared by: [30-85-30/140 Individual services penetrations fire stopping system](#); [30-85-30/145 Linear gap fire stopping system](#); and [30-85-30/150 Loose fire stopping system](#).

- **Resistance to fire:** To maintain fire integrity of particular building element.
- **Reaction to fire:**
 - **Standard:** In accordance with Building Regulations.
- **Smoke resistance:**
 - **Air leakage rate (maximum):** 3 m³/m².hr.

Products

45-45-70/433 Flexible intumescent gap sealer

Shared by: [30-85-30/140 Individual services penetrations fire stopping system](#); and [30-85-30/145 Linear gap fire stopping system](#).

- **Manufacturer:** Submit proposals.
- **Size:** Manufacturer's standard.

45-55-50/325 Intumescent mortar

- **Manufacturer:** Submit proposals.
- **Material:** Manufacturer's standard.
- **Fire resistance:** Manufacturer's standard.

45-55-75/375 Intumescent foam fillers

- **Manufacturer:** Submit proposals.
- **Material:** Manufacturer's standard.
- **Colour:** Natural.
- **Execution:** [45-55-75/610 Suitability of joints for sealant application](#) and [45-55-75/620 Joint preparation for sealant application](#).

45-55-75/405 Intumescent putties

- **Manufacturer:** Submit proposals.
- **Product reference:** Submit proposals.
- **Material:** Manufacturer's standard.
- **Form:** Manufacturer's standard.
- **Execution:** [45-55-75/610 Suitability of joints for sealant application](#); [45-55-75/620 Joint preparation for sealant application](#); and [45-55-75/630 Applying joint sealants](#).

Execution

30-85-30/610 Fire stopping systems workmanship generally

Shared by: [30-85-30/140 Individual services penetrations fire stopping system](#); [30-85-30/145 Linear gap fire stopping system](#); [30-85-30/150 Loose fire stopping system](#); and [30-85-30/155 Multiple services penetrations fire stopping system](#).

- **Preparation:** Remove loose dust and combustible materials.
- **Openings and gaps:** Seal between building elements and services, to provide effective resistance to fire and the passage of smoke. Allow for capping sealants where required. Finish flush with surrounds.
- **Adjacent surfaces:** Prevent overrun of filler, sealant or mortar on to finished surfaces.

30-85-30/630 Installing flexible intumescent gap sealer

Shared by: [30-85-30/140 Individual services penetrations fire stopping system](#); and [30-85-30/145 Linear gap fire stopping system](#).

- **Fitting of strips:** Compress strips and fit into gap so that, as they decompress, the strips wedge themselves in the void.
- **Joints:**
 - **Ends of strips:** Fit intumescent 'end piece' at both ends of run of fire stop laminate.
 - **Joints between strips:** Fit two intumescent 'end pieces' at each butt joint.

30-85-30/640 Applying intumescent foam

- **New joints:** Remove builder's debris, mortar droppings, grease, and other contaminants.
- **Old joints:** Clean and remove existing sealant from each joint.
- **Priming:** Lightly moisten substrate with water.
- **Application:** Fill joint to approximately half its depth, and allow foam to expand to face of joint.
- **Trimming:** As Manufacturers recommendation

30-85-30/650 Applying intumescent mortar

- **Sequence:** Install mortar after services are permanently installed.
- **Shuttering:** Install suitable shuttering panels to the faces of the opening.

- **Temperature:** Do not apply mortar when it could be damaged by frost.
- **Powder:water ratio:** As Manufacturers recommendation
- **Mortar cure:** Do not disturb mortar before final set has taken place.
- **Shuttering removal:** After mortar has cured.

30-85-30/670 Applying intumescent putty

- **Sequence:** Install putty after services are permanently installed.
- **Putty cure:** Do not disturb putty before final set has taken place.

30-85-30/720 Applying fire stopping capping sealant

Shared by: [30-85-30/140 Individual services penetrations fire stopping system](#); [30-85-30/145 Linear gap fire stopping system](#); and [30-85-30/155 Multiple services penetrations fire stopping system](#).

- **Backing strips:** As required by sealant manufacturer to suit gap size and achieve specified fire resistance.
- **Width of sealant:** Within limits set by sealant manufacturer.
- **Excessive gaps:** Submit proposals.
- **Depth of sealant:** As required by sealant manufacturer to achieve specified fire resistance.
- **Width to depth ratio:** As required by sealant manufacturer to achieve specified fire resistance.
- **Temperature:** Do not apply water based sealants when they could be damaged by frost.

45-55-75/610 Suitability of joints for sealant application

Shared by: [45-55-75/375 Intumescent foam fillers](#); and [45-55-75/405 Intumescent putties](#).

- **Joint dimensions:** Within limits specified for the sealant.
- **Substrate quality:** Surfaces regular, undamaged and stable.
- **Joints not fit to receive sealant:** Submit proposals for rectification.

45-55-75/620 Joint preparation for sealant application

Shared by: [45-55-75/375 Intumescent foam fillers](#); and [45-55-75/405 Intumescent putties](#).

- **Surfaces to which sealant must adhere:** Remove temporary coatings, tapes, loosely adhering material, dust, oil, grease, surface water and contaminants that may affect bond.
- **Cleaning:** Use materials and methods recommended by sealant manufacturer.
- **Vulnerable surfaces adjacent to joints:** Do not stain or smear with primer or sealant.

45-55-75/630 Applying joint sealants

- **Substrate:** As recommended by sealant manufacturer.
- **Environmental conditions:** Do not dry or raise temperature of joints by heating.
- **Sealant application:** Completely and neatly fill joints. Provide firm adhesion to substrates.
- **Sealant profiles:**
 - **Butt and lap joints:** Slightly concave.
 - **Fillet joints:** Flat.
- **Protection:** Do not contaminate or damage finished joints.

System completion

30-85-30/810 Cleaning after installation of fire stopping systems

Shared by: [30-85-30/140 Individual services penetrations fire stopping system](#); [30-85-30/145 Linear gap fire stopping system](#); [30-85-30/150 Loose fire stopping system](#); and [30-85-30/155 Multiple services penetrations fire stopping system](#).

- **Masking tapes:** Remove.
- **Cleaning:** Clean off splashes and droppings. Wipe down finishes.

30-85-30/820 Inspection of fire stopping systems

Shared by: [30-85-30/140 Individual services penetrations fire stopping system](#); [30-85-30/145 Linear gap fire stopping system](#); [30-85-30/150 Loose fire stopping system](#); and [30-85-30/155 Multiple services penetrations fire stopping system](#).

- **Notice for inspection (minimum):** 5 working days.

Ω End of system

30-85-30/145 Linear gap fire stopping system**System outline**

30-85-30/145 Linear gap fire stopping system

- **Description:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **System performance:** [30-85-30/220 Fire performance](#).
- **System manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Gap filler:** [45-45-70/433 Flexible intumescent gap sealer](#).
- **Capping sealant:**
 - **Sealant type:** Submit proposals.
 - **Cleaner:** De-greaser.
 - **Primer:** Required.
- **Samples required:** TO BE COMPLETED
- **Execution:** [30-85-30/610 Fire stopping systems workmanship generally](#);
[30-85-30/630 Installing flexible intumescent gap sealer](#);
and [30-85-30/720 Applying fire stopping capping sealant](#).
- **System completion:** [30-85-30/810 Cleaning after installation of fire stopping systems](#) and [30-85-30/820 Inspection of fire stopping systems](#).

System performance[30-85-30/220 Fire performance](#)

See: [30-85-30/140 Individual services penetrations fire stopping system](#).

Shared by: [30-85-30/140 Individual services penetrations fire stopping system](#); [30-85-30/145 Linear gap fire stopping system](#); and [30-85-30/150 Loose fire stopping system](#).

Products[45-45-70/433 Flexible intumescent gap sealer](#)

See: [30-85-30/140 Individual services penetrations fire stopping system](#).

Shared by: [30-85-30/140 Individual services penetrations fire stopping system](#); and [30-85-30/145 Linear gap fire stopping system](#).

Execution[30-85-30/610 Fire stopping systems workmanship generally](#)

See: [30-85-30/140 Individual services penetrations fire stopping system](#).

Shared by: [30-85-30/140 Individual services penetrations fire stopping system](#); [30-85-30/145 Linear gap fire stopping system](#); [30-85-30/150 Loose fire stopping system](#); and [30-85-30/155 Multiple services penetrations fire stopping system](#).

[30-85-30/630 Installing flexible intumescent gap sealer](#)

See: [30-85-30/140 Individual services penetrations fire stopping system](#).

Shared by: [30-85-30/140 Individual services penetrations fire stopping system](#); and [30-85-30/145 Linear gap fire stopping system](#).

[30-85-30/720 Applying fire stopping capping sealant](#)

See: [30-85-30/140 Individual services penetrations fire stopping system](#).

Shared by: [30-85-30/140 Individual services penetrations fire stopping system](#); [30-85-30/145 Linear gap fire stopping system](#); and [30-85-30/155 Multiple services penetrations fire stopping system](#).

System completion[30-85-30/810 Cleaning after installation of fire stopping systems](#)

See: [30-85-30/140 Individual services penetrations fire stopping system](#).

Shared by: [30-85-30/140 Individual services penetrations fire stopping system](#); [30-85-30/145 Linear gap fire stopping system](#); [30-85-30/150 Loose fire stopping system](#); and [30-85-30/155 Multiple services penetrations fire stopping system](#).

[30-85-30/820 Inspection of fire stopping systems](#)

See: [30-85-30/140 Individual services penetrations fire stopping system](#).

Shared by: [30-85-30/140 Individual services penetrations fire stopping system](#); [30-85-30/145 Linear gap fire stopping system](#); [30-85-30/150 Loose fire stopping system](#); and [30-85-30/155 Multiple services penetrations fire stopping system](#).

Ω End of system

30-85-30/150 Loose fire stopping system

System outline

30-85-30/150 Loose fire stopping system

- **Description:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **System performance:** [30-85-30/220 Fire performance](#).
- **System manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Penetration seal:** [45-45-70/435 Intumescent pillows](#).
- **Samples required:** TO BE COMPLETED
- **Execution:** [30-85-30/610 Fire stopping systems workmanship generally](#) and [30-85-30/660 Installing intumescent pillows](#).
- **System completion:** [30-85-30/810 Cleaning after installation of fire stopping systems](#) and [30-85-30/820 Inspection of fire stopping systems](#).

System performance

[30-85-30/220 Fire performance](#)

See: [30-85-30/140 Individual services penetrations fire stopping system](#).

Shared by: [30-85-30/140 Individual services penetrations fire stopping system](#); [30-85-30/145 Linear gap fire stopping system](#); and [30-85-30/150 Loose fire stopping system](#).

Products

45-45-70/310 Insulation products generally

- **Third party product certification:** British Board of Agrément (BBA) certified.
- **Evidence of compliance:** Submit copy of current certificate for proposed product.
- **Certified effective life (minimum):** Manufacturer's standard.

45-45-70/435 Intumescent pillows

- **General requirements:** [45-45-70/310 Insulation products generally](#).
- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Composition:** Sealed polyethylene bags containing graphite and vermiculite granules treated with fire activated chemicals.
- **Integral reinforced eyelets:** Manufacturer's standard.
- **Size:** Manufacturer's standard.
- **Linking cable:** Manufacturer's standard.

Execution

[30-85-30/610 Fire stopping systems workmanship generally](#)

See: [30-85-30/140 Individual services penetrations fire stopping system](#).

Shared by: [30-85-30/140 Individual services penetrations fire stopping system](#); [30-85-30/145 Linear gap fire stopping system](#); [30-85-30/150 Loose fire stopping system](#); and [30-85-30/155 Multiple services penetrations fire stopping system](#).

30-85-30/660 Installing intumescent pillows

- **Pillows:**
 - **Placement:** As Manufacturers recommendations
- **Orientation:** As Manufacturers recommendations

System completion

[30-85-30/810 Cleaning after installation of fire stopping systems](#)

See: [30-85-30/140 Individual services penetrations fire stopping system](#).

Shared by: [30-85-30/140 Individual services penetrations fire stopping system](#); [30-85-30/145 Linear gap fire stopping system](#); [30-85-30/150 Loose fire stopping system](#); and [30-85-30/155 Multiple services penetrations fire stopping system](#).

[30-85-30/820 Inspection of fire stopping systems](#)

See: [30-85-30/140 Individual services penetrations fire stopping system](#).

Shared by: [30-85-30/140 Individual services penetrations fire stopping system](#); [30-85-30/145 Linear gap fire stopping system](#); [30-85-30/150 Loose fire stopping system](#); and [30-85-30/155 Multiple services penetrations fire stopping system](#).

Ω End of system

30-85-30/155 Multiple services penetrations fire stopping system**System outline**

30-85-30/155 Multiple services penetrations fire stopping system

- **Description:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **System performance:** TO BE COMPLETED
- **System manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Board barrier:** Submit proposals.
- **Framing:**
 - **Material:** Submit proposals.
 - **Fixing:** Submit proposals.
- **Sealant:**
 - **Sealant type:** Submit proposals.
 - **Primer:** Required.
- **Samples required:** TO BE COMPLETED
- **Execution:** [30-85-30/610 Fire stopping systems workmanship generally](#); [30-85-30/720 Applying fire stopping capping sealant](#); and [30-85-30/620 Installing fire stopping boarding](#).
- **System completion:** [30-85-30/810 Cleaning after installation of fire stopping systems](#) and [30-85-30/820 Inspection of fire stopping systems](#).

Execution

[30-85-30/610 Fire stopping systems workmanship generally](#)

See: [30-85-30/140 Individual services penetrations fire stopping system](#).

Shared by: [30-85-30/140 Individual services penetrations fire stopping system](#); [30-85-30/145 Linear gap fire stopping system](#); [30-85-30/150 Loose fire stopping system](#); and [30-85-30/155 Multiple services penetrations fire stopping system](#).

30-85-30/620 Installing fire stopping boarding

- **Framing:** Submit proposals.
- **Boarding:**
 - **Position:** Submit proposals.
 - **Number of layers:** Submit proposals.
 - **Joint arrangement:** Stagger joints between layers.
- **Fixing:**
 - **Centres:** 100 mm.
- **Finishing:** Submit proposals.

[30-85-30/720 Applying fire stopping capping sealant](#)

See: [30-85-30/140 Individual services penetrations fire stopping system](#).

Shared by: [30-85-30/140 Individual services penetrations fire stopping system](#); [30-85-30/145 Linear gap fire stopping system](#); and [30-85-30/155 Multiple services penetrations fire stopping system](#).

System completion

[30-85-30/810 Cleaning after installation of fire stopping systems](#)

See: [30-85-30/140 Individual services penetrations fire stopping system](#).

Shared by: [30-85-30/140 Individual services penetrations fire stopping system](#); [30-85-30/145 Linear gap fire stopping system](#); [30-85-30/150 Loose fire stopping system](#); and [30-85-30/155 Multiple services penetrations fire stopping system](#).

[30-85-30/820 Inspection of fire stopping systems](#)

See: [30-85-30/140 Individual services penetrations fire stopping system](#).

Shared by: [30-85-30/140 Individual services penetrations fire stopping system](#); [30-85-30/145 Linear gap fire stopping system](#); [30-85-30/150 Loose fire stopping system](#); and [30-85-30/155 Multiple services penetrations fire stopping system](#).

Ω End of system

70-70-25/110 Earthing and bonding system

System outline

70-70-25/110 Earthing and bonding system

- **Description:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **System performance:** As set in BS EN50310 type A star earthing arrangement
- **Main incoming earth:** Establish with the Electricity Distributor and Separate earth electrode network.
- **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.](#)
- **Circuit protective conductors:** Cable armour;
Cable armour and auxiliary;
and Core of cable.
- **Earth terminal type:** [90-75-50/310 Earth bars](#) and Distribution Network Operators earth terminal block.
- **Accessories:** [90-55-15/305 Anti-vandal capping](#) and [90-75-50/350 Earthing and bonding clamps.](#)
- **Electrical identification:** [90-90-55/320 Electrical shock treatment signs;](#)
[90-90-55/390 Equipment labels and warning notices;](#)
and [90-90-55/395 Electrical diagrams.](#)
- **Execution:** [70-70-25/610 Removing earthing and bonding systems;](#)
[70-70-25/620 Measurement of characteristics of existing installations;](#)
[70-70-25/630 General installation;](#)
[70-70-25/640 Installing earth conductor joints and connections;](#)
[70-70-25/660 Installing earthing conductor;](#)
[70-70-25/670 Installing main protective bonding conductors;](#)
[70-70-25/680 Installing supplementary bonding conductors;](#)
[70-70-25/690 Dissimilar metals;](#)
[70-70-25/700 Earthing and bonding of street furniture;](#)
[70-70-25/710 Earthing of metal fencing around substations;](#)
[70-70-25/720 Notices and labels;](#)
and [70-70-25/730 Installing functional earthing conductors.](#)
- **System completion:** [70-70-25/810 Inspection and testing](#) and [70-70-25/820 Documentation.](#)

Products

90-55-15/305 Anti-vandal capping

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Material:** Manufacturer's standard.
- **Diameter:** Manufacturer's standard.
- **Colour:** Submit proposals.
- **Execution:** [90-55-15/745 Installing anti-vandal capping.](#)

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

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

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standards:** To [BS EN 50525-1](#) and [BS EN 50525-3-41](#).
- **Third party certification:** British Approvals Service for Cables (BASEC) certified.
- **Cable type:** Manufacturer's standard.
- **Size:** Manufacturer's standard.
- **Execution:** [90-55-15/635 Installing low voltage cables](#) and [90-55-15/660 Installing low voltage cables in conduit and trunking](#).

90-75-50/310 Earth bars

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Material:**
 - **Bar type:** Hard drawn copper to [BS EN 13601](#).
 - **Support:** PVC-U.
- **Size:**
 - **Profile:** As shown on Project Drawings.
 - **Length:** As shown on Project Drawings.
- **Predrilled connections (minimum):** As shown on Project Drawings.
- **Disconnecting links:** As shown on Project Drawings.
- **Execution:** [90-75-50/610 Installing earth bars](#).

90-75-50/350 Earthing and bonding clamps

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standard:** To [BS 951](#).

90-90-55/320 Electrical shock treatment signs

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.
- **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:** Reverse engraved and coloured transparent rigid plastic.
- **Label size:** Submit proposals.
- **Colour:**
 - **Background:** White.
 - **Lettering:** Black.
- **Typography:**
 - **Font:** Submit proposals.
 - **Size:** Submit proposals.
- **Notice wording:** Submit proposals.

90-90-55/395 Electrical diagrams

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](#).

- **Material:** Paper print, encapsulated.
- **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

70-70-25/610 Removing earthing and bonding systems

- **Scope:** As set out in M&E Specification Volume 1- Outline of Engineering Services

70-70-25/620 Measurement of characteristics of existing installations

- **External earth fault loop impedance (Ze):** Direct measurement.
- **Earth fault loop impedance (Zs):** Direct measurement.
- **Results:** Submit.

70-70-25/630 General installation

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

70-70-25/640 Installing earth conductor joints and connections

- **Number of joints:** Minimize.
- **Contact surfaces:** Clean. Coat with corrosion inhibitor.
- **Bimetallic joints:** Do not cross-contaminate.
- **Protection to joints and connections:** Apply thixotropic corrosion prevention fluid.
- **Connections to test points:** Clamp.
- **Copper tape jointing:**
 - **Type:** Phosphor bronze clamps, nuts, bolts and washers.
 - **Copper tape overlap (minimum):** 100 mm.
- **Protective cable terminations:** Compression lugs with phosphor bronze nuts, bolts and washers.

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:** As shown on Project Drawings.
- **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:** As shown on Project Drawings.
- **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.

70-70-25/690 Dissimilar metals

- **Connecting dissimilar metals:** Prevent electrolytic action.

70-70-25/700 Earthing and bonding of street furniture

- **Standards:** In accordance with [BS 7671](#) and the Electricity Distributor's requirements.
- **Supplies to street furniture:** Use cables with separate phase, neutral and protective conductors.

70-70-25/710 Earthing of metal fencing around substations

- **Earthing arrangement:** Connected to substation earthing system.

70-70-25/720 Notices and labels

- **Earth bars:** Describe each connection and label with 'SAFETY ELECTRICAL CONNECTION – DO NOT REMOVE'.
- **Earthing and main protective bonding connections:** Describe each connection and label with 'SAFETY ELECTRICAL CONNECTION – DO NOT REMOVE'.
- **Supplementary bonding connections:** Describe each connection and label with 'SAFETY ELECTRICAL CONNECTION – DO NOT REMOVE'.
- **Telecommunications functional earth connections:** Label with 'TELECOMMS EARTH – DO NOT REMOVE'.

70-70-25/730 Installing functional earthing conductors

- **Standard:** To [BS 6701](#).
- **Labelling:** Identify the purpose of functional earth cables along their length using clip-on cable markers.
- **Spacing (maximum):** 3 m.

90-55-15/635 Installing low voltage cables

Shared by: [90-55-15/330 Fire resistant screened \(LSHF\) cables](#); [90-55-15/334 Single core non-sheathed cables with LSHF insulation](#); [90-55-15/340 Multicore screened thermosetting insulated \(LSHF\) sheathed cables](#); [90-55-15/350 Thermosetting insulated and thermoplastic sheathed \(LSHF\) cables](#); [90-55-15/405 Balanced twisted-pair cables](#); [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:** 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

Shared by: [90-55-15/330 Fire resistant screened \(LSHF\) cables](#); [90-55-15/334 Single core non-sheathed cables with LSHF insulation](#); [90-55-15/340 Multicore screened thermosetting insulated \(LSHF\) sheathed cables](#); [90-55-15/350 Thermosetting insulated and thermoplastic sheathed \(LSHF\) cables](#); and [90-55-15/405 Balanced twisted-pair cables](#).

- **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.

90-55-15/745 Installing anti-vandal capping

- **Position:** Provide between finished ground level and 3 m high.

90-75-50/610 Installing earth bars

- **Main earth bar location:** As shown on Project Drawings.
- **Multiple earth bars:** Connect with a conductor ring.
- **Mounting:**
 - **Spacers:** Ceramic.
 - **Support spacing (maximum):** 300 mm for 25 mm bar and 450 mm for 50 mm bar.
 - **Clearance between wall and earth bar (minimum):** 30 mm.

System completion

70-70-25/810 Inspection and testing

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

- **Notice before commencing tests (minimum):** 7 days
- **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 (Ze):** Direct measurement.
- **Earth fault loop impedance (Zs):** Direct measurement.

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 and electronic copies
 - **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:** Electronic drawing.
 - **Number of copies:** Two.
- **Submittal date:** At handover.

Ω End of system

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

- **Description:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **General requirements:**
 - **Electrical test engineer:** Electrical installation contractor.
 - **Approval:** [National Inspection Council for Electrical Installation Contracting \(NICEIC\)](#) or ECA
 - **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):** 5 working days
- **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:** To be arranged in advance with the property and to be carried out at a time to minimise disruption to operation of the property.
- **Earth fault loop impedance (Zs):** By direct measurement.
- **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.
- **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.

Ω End of system

70-70-45/110 Low voltage distribution system**System outline**

70-70-45/110 Low voltage distribution system

- **Description:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **System performance:** TO BE COMPLETED
- **Connection to low voltage supply:** As shown on Project Drawings.
- **Switchgear:** [90-50-45/390 Cable distribution cabinets](#);
[90-50-45/410 Distribution boards](#);
[90-50-45/420 Cubicle switchboards](#);
[90-50-45/440 Busbar chambers](#);
and [90-50-45/450 Switch-disconnectors](#).
- **Distribution circuit cabling:** [90-55-15/324 Thermosetting insulated and thermoplastic sheathed \(LSHF\) armoured cables](#);
[90-55-15/332 Thermosetting insulated armoured fire resistant \(LSHF\) cables](#);
[90-55-15/350 Thermosetting insulated and thermoplastic sheathed \(LSHF\) cables](#);
and [90-50-45/320 Power busbar trunking](#).
- **Cable accessories:** [90-55-10/310 Cable cleats](#);
[90-55-10/315 Cable ties](#);
[90-55-10/320 Cable bands](#);
[90-90-55/440 Plastic warning devices for underground cables and pipelines](#);
and .
- **Containment:** [90-55-10/305 Channel cable supports](#);
[90-55-10/325 Cable baskets](#);
[90-55-10/330 Cable ladders](#);
[90-55-10/335 Cable trays](#);
[90-55-10/380 Rigid conduit](#);
[90-55-10/385 PVC trunking](#);
and [90-55-10/410 Cable trunking and cable ducting for wall and ceiling mounting](#).
- **Containment accessories:** [45-50-05/310 Expansion anchors](#);
[45-50-10/335 Hexagon head stainless steel nuts and bolts](#);
[45-50-12/340 Stainless steel anchor rods](#);
[45-50-12/360 Stainless steel anchor sockets](#);
[45-50-60/410 Hexagon head stainless steel screws](#);
[45-50-67/350 Masonry plugs](#);
[90-55-10/460 Conduit fittings](#);
and [90-55-10/475 Intumescent trunking pillows](#).
- **Rewireable installation:** Required.
- **Concealed installation:** Submit proposals.
- **Monitoring and metering:** [90-65-55/315 Current transformers](#) and [90-65-55/325 Digital multifunction metering equipment](#).
- **Power conditioning equipment:** [90-60-30/410 Surge protective devices for low voltage power supplies](#);
[90-60-40/360 Automatic power factor correction equipment](#);

- [90-60-40/410 Uninterruptible power supply \(UPS\) unit;](#)
and [90-60-40/420 Uninterruptible power supply \(UPS\) remote alarm and indicator panels.](#)
- **Accessories:** [90-90-60/310 Battery shelving racks;](#)
[90-50-45/470 Control and protective switching devices type B;](#)
[90-50-75/310 Electrical insulating matting;](#)
[45-25-18/420 Padlocks;](#)
[45-35-80/390 Padlock and key cabinets;](#)
[90-50-45/460 Transfer switching equipment \(TSE\) type B;](#)
[90-50-45/350 Fire barrier units;](#)
[90-50-45/470 Control and protective switching devices type C;](#)
and [90-50-45/460 Automatic transfer switching equipment \(TSE\) type C.](#)
 - **Electrical identification:** [90-90-55/320 Electrical shock treatment signs;](#)
[90-90-55/390 Equipment labels and warning notices;](#)
and [90-90-55/395 Electrical diagrams.](#)
 - **Execution:** [70-70-45/625 Installing low voltage distribution systems;](#)
[70-70-45/626 Installing multi-box assemblies;](#)
[70-70-45/630 Electrical property measurement of low voltage systems;](#)
[70-70-45/610 Removing low voltage distribution systems;](#)
and [70-70-45/615 Alterations to existing switchgear.](#)
 - **System completion:** [70-70-45/810 Inspecting, testing and commissioning of switchgear generally;](#)
[70-70-45/820 Documentation;](#)
[70-70-45/813 Inspecting, testing and commissioning UPS equipment;](#)
and [70-70-45/840 Maintenance.](#)

Products

45-25-18/420 Padlocks

- **Manufacturer:** TO BE COMPLETED
- **Standard:** To [BS EN 12320](#).
- **Third party certification:** TO BE COMPLETED
- **Classification grades (minimum):**
 - **Corrosion resistance:** TO BE COMPLETED
 - **Security:** TO BE COMPLETED
- **Size:** TO BE COMPLETED
- **Material and finish:**
 - **Case:** TO BE COMPLETED
 - **Shackle:** TO BE COMPLETED
- **Keying:** TO BE COMPLETED
- **Integral accessories:** TO BE COMPLETED

45-35-80/390 Padlock and key cabinets

- **Manufacturer:** TO BE COMPLETED
- **Dimensions:** TO BE COMPLETED

- **Mounting:** Wall.
- **Material:** Metal.
- **Finish:** Match switchgear.
- **Doors:** TO BE COMPLETED
- **Labelling:** Include nameplate on front cover of cabinet and labelled shelves.
- **Execution:** TO BE COMPLETED

45-50-05/310 Expansion anchors

Shared by: [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [75-45-20/110 Data distribution system](#).

- **Manufacturer:** Submit proposals.
- **Certification:** Where a European Assessment Document (EAD) or European Technical Assessment Guideline (ETAG) is available, provide a European Technical Assessment (ETA) with CE marking and a Declaration of Performance (DoP). Otherwise provide third party certification by a [United Kingdom Accreditation Service](#) (UKAS)-approved independent laboratory.
- **Format:** Manufacturer's standard.
- **Material:** Manufacturer's standard.
- **Finish:** Manufacturer's standard.
- **Head arrangement:** Manufacturer's standard.
- **Anchor length:** Manufacturer's standard.
- **Accessories:** Manufacturer's standard.
- **Thread diameter:** Manufacturer's standard.
- **Execution:** [45-50-05/610 Fixing with anchors](#).

45-50-10/335 Hexagon head stainless steel nuts and bolts

Shared by: [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [75-45-20/110 Data distribution system](#).

- **Manufacturer:** Submit proposals.
- **Bolts:**
 - **Standard:** Manufacturer's standard.
 - **Size:**
 - Thread diameter:** Manufacturer's standard.
 - Length:** Manufacturer's standard.
 - **Steel grade:** Manufacturer's standard.
- **Nuts:**
 - **Standard:** Manufacturer's standard.
 - **Property class:** To match bolt strength.
- **Accessories:** Locking nut and Plastics cap to bolt head.
- **Execution:** [45-50-10/605 Fixing with bolts generally](#).

45-50-12/340 Stainless steel anchor rods

Shared by: [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [75-45-20/110 Data distribution system](#).

- **Manufacturer:** Submit proposals.

- **Certification:** Where a European Assessment Document (EAD) or European Technical Assessment Guideline (ETAG) is available, provide a European Technical Assessment (ETA) with CE marking and a Declaration of Performance (DoP). Otherwise provide third party certification by a [United Kingdom Accreditation Service](#) (UKAS)-approved independent laboratory.
- **Head arrangement:** Manufacturer's standard.
- **End arrangement:** Manufacturer's standard.
- **Steel grade:** Manufacturer's standard.
- **Size:**
 - **Thread diameter:** Manufacturer's standard.
 - **Length:** Manufacturer's standard.
- **Execution:** [45-50-12/610 Fixing anchors using cartridge-applied adhesive](#) and [45-50-12/620 Fixing anchors using chemical anchor capsules](#).

45-50-12/360 Stainless steel anchor sockets

Shared by: [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [75-45-20/110 Data distribution system](#).

- **Manufacturer:** Submit proposals.
- **Certification:** Where a European Assessment Document (EAD) or European Technical Assessment Guideline (ETAG) is available, provide a European Technical Assessment (ETA) with CE marking and a Declaration of Performance (DoP). Otherwise provide third party certification by a [United Kingdom Accreditation Service](#) (UKAS)-approved independent laboratory.
- **Steel grade:** Manufacturer's standard.
- **Size:**
 - **Thread diameter:** Manufacturer's standard.
 - **Length:** Manufacturer's standard.
- **Safe working load (minimum):** Manufacturer's standard.
- **Accessories:** Manufacturer's standard.
- **Execution:** [45-50-12/610 Fixing anchors using cartridge-applied adhesive](#) and [45-50-12/620 Fixing anchors using chemical anchor capsules](#).

45-50-60/410 Hexagon head stainless steel screws

Shared by: [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [75-45-20/110 Data distribution system](#).

- **Manufacturer:** Submit proposals.
- **Screws:**
 - **Standard:** Manufacturer's standard.
 - **Size:**
 - Thread diameter:** Manufacturer's standard.
 - Length:** Manufacturer's standard.
 - **Steel grade:** Manufacturer's standard.

45-50-67/350 Masonry plugs

Shared by: [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [75-45-20/110 Data distribution system](#).

- **Manufacturer:** Contractor's choice.
- **Format:** To suit substrate, loads to be supported and conditions expected in use.
- **Size:** Manufacturer's standard.

90-50-45/320 Power busbar trunking

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standards:** To [BS EN 61439-1](#) and [BS EN 61439-6](#).
- **Third party certification:** [ASTA Type test certification](#).
- **Nominal voltage:** 400 V a.c.
- **Rated current:** As shown on Project Drawings.
- **Configuration:** As shown on Project Drawings.
- **Tap-off points:** Manufacturer's standard.
- **Place of installation:** Indoor.
- **Mounting orientation:** Vertical.
- **Rated peak withstand current:** Manufacturer's standard.
- **Rated short-time withstand current (1 s):** Manufacturer's standard.
- **Enclosure:**
 - **Ingress protection (minimum):** To [BS EN 60529](#), IP55.
 - **Impact protection (minimum):** To [BS EN 62262](#), IK08.
 - **Mechanical loads:** Manufacturer's standard.
 - **Material:** Steel.
 - **Finish:** Hot dipped galvanized.
 - **Colour:** Manufacturer's standard.
- **Conductors:** Insulated copper.
- **Supports:** Manufacturer's standard.
- **Accessories:** Manufacturer's standard.
- **Execution:** [90-50-45/620 Installing busbar trunking](#) and [90-50-45/660 Testing and commissioning of site-assembled busbar trunking](#).

90-50-45/350 Fire barrier units

- **Manufacturer:** TO BE COMPLETED
- **Standards:** To [BS EN 61439-1](#) and [BS EN 61439-6](#).
- **Fire resistance:** TO BE COMPLETED
- **Circuits:** Match busbar trunking.
- **Execution:** TO BE COMPLETED

90-50-45/390 Cable distribution cabinets

- **Manufacturer:** Refer to to M&E Specification Volume 1 for approved manufacturers.
- **Product reference:** TO BE COMPLETED
- **Standards:** To [BS EN 61439-1](#) and [BS EN 61439-5](#).
- **Third party certification:** [ASTA Type test certification](#).

- **Rated operational voltage (Ue):** 415 V a.c.
- **Rated operational frequency:** 50 Hz.
- **Number of phases:** Three.
- **Incoming device:** [90-50-45/450 Switch-disconnectors](#).
- **Outgoing devices:**
 - **Type:** As shown on Project Drawings.
 - **Quantity:** As shown on Project Drawings.
- **Busbars and connections:**
 - **Type:** Fully shrouded.
 - **Rated operational current (Ie):** Manufacturer's standard.
 - **Rated short-time withstand current (Icw) for 1 s:** Manufacturer's standard.
- **Neutral and earth bars:** Individual terminal for each outgoing circuit.
- **Spare ways:** As Circuit schedules and Fit with blank plates.
- **Identification:** Label L, N and E cable terminations with push on plastic markers identifying circuit reference.
- **Spare outgoing devices:** Two of each size and rating used mounted within cabinet.
- **Enclosure:**
 - **Ingress protection (minimum):** To [BS EN 60529](#), IP65.
 - **Impact protection (minimum):** To [BS EN 62262](#), IK10.
 - **Dimensions:** Manufacturer's standard.
 - **Material:** Steel.
 - **Finish:** Hot dip galvanized.
 - **Colour:** Manufacturer's standard.
 - **Doors:** Manufacturer's standard.
 - **Backboard:** Manufacturer's standard.
- **Accessories:** Anti-condensation heater and thermostat.
- **Execution:** [90-50-45/665 Installing switchgear generally type A](#).

90-50-45/410 Distribution boards

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standards:** To [BS EN 61439-1](#) and [BS EN 61439-3](#).
- **Third party certification:** [ASTA Type test certification](#).
- **Rated operational voltage (Ue):** 600 V.
- **Incoming device:** [90-50-45/450 Switch-disconnectors](#).
- **Outgoing devices:**
 - **Type:** [90-60-30/330 Miniature circuit breakers](#) and [90-60-30/350 Residual current circuit breakers with integral overcurrent protection](#).
 - **Quantity:** As shown on Project Drawings and Circuit Schedules
- **Busbars and connections:**
 - **Type:** Fully shrouded.
 - **Rated operational current (Ie):** As shown on Project Drawings and Circuit Schedules

- **Rated short-time withstand current (I_{cw}) for 1 s:** As shown on Project Drawings and Circuit Schedules
- **Neutral and earth bars:** Individual terminal for each outgoing circuit.
- **Neutral terminations:** Match current carrying capacity of phase conductor.
- **Spare ways:** As Circuit schedules and Fit with blank plates.
- **Enclosure:**
 - **Ingress protection (minimum):** To [BS EN 60529](#), IP31.
 - **Material:** Steel.
 - **Finish:** Polyester powder coated.
 - **Colour:** Manufacturer's standard.
 - **Locking mechanism:** Cylinder locks with a standard key type.
- **Accessories:** Current transformers and Digital metering equipment.
- **Execution:** [90-50-45/665 Installing switchgear generally type A.](#)

90-50-45/420 Cubicle switchboards

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standards:** To [BS EN 61439-1](#) and [BS EN 61439-2](#).
- **Third party certification:** [ASTA Type test certification](#).
- **External design type:** As shown on Project Drawings
- **Rated operational voltage (U_e):** 600 V a.c.
- **Incoming device:** [90-60-30/310 Air circuit breakers](#) or [90-60-30/320 Moulded case circuit breakers](#) as shown on Project Drawings
- **Outgoing devices:**
 - **Type:** [90-60-30/320 Moulded case circuit breakers](#).
 - **Quantity:** As shown on Project Drawings and Circuit Schedules
- **Busbar and connections:**
 - **Rated operational current (I_e):** As shown on Project Drawings and Circuit Schedules
 - **Rated short-time withstand current (I_{cw}) for 1 s:** As shown on Project Drawings and Circuit Schedules
- **Terminals:** Suitable for the connection of copper conductors.
- **Full length internal copper earth bar:** Required
- **Spare ways:** As Circuit schedules and Fit with blank plates.
- **Enclosure:**
 - **Dimensions:** Manufacturer's standard.
 - **Ingress protection (minimum):** As shown on Project Drawings
 - **Impact protection (minimum):** To [BS EN 62262](#), IK10.
 - **Material:** Steel.
 - **Finish:** Externally polyester powder coated.
Internal partitions, zinc coated.
 - **Colour:** Manufacturer's standard.
 - **Locking mechanism:** Door-interlocked operating handles.
 - **Hardware:** Corrosion-resistant lever type handles with latching mechanism.

- **Locks:** Cylinder type with a standardized key.
- **Fixing of removable panels:** Captive, corrosion resistant knurled thumb screws.
- **Lifting bolts:** Integral within reinforced top frame.
- **Internal separation:** As shown on Project Drawings
- **Cable entry:** Suitable for front access cabling and Entry via gland plates facilitating either top and/or bottom entry.
- **Mounting arrangement for Electricity Distributor's metering equipment:** Integral within cubicle switchboard.
- **Accessories:** Anti-condensation heater and thermostat;
Transfer switching equipment (TSE);
Control and protective switching devices;
Current transformers;
Digital metering equipment;
and Low voltage safety matting.
- **Execution:** [90-50-45/665 Installing switchgear generally type A.](#)

90-50-45/440 Busbar chambers

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standards:** To [BS EN 61439-1](#) and [BS EN 61439-2](#).
- **Third party certification:** [ASTA Type test certification](#).
- **Material:** Hard drawn high conductivity copper to [BS EN 13601](#).
- **Cross section:** Rectangular with radiused edges.
- **Number of poles:** Four.
- **Rated operational current (In):** As shown on Project Drawings.
- **Rated short-time withstand current (Icw) for 1 s:** 50 kA.
- **Enclosure:**
 - **Ingress protection (minimum):** To [BS EN 60529](#), IP31.
 - **Impact protection (minimum):** To [BS EN 62262](#), IK08.
 - **Material:** Sheet steel.
 - **Finish:** Hot dip galvanized. Pre-lacquered.
 - **Colour:** Manufacturer's standard.
- **Accessories:** Busbar extension sets;
Busbar connection sets;
and Busbar clamps and sockets.
- **Execution:** [90-50-45/620 Installing busbar trunking.](#)

90-50-45/450 Switch-disconnectors

Shared by: [70-70-45/110 Low voltage distribution system](#); [90-50-45/390 Cable distribution cabinets](#); and [90-50-45/410 Distribution boards](#).

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standards:** To [BS EN 60947-1](#) and [BS EN 60947-3](#).
- **Third party certification:** [ASTA Type test certification](#).
- **Rated operational voltage (Ue):** 600 V.

- **Rated operational current (In):** As shown on Project Drawings.
- **Rated operational frequency:** 50 Hz.
- **Switch arrangement:** As shown on Project Drawings.
- **Rated short-time withstand current (Icw) for 1 s:** As shown on Project Drawings.
- **Utilization category:** Manufacturer's standard.
- **Terminals:** Suitable for the connection of copper conductors.
- **Mechanical interlocking:** Manufacturer's standard.
- **Enclosure:**
 - **Ingress protection (minimum):** As shown on Project Drawings.
 - **Impact protection (minimum):** To [BS EN 62262](#), IK08.
 - **Material:** Manufacturer's standard.
 - **Finish:** Manufacturer's standard.
 - **Colour:** Manufacturer's standard.
 - **Gland plates:** Manufacturer's standard.
- **Execution:** [90-50-45/665 Installing switchgear generally type A.](#)

90-50-45/460 Transfer switching equipment (TSE) type B

- **Manufacturer:** Submit proposals.
- **Standards:** To [BS EN 60947-1](#) and [BS EN 60947-6-1](#).
- **Short-circuit capability:** TO BE COMPLETED
- **Method of controlling transfer:** TO BE COMPLETED
- **Operating sequence:** TO BE COMPLETED
- **Operating mechanism:** TO BE COMPLETED
- **Rated operational voltage (Ue):** TO BE COMPLETED
- **Rated impulse withstand voltage (Uimp):** TO BE COMPLETED
- **Rated insulation voltage (Ui):** TO BE COMPLETED
- **Rated operational current (In):** TO BE COMPLETED
- **Rated operational frequency:** TO BE COMPLETED
- **Number of poles:** TO BE COMPLETED
- **Rated short-time withstand current (Icw) for 1 s:** TO BE COMPLETED
- **Rated short-circuit making capacity (Icm):** TO BE COMPLETED
- **Rated short-circuit breaking capacity (Icn):** TO BE COMPLETED
- **Utilization category:** TO BE COMPLETED
- **Terminals:** TO BE COMPLETED
- **Controls:**
 - **Type:** TO BE COMPLETED
 - **Display type:** TO BE COMPLETED
 - **Illuminated display to indicate the following conditions:** TO BE COMPLETED
 - **User adjustable functions:** TO BE COMPLETED
 - **Features:** TO BE COMPLETED
 - **Communication module:** TO BE COMPLETED
- **Enclosure:**

- **Ingress protection (minimum):** TO BE COMPLETED
- **Impact protection (minimum):** TO BE COMPLETED
- **Material:** TO BE COMPLETED
- **Finish:** TO BE COMPLETED
- **Colour:** TO BE COMPLETED
- **Gland plates:** TO BE COMPLETED
- **Execution:** TO BE COMPLETED

90-50-45/460 Automatic transfer switching equipment (TSE) type C

- **Manufacturer:** As Electrical Services Preferred Manufacturers list.
- **Standard:** To [BS EN 60947-3](#) and [BS EN 60947-6-1](#).
- **Operating mechanism:** Automatic via 240 V a.c. motor and manual override.
- **Operating sequence:** I-O-II.
- **Short-circuit capability:** To match main switchgear.
- **Rated operational current (In):** 800 A.
- **Rated operational voltage (Ue):** 415 V.
- **Rated operational frequency:** 50 Hz.
- **Number of poles:** Four.
- **Rated short-time withstand current (Icw) for 1 s:** To match main switchgear.
- **Rated short-circuit making capacity (Icm):** To match main switchgear.
- **Rated short-circuit breaking capacity (Icu):** To match main switchgear.
- **Utilization category:** To match main switchgear.
- **Controls:**
 - **Type:** Solid state microprocessor based.
 - **Display type:** Submit proposals.
 - **Illuminated display to indicate the following conditions:** Submit proposals.
 - **User adjustable functions:** Voltage threshold;
Frequency threshold;
Switching delay;
Dead band time L1-L2;
and Dead band time L2-L1.
 - **Features:** 24 V d.c. auxiliary voltage supply connection;
Generator start and stop;
Off load test;
and On load test.
 - **Communication module:** Integral with controls to allow remote monitoring and operation of switch.
- **Execution:** [90-50-45/665 Installing switchgear generally type B](#).

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

- **Manufacturer:** Schneider Electric Ltd
- **Product reference:** Submit proposals.
- **Standards:** To [BS EN 60947-1](#) and [BS EN 60947-6-2](#).

- **Method of operation:** TO BE COMPLETED
- **Method of control:** TO BE COMPLETED
- **Reset after overload:** TO BE COMPLETED
- **Rearming after short-circuit:** TO BE COMPLETED
- **Utilization category:** TO BE COMPLETED
- **Execution:** [90-50-45/665 Installing switchgear generally type A.](#)

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

- **Manufacturer:** As Electrical Services Preferred Manufacturers list in Performance Specification.
- **Standard:** To [BS EN 60947-6-2](#).
- **Method of operation:** Electromagnetic.
- **Method of control:** Automatic.
- **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 type B.](#)

90-50-75/310 Electrical insulating matting

- **Manufacturer:** Submit proposals.
- **Standard:** To [BS EN 61111](#).
- **Class:** 0.
- **Width (minimum):** Submit proposals.
- **Length (minimum):** Submit proposals.
- **Execution:** [90-50-75/610 Installing electrical insulating matting.](#)

90-55-10/305 Channel cable supports

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 6946](#).
- **Format:** Plain.
- **Dimensions:** Manufacturer's standard.
- **Material:** Carbon steel.
- **Finish:** Manufacturer's standard.
- **Accessories:**
 - **Manufacturer:** As channel cable support.
 - **Type:** Manufacturer's standard.
- **Execution:** [90-55-10/640 Installing cable supports on roofs](#);
[90-55-10/650 Multiple cable runs](#);
[90-55-10/660 Cable support zones](#);
and [90-55-10/610 Installing channel cable supports](#).

90-55-10/310 Cable cleats

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

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standard:** To [BS EN 61914](#).
- **Format:** Manufacturer's standard.
- **Material:** Manufacturer's standard.
- **Temperatures for permanent installation:**
 - **Maximum:** Manufacturer's standard.
 - **Minimum:** Manufacturer's standard.
- **Resistance to impact:** Manufacturer's standard.
- **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:** Manufacturer's standard.
- **Material:** Manufacturer's standard.
- **Loop tensile strength (minimum):** Manufacturer's standard.
- **Temperatures for permanent installation:**
 - **Maximum:** Manufacturer's standard.
 - **Minimum:** Manufacturer's standard.
- **Contribution to fire:** Manufacturer's standard.
- **Environmental influences:**
 - **Non-metallic and composite components:** Resistant to ultraviolet light.
 - **Metallic and composite components:** Resistant to corrosion.

90-55-10/320 Cable bands

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.
- **Material:** Manufacturer's standard.
- **Protective covering:** LSHF.

90-55-10/325 Cable baskets

Shared by: [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [75-45-20/110 Data distribution system](#).

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standard:** To [BS EN 61537](#).
- **Material:** Manufacturer's standard.
- **Coating material:** Hot dip galvanized.

- **Sizes:**
 - **Width:** Manufacturer's standard.
 - **Side height:** Manufacturer's standard.
- **Features:**
 - **Segregation:** Manufacturer's standard.
 - **Protective cover:** Not required.
- **Execution:** [90-55-10/630 Installing cable basket](#);
[90-55-10/650 Multiple cable runs](#);
and [90-55-10/660 Cable support zones](#).

90-55-10/330 Cable ladders

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

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standard:** To [BS EN 61537](#).
- **Material:** Metal.
- **Resistance against flame propagation:** Manufacturer's standard.
- **Electrical properties:**
 - **Continuity characteristics:** Manufacturer's standard.
 - **Conductivity characteristics:** Manufacturer's standard.
- **Coating material:** Hot dip galvanized.
- **Temperature properties for transport, storage, installation and application:**
 - **Minimum:** Manufacturer's standard.
 - **Maximum:** Manufacturer's standard.
- **Mechanical properties:**
 - **Cable ladder free base area:** Manufacturer's standard.
 - **Resistance to impact:** Manufacturer's standard.
- **Width:** Manufacturer's standard.
- **Features:**
 - **Segregation:** Manufacturer's standard.
 - **Protective cover:** Not required.
- **Execution:** [90-55-10/650 Multiple cable runs](#);
[90-55-10/660 Cable support zones](#);
[90-55-10/620 Installing cable tray and cable ladder](#);
and [90-55-10/640 Installing cable supports on roofs](#).

90-55-10/335 Cable trays

Shared by: [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [75-45-20/110 Data distribution system](#).

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standard:** To [BS EN 61537](#).
- **Material:** Metal.
- **Resistance against flame propagation:** Manufacturer's standard.
- **Electrical properties:**

- **Continuity characteristics:** Manufacturer's standard.
- **Conductivity characteristics:** Manufacturer's standard.
- **Coating material:** Hot dip galvanized.
- **Temperature properties for transport, storage, installation and application:**
 - **Minimum:** Manufacturer's standard.
 - **Maximum:** Manufacturer's standard.
- **Mechanical properties:**
 - **Cable tray free base area:** Manufacturer's standard.
 - **Resistance to impact:** Manufacturer's standard.
- **Width:** Manufacturer's standard.
- **Features:**
 - **Flange type:** Return.
 - **Segregation:** Manufacturer's standard.
 - **Protective cover:** Required.
- **Execution:** [90-55-10/620 Installing cable tray and cable ladder](#);
[90-55-10/640 Installing cable supports on roofs](#);
[90-55-10/650 Multiple cable runs](#);
and [90-55-10/660 Cable support zones](#).

90-55-10/360 Flexible conduit

Shared by: [70-70-75/110 Hard wired low voltage small power system](#); and [90-55-10/735 Installing conduit connections to equipment](#).

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standards:** To [BS EN 61386-1](#) and [BS EN 61386-23](#).
- **Mechanical properties:**
 - **Resistance to compression:** Manufacturer's standard.
 - **Resistance to impact:** Manufacturer's standard.
- **Transport, installation and application:**
 - **Lower temperature (minimum):** Manufacturer's standard.
 - **Upper temperature (maximum):** Manufacturer's standard.
- **Resistance to bending:** Flexible.
- **Electrical characteristics:** Manufacturer's standard.
- **Resistance to external influences:**
 - **Protection against ingress of solid objects (minimum):** Manufacturer's standard.
 - **Protection against ingress of water (minimum):** Manufacturer's standard.
- **Resistance to corrosion:** Manufacturer's standard.
- **Tensile strength:** Manufacturer's standard.
- **Resistance to flame propagation:** Non-flame propagating.
- **Suspended load capacity:** Manufacturer's standard.
- **Sizes (OD):** Manufacturer's standard.
- **Execution:** [90-55-10/735 Installing conduit connections to equipment](#).

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 [75-45-20/110 Data distribution system](#).

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standards:** To [BS EN 61386-1](#) and [BS EN 61386-21](#).
- **Mechanical properties:**
 - **Resistance to compression:** Manufacturer's standard.
 - **Resistance to impact:** Manufacturer's standard.
- **Transport, installation and application:**
 - **Lower temperature (minimum):** Manufacturer's standard.
 - **Upper temperature (maximum):** Manufacturer's standard.
- **Resistance to bending:** Rigid.
- **Electrical characteristics:** Manufacturer's standard.
- **Resistance to external influences:**
 - **Protection against ingress of solid objects (minimum):** Manufacturer's standard.
 - **Protection against ingress of water (minimum):** Manufacturer's standard.
- **Resistance to corrosion:** Medium protection, inside and outside.
- **Tensile strength:** Manufacturer's standard.
- **Resistance to flame propagation:** Manufacturer's standard.
- **Suspended load capacity:** Manufacturer's standard.
- **Colour:** Manufacturer's standard.
- **Sizes (OD):** Manufacturer's standard.
- **Execution:** [90-55-10/735 Installing conduit connections to equipment](#);
[90-55-10/720 Installing rigid metallic conduit](#);
and [90-55-10/765 Conduit, trunking and ducting zones](#).

90-55-10/385 PVC trunking

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

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standard:** To [BS 4678-4](#).
- **Sizes:** Manufacturer's standard.
- **Compartments:** As shown on Project Drawings.
- **Accessories and fittings:**
 - **Generally:** Factory made by the cable trunking manufacturer and of the same material type and finish as the cable trunking.
 - **Types:** Manufacturer's standard.
- **Strength class:** Manufacturer's standard.
- **Colour:** Manufacturer's standard.
- **Execution:** [90-55-10/700 Installing conduit, trunking and ducting](#) and [90-55-10/740 Installing trunking generally](#).

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

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

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standards:** To [BS EN 50085-1](#) and [BS EN 50085-2-1](#).
- **Installation position:** Manufacturer's standard.
- **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.
 - **Installation and application temperature (minimum):** Manufacturer's standard.
 - **Application temperature (maximum):** Manufacturer's standard.
- **Resistance to flame propagation:** Manufacturer's standard.
- **Electrical properties:** Manufacturer's standard.
- **Protection by enclosure:**
 - **Protection against ingress of solid objects (minimum):** Manufacturer's standard.
 - **Protection against ingress of water (minimum):** Manufacturer's standard.
 - **Protection against access to hazardous parts (minimum):** Manufacturer's standard.
- **Access method:** With tools.
- **Screening:** Not required.
- **Sizes:** Manufacturer's standard.
- **Compartments:** Manufacturer's standard.
- **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:** [90-55-10/765 Conduit, trunking and ducting zones](#) and [90-55-10/740 Installing trunking generally](#).

90-55-10/460 Conduit fittings

Shared by: [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [75-45-20/110 Data distribution system](#).

- **Manufacturer:** 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:** Manufacturer's standard.
 - **Finish:** Match conduit.
- **Conduit boxes:** Fit covers of same material and finish as boxes. Include brass earthing terminals in PVC-U boxes.
- **Plugs:**
 - **For metallic boxes:** Manufacturer's standard.

- **For non-metallic boxes:** Manufacturer's standard.
- **Locknuts:**
 - **For metallic boxes:** Manufacturer's standard.
 - **For non-metallic boxes:** Manufacturer's standard.
- **Execution:** [90-55-10/700 Installing conduit, trunking and ducting](#).

90-55-10/475 Intumescent trunking pillows

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

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standard:** Manufacturer's standard.
- **Third party certification:** [LPCB](#) approved.
- **Size:** Manufacturer's standard.
- **Execution:** [90-55-10/700 Installing conduit, trunking and ducting](#).

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

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

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standard:** To [BS 6724](#).
- **Third party certification:** British Approvals Service for Cables (BASEC) certified.
- **Size:** Manufacturer's standard.
- **Insulation:** Manufacturer's standard.
- **Sheath colour:** Black.
- **Execution:** [90-55-15/680 Installing low voltage armoured cables](#);
[90-55-15/715 Excavations](#);
[90-55-15/720 Cables in ducts](#);
[90-55-15/725 Cables in trenches](#);
[90-55-15/730 Installing warning devices for underground cables](#);
[90-55-15/735 Cable installation on channel cable supports, cable tray, cable ladder and cable basket](#);
and [90-55-15/740 Cables in vertical trunking and ducts](#).

90-55-15/332 Thermosetting insulated armoured fire resistant (LSHF) cables

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standard:** To [BS 7846](#).
- **Third party certification:** British Approvals Service for Cables (BASEC) certified.
- **Size:** Manufacturer's standard.
- **Insulation:** Manufacturer's standard.
- **Fire resistance category:** F120.
- **Voltage rating category:** Manufacturer's standard.
- **Oversheath colour:** Black.
- **Execution:** [90-55-15/680 Installing low voltage armoured cables](#);
[90-55-15/715 Excavations](#);
[90-55-15/720 Cables in ducts](#);

[90-55-15/725 Cables in trenches;](#)

[90-55-15/730 Installing warning devices for underground cables;](#)

[90-55-15/735 Cable installation on channel cable supports, cable tray, cable ladder and cable basket;](#)

and [90-55-15/740 Cables in vertical trunking and ducts.](#)

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

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

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standard:** To [BS 7211](#).
- **Third party certification:** British Approvals Service for Cables (BASEC) certified.
- **Cable type:** Manufacturer's standard.
- **Size:** Manufacturer's standard.
- **Execution:** [90-55-15/635 Installing low voltage cables;](#)
[90-55-15/660 Installing low voltage cables in conduit and trunking;](#)
and [90-55-15/735 Cable installation on channel cable supports, cable tray, cable ladder and cable basket.](#)

90-60-30/310 Air circuit breakers

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standard:** To [BS EN 60947-2](#).
- **Third party certification:** [ASTA Type test certification](#).
- **Protection relays:** Adjustable time delay on overload and I²t characteristics.
- **Trip function:** Earth leakage.
N-phase protection.
Phase rotation protection.
- **Charge mechanism:** Manual.
Electric motor.
- **Mechanical interlocking:** Not required.
- **Rated operational current (In):** As shown on Project Drawings
- **Rated operational voltage (Ue):** 690 V. a.c.
- **Number of poles:** As shown on Project Drawings
- **Rated ultimate short-circuit breaking capacity (Icu):** As shown on Project Drawings
- **Utilization category:** B.
- **Provision for maintenance:** Manufacturer's standard.
- **Method of installation:** Withdrawable.
- **Ingress protection (minimum):** To [BS EN 60529](#), IP30.
- **Accessories:** Manufacturer's standard.

90-60-30/320 Moulded case circuit breakers

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standard:** To [BS EN 60947-2](#).
- **Third party certification:** [ASTA Type test certification](#).

- **Circuit breaker operation:** Electronic.
- **Operating handle:** Manufacturer's standard.
- **Mechanical interlocking:** Not required.
- **Rated operational current (In):** As shown on Project Drawings
- **Rated operational voltage (Ue):** 600 V a.c.
- **Number of poles:** As shown on Project Drawings
- **Rated ultimate short-circuit breaking capacity (Icu):** As shown on Project Drawings
- **Utilization category:** B.
- **Method of installation:** Withdrawable 630A and above
- **Ingress protection (minimum):** To [BS EN 60529](#), IP30.
- **Integral RCD:** As shown on Project Drawings

90-60-30/330 Miniature circuit breakers

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standard:** To [BS EN 60898-1](#). and BS EN 60947-2.
- **Third party certification:** [ASTA Type test certification](#).
- **Rated operational current (In):** As Circuit schedules.
- **Rated operational voltage (Ue):** As Circuit schedules.
- **Number of poles:** As Circuit schedules.
- **Rated short-circuit capacity (Icn):** As Circuit schedules.
- **Tripping characteristic:** As Circuit schedules.
- **Mounting:** Manufacturer's standard.

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

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standard:** To [BS EN 61009-1](#).
- **Operating characteristic:** AC.
- **Tripping characteristic:** As Circuit schedules.
- **Rated operational current (In):** As Circuit schedules.
- **Rated operational voltage (Ue):** As Circuit schedules.
- **Number of poles:** As Circuit schedules.
- **Rated short-circuit capacity (Icn):** As Circuit schedules.
- **Rated residual operating current:** As Circuit schedules.
- **Time delay:** As Circuit schedules.
- **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:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standard:** To [BS EN 61643-11](#).
- **Operating voltage and frequency (nominal):** 400 V at 50 Hz.
- **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:** Not required.
- **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.](#)

90-60-40/360 Automatic power factor correction equipment

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standards:** To [BS EN 61439-1](#), [BS EN 61439-2](#) and [BS EN 61921](#).
- **Rated voltage:** 415 V.
- **Rated frequency:** 50 Hz.
- **Rated reactive power:** As shown on Project Drawings.
- **Rated short-time withstand current (Icw) for 1 s:** 30kA
- **Capacitor banks:** Manufacturer's standard.
- **Capacitor modules:**
 - **Standards:** To [BS EN 60831-1](#), [BS EN 60831-2](#).
 - **Elements:** Integral, dry, metallized dielectric, self-healing.
 - **Encapsulation:** Individual elements vacuum treated, encapsulated with thermosetting resin and sealed in within plastic case. Element array encased within sheet steel enclosure, filled with inorganic, inert and fire proof granules.
- **Enclosure:**
 - **Mounting arrangement:** Floor.
 - **Ingress protection (minimum):** To [BS EN 60529](#), IP31.
 - **Impact protection (minimum):** To [BS EN 62262](#), IK10.
 - **Material:** Steel.
 - **Finish:** Externally polyester powder coated.
Internal partitions, zinc coated.
 - **Colour:** Manufacturer's standard.
 - **Incoming cabling access:** Manufacturer's standard.
 - **Outgoing cable access:** Manufacturer's standard.
 - **Cable entry:** Entry via gland plates facilitating either and top and/ or bottom entry.
 - **Lifting bolts:** Manufacturer's standard.
- **Incoming device:**
 - **Type:** MCCB to [BS EN 60947-2](#).

- **Rated ultimate short-circuit breaking capacity (Icu):** As shown on Project Drawings.
- **Locking mechanism:** Door-interlocked operating handles.
- **Mounting:** Front of panel.
- **Controls:**
 - **Functions:** TO BE COMPLETED
 - **Display type:** Menu driven Liquid crystal display (LCD).
 - **Display the following information:** Required and actual power factors.
Number of capacitor banks in use.
Bank reconnection delay time.
Real and reactive currents.
Voltage THD.
System alarms.
 - **Accuracy:** Within 1% of measured value.
 - **Operating modes:** On, off and automatic compensation.
 - **Undervoltage sensing:** Disconnects capacitor banks at pre-set adjustable undervoltage and upon supply failure.
 - **Alarms:** Manufacturer's standard.
 - **Mounting:** Front of panel.
- **Remote monitoring:** Not required.
- **Execution:** [90-60-40/620 Installing power factor correction equipment](#) and [90-60-40/630 Framework for mounting power factor correction equipment](#).

90-60-40/410 Uninterruptible power supply (UPS) unit

- **Manufacturer:** Eaton Electric Ltd
- **Product reference:** UPS 93PM Configuration 400kW software limited to 300kW
- **Standards:** To [BS EN 62040-1](#) and [BS EN 62040-3](#).
- **Test requirements:** Factory tests and Submit type test certificates.
- **Mode of operation:** On-line.
- **Configuration:** Parallel redundant (n+1) with bypass.
- **Load compatibility:** Suitable for use with loads operating at any (leading or lagging) Power factor
- **Input:**
 - **Nominal voltage:** Three phase 400 V a.c.
 - **Voltage tolerance:** $\pm 10\%$ at full load.
 - **Frequency:** 50 Hz. $\pm 2\%$.
 - **Power factor:** > 0.98 at full load.
 - **Input current distortion (THDi):** $< 3\%$ at full load.
 - **Inrush current:** Limited by soft start to maximum I_n .
- **Maintenance bypass:** Internal fully interlocked and External fully interlocked.
- **Integral bypass operation:**
 - **Automatic transfer of the load to the bypass source under the following conditions:** Inverter overload capacity exceeded;

- Inverter over temperature;
and Fault condition.
- **Re-transfer of the load from the bypass source:** Automatic unless under manual control or fault conditions are present.
 - **Galvanic separation between input and output:** Manufacturer's standard.
 - **Inverter output:**
 - **Rated output apparent power:** 400kW software restricted to 300kW
 - **Nominal voltage:** Three phase 400 V a.c.
 - **Voltage tolerance:** $<\pm 4\%$ dynamic (step load 0–100%, 100–0%).
 - **Voltage waveform:** Sinusoidal in both normal and stored energy mode of operation.
 - **Voltage distortion:** $<1\%$ with linear load and $<3\%$ with non linear load.
 - **Nominal frequency:** 50 Hz.
 - **Frequency tolerance:** $\pm 4\%$ (adjustable) synchronized with mains.
 - **Overload capability:** 110% for 60 minutes;
125% for 10 minutes;
and 150% for 1 minute.
 - **Operation on overload:** Operate visual and audible alarm indicator integral to UPS enclosure and Transfer load within 200 ms to bypass where overload limits or times are exceeded.
 - **Output power factor (minimum):** 0.95.
 - **Crest factor:** Manufacturer's standard.
 - **Batteries:**
 - **Location:** Battery shelving racks and Separate battery enclosures.
 - **Type:** Lead-acid valve regulated (VRLA) to [BS EN 60896-22](#) and [BS EN 61056-1](#).
 - **Voltage:** 12 V.
 - **Number of cells (minimum):** Submit proposals.
 - **Battery autonomy (stored energy time at rated power):** Submit proposals.
 - **Battery service life (minimum):** Submit proposals.
 - **Battery design (minimum):** Submit proposals.
 - **Fused parallel battery strings:**
 - Quantity (minimum):** Submit proposals.
 - Automatic disconnection of a faulty string:** Required.
 - **Impact resistant plastic shields to intercell terminal and output terminals:**
Required.
 - **Battery supply d.c. circuit breaker with overload and short circuit protection:**
Required.
 - **Battery charger:** Ripple free battery charge and Automatic temperature and float voltage compensation.
 - **Battery recharge time:**
 - To 80% capacity:** <100 minutes.
 - To 100% capacity:** Within four hours.
 - **Battery monitors:**

Type: Microprocessor based.

Features: Automatic battery discharge test at adjustable time intervals and with manual override;

Battery voltage;

Detection of faulty battery;

Detection of excessive temperature;

Estimated remaining battery service life;

and Standby time remaining.

- **Controls, indicators and alarms:**

- **Status indicators:**

During normal operation (on-line) indicate the following with green LED:

a.c. input to rectifier;

a.c. input to bypass;

Load supplied from battery;

Load supplied from inverter;

and Load supplied from bypass.

During mains failure indicate the following with green LED: Load supplied from battery and Load supplied from inverter.

During mains failure indicate the following with red LED: a.c. input to rectifier and a.c. input to bypass.

- **LCD display:**

Display the following information: Input voltage to inverter;

Input voltage to bypass;

Output voltage from UPS;

Battery charger current;

Input voltage to battery;

Output voltage from battery;

Input frequency;

Output frequency;

Output current;

Output active power kW;

Output apparent power (kV·A);

and Output reactive power (kV·Ar).

- **Event log:** Record up to 64 fault occurrences including time and date for each occurrence. Provide user access to event log through LCD display.

- **Audible alarms:**

- **Type:** Integral alarm within UPS enclosure providing minimum 65 dBA at 1 m.

- **Activation and reset:** Activated by any fault condition. Continuous output until fault cleared or alarm silenced. Silencing of the alarm must not clear LED status indication.

- **Communications and signalling:** SNMP adaptor;

RS 232 port;

and RS 485 port.

- **Enclosure:**
 - **Ingress protection (minimum):** To [BS EN 60529](#), IP31.
 - **Material and construction:**
 - Type:** Manufacturer's standard.
 - Finish:** Manufacturer's standard.
 - Colour:** Manufacturer's standard.
 - **Lockable access doors:** Required.
 - **Cable entry with removable gland plates:** For top entry cables.
 - **Ventilation arrangement:**
 - Type:** Duplicate forced ventilation fans.
 - Fan failure alarms:** Required.
 - **Noise emission:**
 - Sound pressure level in normal mode (maximum):** Manufacturer's standard.
 - Sound pressure level in battery mode (maximum):** Manufacturer's standard.
- **Efficiency:**
 - **Overall (minimum):** >89% at 25% load;
>91% at 50% load;
>92% at 75% load;
and >93% at 100% load.
 - **Eco mode (minimum):** 98% at 100% load through bypass.
- **Execution:** [90-60-40/670 Factory inspections of UPS equipment](#);
[90-60-40/680 Installation of UPS](#);
and [90-60-40/690 Installing UPS batteries](#).

90-60-40/420 Uninterruptible power supply (UPS) remote alarm and indicator panels

- **Manufacturer:** As UPS manufacturer.
- **Status indicators:**
 - **During normal operation (on-line) indicate the following with green LED:** UPS on line.
 - **During mains failure indicate the following with green LED:** Load supplied from battery and Load supplied from inverter.
 - **During mains failure indicate the following with red LED:** a.c. input to rectifier and a.c. input to bypass.
 - **Display the following information:** Input voltage to inverter;
Input voltage to bypass;
Output voltage from UPS;
Battery charger current;
Input voltage to battery;
Output voltage from battery;
Input frequency;

Output frequency;
Output current;
Output active power kW;
Output apparent power (kV·A);
and Output reactive power (kV·Ar).

- **Audible alarms:**
 - **Type:** Integral alarm providing minimum 65 dBA at 1 m.
 - **Activation and reset:** Activated by any fault condition. Continuous output until fault cleared or alarm silenced. Silencing of the alarm must not clear LED status indication.
- **Power supply:** Via UPS serial port.
- **Mounting:** Wall.
- **Execution:** [90-60-40/710 Installing UPS remote alarm and indicator panels.](#)

90-65-55/315 Current transformers

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standard:** To [BS EN 61869-2](#).
- **Accuracy classification:**
 - **For use with protective equipment:** Submit proposals.
 - **For use with measuring equipment:** Submit proposals.
- **Format:** Cast resin encapsulated solid ring.
- **Size:** Submit proposals.
- **Primary rating:** As shown on Project Drawings.
- **Secondary rating:** Submit proposals.
- **Rated short time current:** Match the rating of the circuit in which the current transformer is installed.
- **Test links:** Provide for connection of calibration instruments and meters.
- **Mounting arrangement:** Submit proposals.
- **Execution:** [90-65-55/610 Installing current transformers.](#)

90-65-55/325 Digital multifunction metering equipment

- **Manufacturer:** Schneider Electric Ltd
- **Product reference:** Submit proposals.
- **Display type:** Liquid crystal display (LCD).
- **Ingress protection (minimum):** To [BS EN 60529](#), IP31.
- **Metering functions:** Active energy (kWh);
Active power (kW);
Apparent power (kVA);
Frequency (Hz);
Maximum active power demand (kW);
Phase currents (A);
Power factor;
Pulsed output (kWh);

Reactive power (kVA(r));
and Voltage between phases (V).

- **Mounting:** Recessed into switchgear.
- **Execution:** [90-65-55/620 Installing electrical monitoring and metering equipment.](#)

[90-90-55/320 Electrical shock treatment signs](#)

See: [70-70-25/110 Earthing and bonding system.](#)

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.](#)

[90-90-55/390 Equipment labels and warning notices](#)

See: [70-70-25/110 Earthing and bonding system.](#)

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.](#)

[90-90-55/395 Electrical diagrams](#)

See: [70-70-25/110 Earthing and bonding system.](#)

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.](#)

[90-90-55/440 Plastic warning devices for underground cables and pipelines](#)

- **Manufacturer:** Contractor's choice.
- **Standard:** To [EN 12-23](#).
- **Material:** Manufacturer's standard.
- **Size:**
 - **Length:** Manufacturer's standard.
 - **Width:** Manufacturer's standard.
 - **Thickness:** Manufacturer's standard.
- **Joining method:** Manufacturer's standard.
- **Format:**
 - **Background colour:** Manufacturer's standard.
 - **Text colour:** Manufacturer's standard.
- **Legend:** Manufacturer's standard.
- **Wire detection aid:** Required.
- **Execution:** [90-90-55/700 Installing warning devices for underground cables and pipelines.](#)

[90-90-60/310 Battery shelving racks](#)

- **Manufacturer:** Submit proposals.
- **Arrangement:** Free standing open.
- **Material:** Welded carbon steel.
- **Finish:** Epoxy powder coated.

Execution

[70-70-45/610 Removing low voltage distribution systems](#)

- **Scope:** Complete installation.

[70-70-45/615 Alterations to existing switchgear](#)

- **Standards:** In accordance with manufacturer's instructions and type test certification.
- **Alterations:** Submit records of alterations made to assemblies.

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.

70-70-45/626 Installing multi-box assemblies

- **General arrangement:** Submit proposals.

70-70-45/630 Electrical property measurement of low voltage systems

- **Objectives:** To determine the current demand through each phase at incoming supply position to establish its spare capacity. To determine the level of existing harmonics within the electrical installation with a view to recommending suitable mitigation measures to comply with Energy Networks Association
- **Property values to be recorded:** Voltage between phases (V);
Voltage between phases and neutral (V);
Phase currents (A);
Frequency (Hz);
Power factor;
Active power (W);
Reactive power (V·A(r));
Active energy (kW·h);
Apparent power (V·A);
Current demand (A);
Active power demand (W);
and Apparent power demand (V·A).
- **Sampling:**
 - **Start date and time:** Submit proposals.
 - **Period:** 7 day.
 - **Interval:** Continuous.
- **Connection to existing switchgear:**
 - **Method statement:** Submit.
 - **Timing:** Submit proposals.
- **Results:**
 - **Format:** Output generated from chart recorder. Also submit data electronically in Microsoft Excel format.
 - **Number of copies:** Two.

90-50-45/620 Installing busbar trunking

Shared by: [90-50-45/320 Power busbar trunking](#); and [90-50-45/440 Busbar chambers](#).

- **Standard:** In accordance with [BS 7671](#).
- **Supports and fixings:**
 - **Supports:** Purpose-made brackets.
 - **Finish:** Match trunking.
 - **Colour:**

- **Locations where moisture may occur:** Corrosion resistant, selected to prevent deterioration by electrolytic action.
- **Joints:**
 - **Type:** Manufacturer's jointing fittings.
 - **Rigidity:** Maintain across joint.
 - **Number of joints:** Minimize.
- **Trunking:**
 - **Lengths of trunking:** Maximize.
 - **Open ends:** Blank using manufacturer's removable end caps.
 - **Electrical continuity:** Maintain at each joint with a copper link fitted on the outside of the trunking.
 - **Cleaning:** Immediately before handover.
- **Trunking covers:**
 - **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 and extend these 50 mm from both sides of the opening.
- **Busbar terminals:** Label in accordance with [BS EN 60445](#).

90-50-45/660 Testing and commissioning of site-assembled busbar trunking

- **Notice before testing and commissioning:** 7 days.
- **Protective devices settings:** Submit proposals.
- **Routine testing and commissioning:** Submit results.
- **Additional inspection and testing:** Check and adjust tightness of busbar connections and supports.
 - Check tightness of bolted connections.
 - Check busbar joints using ductor resistance measurements.
 - Check earth connections.
 - Check clearance of live parts from direct contact.
 - Carry out earth fault protection simulation tests.
- **Inspection and test results:** Submit.

90-50-45/665 Installing switchgear generally type A

Shared by: [90-50-45/390 Cable distribution cabinets](#); [90-50-45/410 Distribution boards](#); [90-50-45/420 Cubicle switchboards](#); [90-50-45/450 Switch-disconnectors](#); and [90-50-45/470 Control and protective switching devices type B](#).

- **General requirements:** [90-50-45/675 Labelling switchgear type A](#).
- **Switchgear cubicles:** Arrange in modular form to facilitate future extension.
- **Clearance (minimum):**
 - **Front access switchgear:** 1000 mm in front of switchgear.

- **Rear access switchgear:** TO BE COMPLETED
- **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:** Submit proposals.
 - **Containment:** Manufacturer's enclosure.
- **Identification:**
 - **Neutral and earth bar terminals:** Label with the outgoing circuit reference.
 - **Cable terminations:** Label with circuit reference, with push-on plastics markers.

90-50-45/665 Installing switchgear generally type B

Shared by: [90-50-45/460 Automatic transfer switching equipment \(TSE\) type C](#); and [90-50-45/470 Control and protective switching devices type C](#).

- **General requirements:** [90-50-45/675 Labelling switchgear type B](#).
- **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.
- **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 type A

- **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.

90-50-45/675 Labelling switchgear type B

- **Switchgear terminals:** To [BS EN 60445](#).
- **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.

90-50-75/610 Installing electrical insulating matting

- **Front access equipment:** Install electrical insulating matting in front of the equipment.
- **Rear access equipment:** Install electrical insulating matting in front of and behind the equipment.
- **Installation:** Fix securely to the floor.
- **Position:** TO BE COMPLETED

90-55-10/610 Installing channel cable supports

- **Standards:** In accordance with [BS 7671](#), [IET Guidance Note 1](#) and BEAMA [Best practice guide to cable ladder and cable tray systems: Channel support systems and other associated supports](#).
- **Preparation:**
 - **Burrs and sharp edges:** Make smooth.
 - **Cutting:** Minimize and make good edges. Cuts to slotted channel cable supports 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 channel cable supports to permit access for installing and maintaining cables.
- **Joints and expansion couplers:** Locate between the bracket support and the quarter point.
 - **Number of joints:** Minimize.
 - **Lengths of cable supports:** Maximize.
- **Fire barriers:** Provide where required to maintain fire performance of fabric.
- **Changes of size and direction:** Manufacturer's accessories of the same material type, pattern, finish and thickness as channel cable supports.
- **Support:**
 - **Fixing arrangement:** Independently fix and support from building structure using threaded rod fixed into expanding anchors.
 - **Clearance from building fabric (minimum):** 20 mm.
- **Components:** Avoid contact between dissimilar metals.
- **Routing of channel cable supports:** Submit drawings showing the proposed routes.

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

Shared by: [90-55-10/330 Cable ladders](#); and [90-55-10/335 Cable trays](#).

- **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:** 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.

90-55-10/630 Installing cable basket

- **Standards:** In accordance with [BS 7671](#) and [IET Guidance Note 1](#).
- **Joints:** Cut adjacent cross basket wires. Make smooth any burrs or edges.
- **Accessories:** Form on site and connect with basket manufacturer's coupling components.
- **Fire barriers:** Provide where required to maintain fire performance of fabric.
- **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 basket:** Submit drawings showing the proposed routes.

90-55-10/650 Multiple cable runs

Shared by: [90-55-10/305 Channel cable supports](#); [90-55-10/325 Cable baskets](#); [90-55-10/330 Cable ladders](#); and [90-55-10/335 Cable trays](#).

- **Requirement:** Use cable basket when three or more cables are run in parallel;
Use cable ladder when two or more cables run in parallel;
Use cable tray when three or more cables are run in parallel;
and Use cable trunking when three or more conduits are run in parallel.

90-55-10/660 Cable support zones

Shared by: [90-55-10/305 Channel cable supports](#); [90-55-10/325 Cable baskets](#); [90-55-10/330 Cable ladders](#); and [90-55-10/335 Cable trays](#).

- **Ceiling voids:** Provide clear distance of 150 mm (minimum) between underside of any cable supports and brackets and the topside of ceiling.

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

Shared by: [90-55-10/385 PVC trunking](#); [90-55-10/460 Conduit fittings](#); [90-55-10/475 Intumescent trunking pillows](#); [90-55-10/720 Installing rigid metallic conduit](#); [90-55-10/735 Installing conduit connections to equipment](#); and [90-55-10/765 Conduit, trunking and ducting zones](#).

- **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:** Galvanizing zinc rich paint, two coats.
- **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:** TO BE COMPLETED
- **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:** 600 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:** Spacer bar 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

Shared by: [90-55-10/360 Flexible conduit](#); and [90-55-10/380 Rigid conduit](#).

- **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:** [90-55-10/360 Flexible conduit](#).

90-55-10/740 Installing trunking generally

Shared by: [90-55-10/385 PVC trunking](#); and [90-55-10/410 Cable trunking and cable ducting for wall and ceiling mounting](#).

- **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.

90-55-10/765 Conduit, trunking and ducting zones

Shared by: [90-55-10/380 Rigid conduit](#); and [90-55-10/410 Cable trunking and cable ducting for wall and ceiling mounting](#).

- **General requirements:** [90-55-10/700 Installing conduit, trunking and ducting](#).
- **Ceiling voids:** Provide clear distance of 150 mm (minimum) between underside of any conduit, trunking or trunking and the topside of ceiling.

[90-55-15/635 Installing low voltage cables](#)

See: [90-55-15/330 Fire resistant screened \(LSHF\) cables](#).

Shared by: [90-55-15/330 Fire resistant screened \(LSHF\) cables](#); [90-55-15/334 Single core non-sheathed cables with LSHF insulation](#); [90-55-15/340 Multicore screened thermosetting insulated \(LSHF\) sheathed cables](#); [90-55-15/350 Thermosetting insulated and thermoplastic sheathed \(LSHF\) cables](#); [90-55-15/405 Balanced twisted-pair cables](#); [90-55-15/665 Installing flexible cables](#); and [90-55-15/680 Installing low voltage armoured cables](#).

[90-55-15/660 Installing low voltage cables in conduit and trunking](#)

See: [90-55-15/330 Fire resistant screened \(LSHF\) cables](#).

Shared by: [90-55-15/330 Fire resistant screened \(LSHF\) cables](#); [90-55-15/334 Single core non-sheathed cables with LSHF insulation](#); [90-55-15/340 Multicore screened thermosetting insulated \(LSHF\) sheathed cables](#); [90-55-15/350 Thermosetting insulated and thermoplastic sheathed \(LSHF\) cables](#); and [90-55-15/405 Balanced twisted-pair cables](#).

[90-55-15/680 Installing low voltage armoured cables](#)

Shared by: [90-55-15/324 Thermosetting insulated and thermoplastic sheathed \(LSHF\) armoured cables](#); and [90-55-15/332 Thermosetting insulated armoured fire resistant \(LSHF\) cables](#).

- **General requirements:** [90-55-15/685 Jointing and terminating low voltage armoured cables](#) and [90-55-15/635 Installing low voltage cables](#).
- **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.
- **Joints and terminations:** Use qualified cable jointers, using jointing materials, components and installation techniques recommended by the cable manufacturer and the jointing accessory manufacturer.
- **Tooling certificate:** Submit before installing connectors.
- **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.

[90-55-15/715 Excavations](#)

Shared by: [90-55-15/324 Thermosetting insulated and thermoplastic sheathed \(LSHF\) armoured cables](#); and [90-55-15/332 Thermosetting insulated armoured fire resistant \(LSHF\) cables](#).

- **Excavations next to existing underground services:** In accordance with [HSG 47](#).

- **Existing underground services:** Expose and identify.

90-55-15/720 Cables in ducts

Shared by: [90-55-15/324 Thermosetting insulated and thermoplastic sheathed \(LSHF\) armoured cables](#); and [90-55-15/332 Thermosetting insulated armoured fire resistant \(LSHF\) cables](#).

- **Cable installation from cable drums:** Submit method statement.
- **Single core trefoil cable groups and protective conductors:** Install within a single duct and bind at 1 m intervals.

90-55-15/725 Cables in trenches

Shared by: [90-55-15/324 Thermosetting insulated and thermoplastic sheathed \(LSHF\) armoured cables](#); and [90-55-15/332 Thermosetting insulated armoured fire resistant \(LSHF\) cables](#).

- **Base:** All cables and ducts to be surrounded by 75 mm sand, free of any sharp stones or flints.
- **Multiple cables in same trench:** Set 150 mm apart.
- **Cable formation within trench:** Space cables apart by a distance of half the cable diameter.
- **Trefoil cable groups and protective conductors:** Bind at 1 m intervals.
- **Cables below roads and hardstandings:** Install within duct and derate cable if longer than 10 m. Extend ducts 1 m each side of hardstanding.

90-55-15/730 Installing warning devices for underground cables

Shared by: [90-55-15/324 Thermosetting insulated and thermoplastic sheathed \(LSHF\) armoured cables](#); and [90-55-15/332 Thermosetting insulated armoured fire resistant \(LSHF\) cables](#).

- **Installation:** Warning devices to be laid 100 mm above top of cable or duct.

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

Shared by: [90-55-15/324 Thermosetting insulated and thermoplastic sheathed \(LSHF\) armoured cables](#); [90-55-15/332 Thermosetting insulated armoured fire resistant \(LSHF\) cables](#); [90-55-15/340 Multicore screened thermosetting insulated \(LSHF\) sheathed cables](#); and [90-55-15/350 Thermosetting insulated and thermoplastic sheathed \(LSHF\) cables](#).

- **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 cleats at 350 mm (maximum) horizontal spacing and 450 mm (maximum) vertical spacing.
 - **Submain cables >95 mm²:** 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.

90-55-15/740 Cables in vertical trunking and ducts

Shared by: [90-55-15/324 Thermosetting insulated and thermoplastic sheathed \(LSHF\) armoured cables](#); and [90-55-15/332 Thermosetting insulated armoured fire resistant \(LSHF\) cables](#).

- **Supports:** Pin racks or cleats at each floor level or at 5 m vertical centres, whichever is less.
- **Heat barriers:** Required.

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.

90-60-40/620 Installing power factor correction equipment

- **Standard:** In accordance with [BS 7671](#).
- **Transportation, off-load and installation:** Submit method statement.
- **Weight limit:** None.
- **Assembly:** Replace fittings removed for transport.
- **Separate enclosures:** Arrange in modular form to facilitate future extension.
- **Clearance (minimum):** 1000 mm access to front of equipment.
- **Fixing equipment:** Fix independently of wiring installation with zinc electroplated fasteners.
- **Indoor equipment:** Fix with internal lugs.
- **Outdoor equipment:** Fix with external lugs.
- **Extension boxes:** Provide where necessary.
- **Gland plates:** Non-ferrous for single core cables.
- **Interconnection with close coupled switchgear:**
 - **Cable type:** As Circuit schedule.
 - **Cable size:** As Circuit schedule.
 - **Containment:** TO BE COMPLETED
- **Remote monitoring:** Not required.

90-60-40/630 Framework for mounting power factor correction equipment

- **Material:** Match main switchgear.
- **Finish:** Match main switchgear.
- **Arrangement and fixings:** Submit proposals.

90-60-40/670 Factory inspections of UPS equipment

- **Notice before inspection and testing:** Fourteen days.
- **Witnessing:** Arrange for full factory acceptance testing for 4 no. personal. Contractor to include for all expenses client and engineers expensences
- **Scope:** Factory test UPS equipment before delivery to site.
- **Tests:**
 - **Standard:** To [BS EN 62040-3](#).
 - **Routine tests:** Undertake.
 - **Special tests:** Balanced load test;
Efficiency test;
Harmonic components test;
Input voltage and frequency test;

and Inrush current test.

- **Test equipment calibration certificates:** Submit.
- **Test report:** Submit.

90-60-40/680 Installation of UPS

- **Standard:** In accordance with [BS 7671](#).
- **Transportation, off-load and installation:** Submit method statement.
- **Weight limit:** TO BE COMPLETED
- **Assembly:** Replace fittings removed for transport.
- **UPS units:** Interconnect.
- **UPS controls and batteries:** Interconnect.
- **Identification labels:** Submit proposals.

90-60-40/690 Installing UPS batteries

- **Position:** Submit proposals.
- **Batteries:** Interconnect individual cells and Top up electrolyte.
- **Battery circuit breaker:** Interconnect with UPS units and batteries.

90-60-40/710 Installing UPS remote alarm and indicator panels

- **Position:** TO BE COMPLETED
- **Equipment interconnection:** TO BE COMPLETED
- **Interface:** TO BE COMPLETED

90-65-55/610 Installing current transformers

- **Standard:** In accordance with [BS 7671](#).
- **Identification details:** Mount current transformers so that polarity markings and name plate details are easily viewed in situ.

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

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

90-90-55/700 Installing warning devices for underground cables and pipelines

- **Installation:** Lay along the route of underground cables during backfilling of excavation.
- **Marker position:**
 - **Cables:** Lay tape 300 mm above high voltage cables.
 - **Pipelines less than 2 m:** TO BE COMPLETED
 - **Pipelines deeper than 2 m:** TO BE COMPLETED
- **Location, depth, colour and markings:** To requirements of service undertaker.

System completion

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

- **Standard:** In accordance with [BS 7671](#).
- **Notice before testing and commissioning:** 14 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.
- **Testing and commissioning results:** Submit two copies.
- **Certificates of calibration for meters and instruments:** Submit.

70-70-45/813 Inspecting, testing and commissioning UPS equipment

- **Standards:** In accordance with [BS 7671](#) and [BS EN 62040-3](#).
- **Method statement:** Submit.
- **Phase rotation:** Verify.
- **Emergency and safety circuits:** Check.
- **Correct operation of alarms and controls:** Confirm.
- **Insulation resistance tests:** Test interconnecting cables and Test forced cooling fan motors.
- **Site tests:** In accordance with [BS EN 62040-3](#).
- **Operational tests:** a.c. input failure test;
a.c. input return test;
Acoustic noise test;
Battery ripple current measurement;
Current division test;
Earth fault test;
Overload capability test;
Rated restored energy time;
Rated stored energy time test;
Restart test;
Short circuit test;
Short circuit protection device test;
Simulation of parallel redundant UPS fault test;
Synchronization test;
Transfer test;
UPS efficiency test;
UPS auxiliary devices test;
and Ventilation test.

- **Output tests:** Harmonic components measurement;
Frequency variation test;
Output over voltage test;
Output frequency slew rate test;
Periodic output voltage variation test;
and Radiofrequency interference and conducted noise test.
- **Load tests:** Light load test;
Unbalanced load test;
Balanced load test;
and Full load test.
- **Standby generator compatibility tests:** Not required.

70-70-45/820 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 and Electronic
 - **Number of copies:** Two.
- **Record drawings:**
 - **Content:** For all low voltage distribution 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;
Location, route and depth of underground cables;
Location of LV switchgear including distribution boards;
Routes of trunking, conduit, cable tray and cable ladders;
and Schematic drawings showing all low voltage distribution circuits: the cable origin, circuit designation, cable type, size, number of cores, size and type of overcurrent protective device.
 - **Drawing format:** Electronic drawing.
 - **Number of copies:** Two.
- **Submittal date:** At handover.

70-70-45/840 Maintenance

- **Servicing and maintenance:** Undertake.
- **Duration:** Until 12 months after Practical Completion.

Ω End of system

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

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

- **Description:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **System performance:** [70-70-75/215 Low voltage small power cables generally;](#)
[70-70-75/220 Selection of conduit, trunking and ducting generally;](#)
and [70-70-75/230 Multi-gang power outlets.](#)
- **Connection to low voltage supply:** As shown on Project Drawings.
- **Final circuit cabling:** [90-55-15/324 Thermosetting insulated and thermoplastic sheathed \(LSHF\) armoured cables;](#)
[90-55-15/330 Fire resistant screened \(LSHF\) cables;](#)
[90-55-15/340 Multicore screened thermosetting insulated \(LSHF\) sheathed cables;](#)
[90-55-15/350 Thermosetting insulated and thermoplastic sheathed \(LSHF\) cables;](#)
and [90-55-15/334 Single core non-sheathed cables with LSHF insulation.](#)
- **Cable accessories:** [90-55-10/310 Cable cleats;](#)
[90-55-10/315 Cable ties;](#)
and [90-55-10/320 Cable bands.](#)
- **Containment:** [90-55-10/305 Channel cable supports;](#)
[90-55-10/325 Cable baskets;](#)
[90-55-10/330 Cable ladders;](#)
[90-55-10/335 Cable trays;](#)
[90-55-10/360 Flexible conduit;](#)
[90-55-10/380 Rigid conduit;](#)
[90-55-10/385 PVC trunking;](#)
and [90-55-10/410 Cable trunking and cable ducting for wall and ceiling mounting.](#)
- **Containment accessories:** [45-50-05/310 Expansion anchors;](#)
[45-50-10/335 Hexagon head stainless steel nuts and bolts;](#)
[45-50-12/340 Stainless steel anchor rods;](#)
[45-50-12/360 Stainless steel anchor sockets;](#)
[45-50-60/410 Hexagon head stainless steel screws;](#)
[45-50-67/350 Masonry plugs;](#)
[90-55-10/430 Service outlet boxes;](#)
[90-55-10/460 Conduit fittings;](#)
and [90-55-10/475 Intumescent trunking pillows.](#)
- **Rewireable installation:** Required.
- **Concealed installation:** Required.
- **Final connections:** [90-55-15/394 Ordinary duty heat resistant cross-linked elastomeric 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:** [90-60-25/320 Surface and concealed wiring enclosures;](#)
[90-60-25/335 Fused connection units;](#)

- [90-60-25/340 Cable outlets;](#)
- [90-60-25/345 Standard socket outlets;](#)
- [90-60-25/355 Industrial socket outlets;](#)
- [90-60-25/365 Multi-gang power outlets;](#)
- [90-60-25/370 Industrial plugs;](#)
- [90-60-25/375 Cable couplers;](#)
- [90-60-25/395 Double pole switches;](#)
- [90-60-25/410 Ceiling power switches;](#)
- and [90-60-25/350 Specialist socket outlets.](#)
- **Controls and starters:** [90-65-25/370 Emergency stop buttons;](#)
[90-65-25/310 a.c. semiconductor motor controllers and starters;](#)
[90-65-25/320 Direct-on-line starters;](#)
[90-65-25/330 Star delta starters;](#)
[90-65-25/340 Electromechanical contactors;](#)
and [90-65-25/360 Electromechanical control circuit devices.](#)
- **Accessories:** TO BE COMPLETED
- **Electrical identification:** [90-90-55/320 Electrical shock treatment signs;](#)
[90-90-55/390 Equipment labels and warning notices;](#)
and [90-90-55/395 Electrical diagrams.](#)
- **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 .
- **System completion:** [70-70-75/820 Documentation;](#)
[70-70-75/830 Spares;](#)
and .

System performance

70-70-75/215 Low voltage small power cables generally

- **Standard:** In accordance with [BS 7671](#).
- **Proposed selection of low voltage cables:** Submit drawings, technical information, calculations and manufacturers' literature.
- **Conductor sizes (minimum):** As per Circuit Charts
- **Cable sizes not stated:** Submit.
- **Format:** TO BE COMPLETED

70-70-75/220 Selection of conduit, trunking and ducting generally

- **Standard:** In accordance with [BS 7671](#).
- **Requirement:** Submit proposals including detailed design drawings, technical information, calculations and manufacturers' literature.
- **Conduit, trunking and ducting sizes not stated:** Submit.

70-70-75/230 Multi-gang power outlets

- **Quantity:** As shown on the drawings

Products

[45-50-05/310 Expansion anchors](#)

See: [70-70-45/110 Low voltage distribution system](#).

Shared by: [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [75-45-20/110 Data distribution system](#).

[45-50-10/335 Hexagon head stainless steel nuts and bolts](#)

See: [70-70-45/110 Low voltage distribution system](#).

Shared by: [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [75-45-20/110 Data distribution system](#).

[45-50-12/340 Stainless steel anchor rods](#)

See: [70-70-45/110 Low voltage distribution system](#).

Shared by: [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [75-45-20/110 Data distribution system](#).

[45-50-12/360 Stainless steel anchor sockets](#)

See: [70-70-45/110 Low voltage distribution system](#).

Shared by: [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [75-45-20/110 Data distribution system](#).

[45-50-60/410 Hexagon head stainless steel screws](#)

See: [70-70-45/110 Low voltage distribution system](#).

Shared by: [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [75-45-20/110 Data distribution system](#).

[45-50-67/350 Masonry plugs](#)

See: [70-70-45/110 Low voltage distribution system](#).

Shared by: [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [75-45-20/110 Data distribution system](#).

[90-55-10/305 Channel cable supports](#)

See: [70-70-45/110 Low voltage distribution system](#).

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

[90-55-10/310 Cable cleats](#)

See: [70-70-45/110 Low voltage distribution system](#).

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

[90-55-10/315 Cable ties](#)

See: [70-70-45/110 Low voltage distribution system](#).

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

[90-55-10/320 Cable bands](#)

See: [70-70-45/110 Low voltage distribution system](#).

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

[90-55-10/325 Cable baskets](#)

See: [70-70-45/110 Low voltage distribution system](#).

Shared by: [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [75-45-20/110 Data distribution system](#).

[90-55-10/330 Cable ladders](#)

See: [70-70-45/110 Low voltage distribution system](#).

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

[90-55-10/335 Cable trays](#)

See: [70-70-45/110 Low voltage distribution system](#).

Shared by: [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [75-45-20/110 Data distribution system](#).

[90-55-10/360 Flexible conduit](#)

See: [70-70-75/110 Hard wired low voltage small power system](#).

Shared by: [70-70-75/110 Hard wired low voltage small power system](#); and [90-55-10/735 Installing conduit connections to equipment](#).

[90-55-10/380 Rigid conduit](#)

See: [70-70-45/110 Low voltage distribution system](#).

Shared by: [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [75-45-20/110 Data distribution system](#).

[90-55-10/385 PVC trunking](#)

See: [70-70-45/110 Low voltage distribution system](#).

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

[90-55-10/410 Cable trunking and cable ducting for wall and ceiling mounting](#)

See: [70-70-45/110 Low voltage distribution system](#).

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

[90-55-10/430 Service outlet boxes](#)

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standards:** To [BS EN 60670-1](#) and [BS EN 60670-23](#).
- **Installation method:** Surface mounting on non-combustible floors.
- **Dimensions:** Manufacturer's standard.
- **Frame material:** Galvanized carbon steel.
- **Hinged lid:**
 - **Material:** Manufacturer's standard.
 - **Outer finish:** Manufacturer's standard.
 - **Recess:** To suit floor covering.
 - **Cable exits:** Via lift up flap with grommet insert to allow cable exit whilst lid closed.
 - **Lockable:** Not required.
- **Compartments:**
 - **Power:** As shown on Project Drawings.
 - **Communications and signalling:** As shown on Project Drawings.
- **Segregation of cabling:** Maintain with bridges and dividers.
- **Execution:** [90-55-10/770 Installing service outlets](#).

[90-55-10/460 Conduit fittings](#)

See: [70-70-45/110 Low voltage distribution system](#).

Shared by: [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [75-45-20/110 Data distribution system](#).

[90-55-10/475 Intumescent trunking pillows](#)

See: [70-70-45/110 Low voltage distribution system](#).

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

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

See: [70-70-45/110 Low voltage distribution system](#).

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

[90-55-15/330 Fire resistant screened \(LSHF\) cables](#)

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standard:** To [BS 7629-1](#).
- **Third party certification:** British Approvals Service for Cables (BASEC) certified.
- **Size:** As shown on Project Drawings.
- **Insulation:** Manufacturer's standard.
- **Fire resistance category:** ENHANCED 120.

- **Screen:** Aluminium tape.
- **Execution:** [90-55-15/635 Installing low voltage cables](#) and [90-55-15/660 Installing low voltage cables in conduit and trunking](#).

[90-55-15/334 Single core non-sheathed cables with LSHF insulation](#)

See: [70-70-25/110 Earthing and bonding system](#).

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

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

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standard:** To [BS 8436](#).
- **Third party certification:** British Approvals Service for Cables (BASEC) certified.
- **Size:** As shown on Project Drawings.
- **Sheath colour:** Manufacturer's standard.
- **Execution:** [90-55-15/635 Installing low voltage cables](#);
[90-55-15/660 Installing low voltage cables in conduit and trunking](#);
and [90-55-15/735 Cable installation on channel cable supports, cable tray, cable ladder and cable basket](#).

[90-55-15/350 Thermosetting insulated and thermoplastic sheathed \(LSHF\) cables](#)

See: [70-70-45/110 Low voltage distribution system](#).

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

90-55-15/394 Ordinary duty heat resistant cross-linked elastomeric insulated and sheathed flexible cables

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standards:** To [BS EN 50525-1](#) and [BS EN 50525-2-21](#).
- **Third party certification:** British Approvals Service for Cables (BASEC) certified.
- **Cable type:** H05GG-F.
- **Size:** Manufacturer's standard.
- **Sheath colour:** White.
- **Execution:** [90-55-15/665 Installing flexible cables](#).

90-60-25/320 Surface and concealed wiring enclosures

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standards:**
 - **Concealed enclosures:** To [BS 4662](#).
 - **Surface enclosures:** To [BS 5733](#).
- **Enclosure:**
 - **Material:** Manufacturer's standard.
 - **Finish:** Manufacturer's standard.
- **Enclosure depth (minimum):** 25 mm.
- **Execution:** [90-60-25/610 Installing electrical accessories](#).

90-60-25/335 Fused connection units

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services

- **Standard:** To [BS 1363-4](#).
- **Ingress protection (minimum):** Manufacturer's standard.
- **Poles:** Double pole.
- **Control:** As shown on Project Drawings.
- **Indicator lamp:** As shown on Project Drawings.
- **Fuse carrier access:** Tamper proof screw.
- **Flex outlet:** As shown on Project Drawings.
- **Mounting:** As shown on Project Drawings.
- **Cable termination:** Screw.
- **Plate:**
 - **Material:** As shown on Project Drawings.
 - **Finish:** As shown on Project Drawings.
- **Insert colour:** As shown on Project Drawings.
- **Execution:** [90-60-25/610 Installing electrical accessories](#).

90-60-25/340 Cable outlets

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standard:** To [BS 5733](#).
- **Ingress protection (minimum):** Manufacturer's standard.
- **Flex outlet:** As shown on Project Drawings.
- **Mounting:** As shown on Project Drawings.
- **Cable termination:** Screw.
- **Plate:**
 - **Material:** As shown on Project Drawings.
 - **Finish:** As shown on Project Drawings.
- **Execution:** [90-60-25/610 Installing electrical accessories](#).

90-60-25/345 Standard socket outlets

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standard:** To [BS 1363-2](#).
- **Ingress protection (minimum):** Manufacturer's standard.
- **Arrangement:** As shown on Project Drawings.
- **Control:**
 - **Type:** As shown on Project Drawings.
 - **Switch position:** Manufacturer's standard.
 - **Indicator lamp:** As shown on Project Drawings.
- **Interlock:** Manufacturer's standard.
- **Accessories:** As shown on Project Drawings.
- **Mounting:** As shown on Project Drawings.
- **Cable termination:** Screw.
- **Plate:**
 - **Material:** As shown on Project Drawings.

- **Finish:** As shown on Project Drawings.
- **Insert colour:** As shown on Project Drawings.
- **Execution:** [90-60-25/610 Installing electrical accessories.](#)

90-60-25/350 Specialist socket outlets

- **Manufacturer:** TO BE COMPLETED
- **Standard:** TO BE COMPLETED
- **Ingress protection (minimum):** To [BS EN 60529](#), IP 2X.
- **Mounting:** TO BE COMPLETED
- **Arrangement:** TO BE COMPLETED
- **Control:**
 - **Type:** TO BE COMPLETED
 - **Indicator lamp:** TO BE COMPLETED
- **Voltage rating:** TO BE COMPLETED
- **Current rating:** TO BE COMPLETED
- **Frequency rating:** TO BE COMPLETED
- **Pin configuration:** TO BE COMPLETED
- **Special features:** TO BE COMPLETED
- **Execution:** TO BE COMPLETED

90-60-25/355 Industrial socket outlets

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standards:** To [BS EN 60309-1](#) and [BS EN 60309-2](#).
- **Ingress protection (minimum):** As shown on Project Drawings.
- **Material:** Polycarbonate.
- **Voltage rating:** As shown on Project Drawings.
- **Current rating:** As shown on Project Drawings.
- **Frequency rating:** 50–60 Hz.
- **Pin configuration:** As shown on Project Drawings.
- **Controls:** As shown on Project Drawings.
- **Mounting:** As shown on Project Drawings.
- **Execution:** [90-60-25/610 Installing electrical accessories.](#)

90-60-25/365 Multi-gang power outlets

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standard:** To [BS 1363-2](#).
- **Rating:** Manufacturer's standard.
- **Outgoing ways:**
 - **Type:** As shown on Project Drawings.
 - **Fusing:** As shown on Project Drawings.
 - **Quantity:** As shown on Project Drawings.
- **Features:** Manufacturer's standard.

90-60-25/370 Industrial plugs

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standards:** To [BS EN 60309-1](#) and [BS EN 60309-2](#).
- **Ingress protection (minimum):** As shown on Project Drawings.
- **Material:** Polycarbonate.
- **Voltage rating:** As shown on Project Drawings.
- **Current rating:** As shown on Project Drawings.
- **Frequency rating:** 50–60 Hz.
- **Pin configuration:** As shown on Project Drawings.
- **Execution:** [90-60-25/610 Installing electrical accessories](#).

90-60-25/375 Cable couplers

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standard:** To [BS EN 60309-1](#) and [BS EN 60309-2](#).
- **Ingress protection (minimum):** Manufacturer's standard.
- **Material:** Polycarbonate.
- **Voltage rating:** As shown on Project Drawings.
- **Current rating:** As shown on Project Drawings.
- **Frequency rating:** 50–60 Hz.
- **Pin configuration:** As shown on Project Drawings.
- **Execution:** [90-60-25/610 Installing electrical accessories](#).

90-60-25/395 Double pole switches

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standard:** To [BS EN 60669-1](#).
- **Ingress protection (minimum):** As shown on Project Drawings.
- **Rating:** As shown on Project Drawings.
- **Indicator lamp:** As shown on Project Drawings.
- **Mounting:** As shown on Project Drawings.
- **Cable termination:** Screw.
- **Plate:**
 - **Material:** As shown on Project Drawings.
 - **Finish:** As shown on Project Drawings.
- **Insert colour:** As shown on Project Drawings.
- **Execution:** [90-60-25/610 Installing electrical accessories](#).

90-60-25/410 Ceiling power switches

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standard:** To [BS EN 60669-1](#).
- **Ingress protection (minimum):** To [BS EN 60529](#), IP 4X.
- **Rating:** As shown on Project Drawings.
- **Poles:** Double pole.
- **Neon indicator:** Required.

- **Flag indicator:** Mechanical on/ off indication.
- **Mounting:** As shown on Project Drawings.
- **Cable termination:** Screw.
- **Material:** Plastics.

- **Colour:** White.
- **Execution:** [90-60-25/610 Installing electrical accessories](#).

[90-60-30/410 Surge protective devices for low voltage power supplies](#)

See: [70-70-45/110 Low voltage distribution system](#).

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

90-65-25/310 a.c. semiconductor motor controllers and starters

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standard:** To [BS EN 60947-4-2](#).
- **Equipment type:** Manufacturer's standard.
- **Form:** 2.
- **Rated operational voltage (Ue):** 400 V a.c.
- **Rated power (kW):** As shown on Project Drawings.
- **Rated operational frequency:** 50 Hz.
- **Number of poles:** 3.
- **Method of operation:** Manufacturer's standard.
- **Control method:** Manufacturer's standard.
- **Motor connection:** Manufacturer's standard.
- **Utilization category:** AC-53b.
- **Enclosure:**
 - **Mounting arrangement:** As shown on Project Drawings.
 - **Material:** As shown on Project Drawings.
Finish: As shown on Project Drawings.
Colour: As shown on Project Drawings.
 - **Ingress protection (minimum):** As shown on Project Drawings.
- **Control features:**
 - **User adjustable functions:** Manufacturer's standard.
 - **Protection:** Manufacturer's standard.
 - **Display type:** Manufacturer's standard.
Display the following conditions: Start;
Stop;
and Trip.

90-65-25/320 Direct-on-line starters

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standard:** To [BS EN 60947-4-1](#).
- **Rated operational voltage (Ue):** As shown on Project Drawings.
- **Rated power (kW):** As shown on Project Drawings.

- **Rated operational frequency:** 50 Hz.
- **Utilization category:** Manufacturer's standard.
- **Number of poles:** As shown on Project Drawings.
- **Interrupting medium:** Air.
- **Reverse mode:** Not required.
- **Control coil:** Manufacturer's standard.
- **Overload relay:**
 - **Type:** Manufacturer's standard.
 - **Rating:** Manufacturer's standard.
 - **Features:** Manufacturer's standard.
- **Enclosure:**
 - **Mounting arrangement:** As shown on Project Drawings.
 - **Material:** As shown on Project Drawings.
 - Finish:** As shown on Project Drawings.
 - Colour:** As shown on Project Drawings.
 - **Ingress protection (minimum):** As shown on Project Drawings.
 - **Integral control buttons:** As shown on Project Drawings.
 - **Motor control switch:** To [BS EN 60947-3](#).
- **Accessories:** As shown on Project Drawings.

90-65-25/330 Star delta starters

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standard:** To [BS EN 60947-4-1](#).
- **Rated operational voltage (Ue):** 400 V a.c.
- **Rated power (kW):** As shown on Project Drawings.
- **Rated operational frequency:** 50 Hz.
- **Utilization category:** AC-3.
- **Number of poles:** 3.
- **Interrupting medium:** Air.
- **Reverse mode:** Not required.
- **Control coil:** Manufacturer's standard.
- **Overload relay:**
 - **Type:** Manufacturer's standard.
 - **Rating:** Manufacturer's standard.
 - **Features:** Manufacturer's standard.
- **Changeover timer:**
 - **Type:** Electronic.
 - **Adjustable range (minimum):** 3–45 s.
- **Enclosure:**
 - **Mounting arrangement:** As shown on Project Drawings.
 - **Material:** As shown on Project Drawings.
 - Finish:** As shown on Project Drawings.

Colour: As shown on Project Drawings.

- **Ingress protection (minimum):** As shown on Project Drawings.
- **Integral control buttons:** As shown on Project Drawings.
- **Motor control switch:** To [BS EN 60947-3](#).
- **Accessories:** As shown on Project Drawings.

90-65-25/340 Electromechanical contactors

- **Manufacturer:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Standard:** To [BS EN 60947-4-1](#).
- **Equipment type:** a.c. contactor.
- **Rated operational voltage (Ue):** As shown on Project Drawings.
- **Rated operational current (In):** As shown on Project Drawings.
- **Rated operational frequency:** 50 Hz.
- **Utilization category:** Manufacturer's standard.
- **Number of poles:** As shown on Project Drawings.
- **Interrupting medium:** Air.
- **Control coil:** Manufacturer's standard.
- **Enclosure:**
 - **Material:** As shown on Project Drawings.
Finish: As shown on Project Drawings.
Colour: As shown on Project Drawings.
 - **Ingress protection (minimum):** As shown on Project Drawings.
 - **Integral switch disconnecter:** To [BS EN 60947-3](#).
- **Overload relay:**
 - **Type:** Manufacturer's standard.
 - **Rating:** Manufacturer's standard.
- **Accessories:** As shown on Project Drawings.

90-65-25/360 Electromechanical control circuit devices

- **Manufacturer:** Submit proposals.
- **Standard:** To [BS EN 60947-5-1](#).
- **Format:** Indicator lights;
Push button;
Rotary switch;
Pressure switch;
Thermostat;
Position switch;
and Time delay relay.
- **Number of poles:** TO BE COMPLETED
- **Interrupting medium:** TO BE COMPLETED
- **Operating method:** TO BE COMPLETED
- **Control method:** TO BE COMPLETED
- **Utilization category:** TO BE COMPLETED

- **Form:** TO BE COMPLETED
- **Features:** TO BE COMPLETED
- **Enclosure:**
 - **Material:** Manufacturer's standard.
 - **Ingress protection (minimum):** Manufacturer's standard.

90-65-25/370 Emergency stop buttons

- **Manufacturer:** Submit proposals.
- **Standard:** To [BS EN 60947-5-5](#).
- **Format:** Manufacturer's standard.
- **Shroud:** Required.
- **Enclosure:**
 - **Material:** Manufacturer's standard.
 - **Ingress protection (minimum):** To [BS EN 60529](#), IP 65.
- **Execution:** [90-65-25/610 Installing emergency stop buttons](#).

[90-90-55/320 Electrical shock treatment signs](#)

See: [70-70-25/110 Earthing and bonding system](#).

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](#).

[90-90-55/390 Equipment labels and warning notices](#)

See: [70-70-25/110 Earthing and bonding system](#).

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](#).

[90-90-55/395 Electrical diagrams](#)

See: [70-70-25/110 Earthing and bonding system](#).

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](#).

Execution

70-70-75/610 Removing small power systems

- **Scope:** As set out in M&E Specification Volume 1- Outline of Engineering Services

70-70-75/620 Small power installation

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

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

- **General:** As Circuit schedule.

[90-55-10/610 Installing channel cable supports](#)

See: [90-55-10/305 Channel cable supports](#).

[90-55-10/620 Installing cable tray and cable ladder](#)

See: [90-55-10/330 Cable ladders](#).

Shared by: [90-55-10/330 Cable ladders](#); and [90-55-10/335 Cable trays](#).

[90-55-10/630 Installing cable basket](#)

See: [90-55-10/325 Cable baskets](#).

[90-55-10/650 Multiple cable runs](#)

See: [90-55-10/305 Channel cable supports](#).

Shared by: [90-55-10/305 Channel cable supports](#); [90-55-10/325 Cable baskets](#); [90-55-10/330 Cable ladders](#); and [90-55-10/335 Cable trays](#).

[90-55-10/660 Cable support zones](#)

See: [90-55-10/305 Channel cable supports](#).

Shared by: [90-55-10/305 Channel cable supports](#); [90-55-10/325 Cable baskets](#); [90-55-10/330 Cable ladders](#); and [90-55-10/335 Cable trays](#).

[90-55-10/700 Installing conduit, trunking and ducting](#)

See: [90-55-10/385 PVC trunking](#).

Shared by: [90-55-10/385 PVC trunking](#); [90-55-10/460 Conduit fittings](#); [90-55-10/475 Intumescent trunking pillows](#); [90-55-10/720 Installing rigid metallic conduit](#); [90-55-10/735 Installing conduit connections to equipment](#); and [90-55-10/765 Conduit, trunking and ducting zones](#).

[90-55-10/710 Installing conduit generally](#)

See: [90-55-10/720 Installing rigid metallic conduit](#).

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

[90-55-10/720 Installing rigid metallic conduit](#)

See: [90-55-10/380 Rigid conduit](#).

[90-55-10/735 Installing conduit connections to equipment](#)

See: [90-55-10/360 Flexible conduit](#).

Shared by: [90-55-10/360 Flexible conduit](#); and [90-55-10/380 Rigid conduit](#).

[90-55-10/740 Installing trunking generally](#)

See: [90-55-10/385 PVC trunking](#).

Shared by: [90-55-10/385 PVC trunking](#); and [90-55-10/410 Cable trunking and cable ducting for wall and ceiling mounting](#).

[90-55-10/765 Conduit, trunking and ducting zones](#)

See: [90-55-10/380 Rigid conduit](#).

Shared by: [90-55-10/380 Rigid conduit](#); and [90-55-10/410 Cable trunking and cable ducting for wall and ceiling mounting](#).

[90-55-10/770 Installing service outlets](#)

- **Setting out:** As shown on Project Drawings.
- **Complete installation:** Clean and stable. Free from bounce and vibration.
- **Cable connections to raised access floor outlets:** Provide flexible metal conduit.
- **Spare compartments:** Install blank plates.

[90-55-15/635 Installing low voltage cables](#)

See: [90-55-15/330 Fire resistant screened \(LSHF\) cables](#).

Shared by: [90-55-15/330 Fire resistant screened \(LSHF\) cables](#); [90-55-15/334 Single core non-sheathed cables with LSHF insulation](#); [90-55-15/340 Multicore screened thermosetting insulated \(LSHF\) sheathed cables](#); [90-55-15/350 Thermosetting insulated and thermoplastic sheathed \(LSHF\) cables](#); [90-55-15/405 Balanced twisted-pair cables](#); [90-55-15/665 Installing flexible cables](#); and [90-55-15/680 Installing low voltage armoured cables](#).

[90-55-15/660 Installing low voltage cables in conduit and trunking](#)

See: [90-55-15/330 Fire resistant screened \(LSHF\) cables](#).

Shared by: [90-55-15/330 Fire resistant screened \(LSHF\) cables](#); [90-55-15/334 Single core non-sheathed cables with LSHF insulation](#); [90-55-15/340 Multicore screened thermosetting insulated \(LSHF\) sheathed cables](#); [90-55-15/350 Thermosetting insulated and thermoplastic sheathed \(LSHF\) cables](#); and [90-55-15/405 Balanced twisted-pair cables](#).

[90-55-15/665 Installing flexible cables](#)

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

[90-55-15/680 Installing low voltage armoured cables](#)

See: [90-55-15/324 Thermosetting insulated and thermoplastic sheathed \(LSHF\) armoured cables](#).

Shared by: [90-55-15/324 Thermosetting insulated and thermoplastic sheathed \(LSHF\) armoured cables](#); and [90-55-15/332 Thermosetting insulated armoured fire resistant \(LSHF\) cables](#).

[90-55-15/685 Jointing and terminating low voltage armoured cables](#)

See: [90-55-15/680 Installing low voltage armoured cables](#).

[90-55-15/715 Excavations](#)

See: [90-55-15/324 Thermosetting insulated and thermoplastic sheathed \(LSHF\) armoured cables](#).

Shared by: [90-55-15/324 Thermosetting insulated and thermoplastic sheathed \(LSHF\) armoured cables](#); and [90-55-15/332 Thermosetting insulated armoured fire resistant \(LSHF\) cables](#).

[90-55-15/720 Cables in ducts](#)

See: [90-55-15/324 Thermosetting insulated and thermoplastic sheathed \(LSHF\) armoured cables](#).

Shared by: [90-55-15/324 Thermosetting insulated and thermoplastic sheathed \(LSHF\) armoured cables](#); and [90-55-15/332 Thermosetting insulated armoured fire resistant \(LSHF\) cables](#).

[90-55-15/725 Cables in trenches](#)

See: [90-55-15/324 Thermosetting insulated and thermoplastic sheathed \(LSHF\) armoured cables](#).

Shared by: [90-55-15/324 Thermosetting insulated and thermoplastic sheathed \(LSHF\) armoured cables](#); and [90-55-15/332 Thermosetting insulated armoured fire resistant \(LSHF\) cables](#).

[90-55-15/730 Installing warning devices for underground cables](#)

See: [90-55-15/324 Thermosetting insulated and thermoplastic sheathed \(LSHF\) armoured cables](#).

Shared by: [90-55-15/324 Thermosetting insulated and thermoplastic sheathed \(LSHF\) armoured cables](#); and [90-55-15/332 Thermosetting insulated armoured fire resistant \(LSHF\) cables](#).

[90-55-15/735 Cable installation on channel cable supports, cable tray, cable ladder and cable basket](#)

See: [90-55-15/324 Thermosetting insulated and thermoplastic sheathed \(LSHF\) armoured cables](#).

Shared by: [90-55-15/324 Thermosetting insulated and thermoplastic sheathed \(LSHF\) armoured cables](#); [90-55-15/332 Thermosetting insulated armoured fire resistant \(LSHF\) cables](#); [90-55-15/340 Multicore screened thermosetting insulated \(LSHF\) sheathed cables](#); and [90-55-15/350 Thermosetting insulated and thermoplastic sheathed \(LSHF\) cables](#).

[90-55-15/740 Cables in vertical trunking and ducts](#)

See: [90-55-15/324 Thermosetting insulated and thermoplastic sheathed \(LSHF\) armoured cables](#).

Shared by: [90-55-15/324 Thermosetting insulated and thermoplastic sheathed \(LSHF\) armoured cables](#); and [90-55-15/332 Thermosetting insulated armoured fire resistant \(LSHF\) cables](#).

[90-60-25/610 Installing electrical accessories](#)

Shared by: [90-60-25/320 Surface and concealed wiring enclosures](#); [90-60-25/335 Fused connection units](#); [90-60-25/340 Cable outlets](#); [90-60-25/345 Standard socket outlets](#); [90-60-25/355 Industrial socket outlets](#); [90-60-25/370 Industrial plugs](#); [90-60-25/375 Cable couplers](#); [90-60-25/395 Double pole switches](#); [90-60-25/410 Ceiling power switches](#); and [90-60-25/455 Balanced twisted-pair cable outlet plates](#).

- **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:** As shown on Project Drawings.
- **Separation distance between adjacent accessories (minimum):** 50 mm.

[90-60-30/610 Installing surge protective devices for low voltage power supplies](#)

See: [90-60-30/410 Surge protective devices for low voltage power supplies](#).

[90-65-25/610 Installing emergency stop buttons](#)

- **Standards:** In accordance with [BS 7671](#) and to [BS EN 60204-1](#).
- **Mounting:** Submit proposals.

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 and electronic copies
 - **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;
Location, route and depth of underground cables;
Location of LV switchgear including distribution boards;
Routes of trunking, conduit, cable tray and cable ladders;
and Location of all electrical outlets, including isolators, starters, control equipment and electrical accessories Schematic drawings showing all low voltage final circuits, the cable origin, circuit designation, cable type, size, number of cores, size and type of overcurrent protective device..
 - **Format:** 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:** TO BE COMPLETED

Ω End of system

75-45-20/110 Data distribution system**System outline**

75-45-20/110 Data distribution system

- **Description:** As set out in MEP Specification Volume 0001- Outline of Engineering Services
- **Containment:** [90-55-10/325 Cable baskets](#);
[90-55-10/335 Cable trays](#);
and [90-55-10/380 Rigid conduit](#).
- **Containment accessories:** [45-50-05/310 Expansion anchors](#);
[45-50-10/335 Hexagon head stainless steel nuts and bolts](#);
[45-50-12/340 Stainless steel anchor rods](#);
[45-50-12/360 Stainless steel anchor sockets](#);
[45-50-60/410 Hexagon head stainless steel screws](#);
[45-50-67/350 Masonry plugs](#);
and [90-55-10/460 Conduit fittings](#).

Products

[45-50-05/310 Expansion anchors](#)

See: [70-70-45/110 Low voltage distribution system](#).

Shared by: [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [75-45-20/110 Data distribution system](#).

[45-50-10/335 Hexagon head stainless steel nuts and bolts](#)

See: [70-70-45/110 Low voltage distribution system](#).

Shared by: [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [75-45-20/110 Data distribution system](#).

[45-50-12/340 Stainless steel anchor rods](#)

See: [70-70-45/110 Low voltage distribution system](#).

Shared by: [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [75-45-20/110 Data distribution system](#).

[45-50-12/360 Stainless steel anchor sockets](#)

See: [70-70-45/110 Low voltage distribution system](#).

Shared by: [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [75-45-20/110 Data distribution system](#).

[45-50-60/410 Hexagon head stainless steel screws](#)

See: [70-70-45/110 Low voltage distribution system](#).

Shared by: [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [75-45-20/110 Data distribution system](#).

[45-50-67/350 Masonry plugs](#)

See: [70-70-45/110 Low voltage distribution system](#).

Shared by: [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [75-45-20/110 Data distribution system](#).

[90-55-10/325 Cable baskets](#)

See: [70-70-45/110 Low voltage distribution system](#).

Shared by: [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [75-45-20/110 Data distribution system](#).

[90-55-10/335 Cable trays](#)

See: [70-70-45/110 Low voltage distribution system](#).

Shared by: [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [75-45-20/110 Data distribution system](#).

[90-55-10/360 Flexible conduit](#)

See: [70-70-75/110 Hard wired low voltage small power system](#).

Shared by: [70-70-75/110 Hard wired low voltage small power system](#); and [90-55-10/735 Installing conduit connections to equipment](#).

[90-55-10/380 Rigid conduit](#)

See: [70-70-45/110 Low voltage distribution system](#).

Shared by: [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [75-45-20/110 Data distribution system](#).

[90-55-10/460 Conduit fittings](#)

See: [70-70-45/110 Low voltage distribution system](#).

Shared by: [70-70-45/110 Low voltage distribution system](#); [70-70-75/110 Hard wired low voltage small power system](#); and [75-45-20/110 Data distribution system](#).

90-70-25/310 Data equipment cabinets

- **Manufacturer:** Supplied by Client

Execution

[90-55-10/620 Installing cable tray and cable ladder](#)

See: [90-55-10/330 Cable ladders](#).

Shared by: [90-55-10/330 Cable ladders](#); and [90-55-10/335 Cable trays](#).

[90-55-10/630 Installing cable basket](#)

See: [90-55-10/325 Cable baskets](#).

[90-55-10/650 Multiple cable runs](#)

See: [90-55-10/305 Channel cable supports](#).

Shared by: [90-55-10/305 Channel cable supports](#); [90-55-10/325 Cable baskets](#); [90-55-10/330 Cable ladders](#); and [90-55-10/335 Cable trays](#).

[90-55-10/660 Cable support zones](#)

See: [90-55-10/305 Channel cable supports](#).

Shared by: [90-55-10/305 Channel cable supports](#); [90-55-10/325 Cable baskets](#); [90-55-10/330 Cable ladders](#); and [90-55-10/335 Cable trays](#).

[90-55-10/700 Installing conduit, trunking and ducting](#)

See: [90-55-10/385 PVC trunking](#).

Shared by: [90-55-10/385 PVC trunking](#); [90-55-10/460 Conduit fittings](#); [90-55-10/475 Intumescent trunking pillows](#); [90-55-10/720 Installing rigid metallic conduit](#); [90-55-10/735 Installing conduit connections to equipment](#); and [90-55-10/765 Conduit, trunking and ducting zones](#).

[90-55-10/710 Installing conduit generally](#)

See: [90-55-10/720 Installing rigid metallic conduit](#).

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

[90-55-10/720 Installing rigid metallic conduit](#)

See: [90-55-10/380 Rigid conduit](#).

[90-55-10/735 Installing conduit connections to equipment](#)

See: [90-55-10/360 Flexible conduit](#).

Shared by: [90-55-10/360 Flexible conduit](#); and [90-55-10/380 Rigid conduit](#).

[90-55-10/765 Conduit, trunking and ducting zones](#)

See: [90-55-10/380 Rigid conduit](#).

Shared by: [90-55-10/380 Rigid conduit](#); and [90-55-10/410 Cable trunking and cable ducting for wall and ceiling mounting](#).

[90-55-15/635 Installing low voltage cables](#)

See: [90-55-15/330 Fire resistant screened \(LSHF\) cables](#).

Shared by: [90-55-15/330 Fire resistant screened \(LSHF\) cables](#); [90-55-15/334 Single core non-sheathed cables with LSHF insulation](#); [90-55-15/340 Multicore screened thermosetting insulated \(LSHF\) sheathed cables](#); [90-55-15/350 Thermosetting insulated and thermoplastic sheathed \(LSHF\) cables](#); [90-55-15/405 Balanced twisted-pair cables](#); [90-55-15/665 Installing flexible cables](#); and [90-55-15/680 Installing low voltage armoured cables](#).

[90-55-15/660 Installing low voltage cables in conduit and trunking](#)

See: [90-55-15/330 Fire resistant screened \(LSHF\) cables](#).

Shared by: [90-55-15/330 Fire resistant screened \(LSHF\) cables](#); [90-55-15/334 Single core non-sheathed cables with LSHF insulation](#); [90-55-15/340 Multicore screened thermosetting insulated \(LSHF\) sheathed cables](#); [90-55-15/350 Thermosetting insulated and thermoplastic sheathed \(LSHF\) cables](#); and [90-55-15/405 Balanced twisted-pair cables](#).

[90-60-25/610 Installing electrical accessories](#)

See: [90-60-25/320 Surface and concealed wiring enclosures](#).

Shared by: [90-60-25/320 Surface and concealed wiring enclosures](#); [90-60-25/335 Fused connection units](#); [90-60-25/340 Cable outlets](#); [90-60-25/345 Standard socket outlets](#); [90-60-25/355 Industrial socket outlets](#); [90-60-25/370 Industrial plugs](#); [90-60-25/375 Cable couplers](#); [90-60-25/395 Double pole switches](#); [90-60-25/410 Ceiling power switches](#); and [90-60-25/455 Balanced twisted-pair cable outlet plates](#).

System completion

75-45-20/810 Testing and inspection of data distribution systems

- **Standards:** To [BS EN 50346](#).
- **Testing and inspection agent:** Structured Cabling System Contractor

- **Notice before commencing tests (minimum):** 7 days
- **Inspection of cabling:** Inspect cables for kinks, bends, snags and compression and deformation damage.
- **Permanent link:** Measure length of each cabling segment (connector to connector).
- **Pin assignment and continuity:** Verify and submit results.
- **Cable temperature during testing:** Submit.
- **Results:** Submit in accordance with [BS EN 50346](#), Annex A.
- **Certificates of calibration for meters and instruments:** Submit.

75-45-20/820 Documentation for data distribution systems

- **Standard:** To [BS EN 50174-1](#).
- **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:** Electronic
 - **Number of copies:** Two.
- **Record drawings:**
 - **Content:** Point of entry of PABX cable into building;
Route of incoming connection cable to the public telephone network from point of entry into building and PABX;
For all data cabling, the cable origin, circuit designation, route, conductor material and c.s.a., insulation type and colour, number of cores per cable, number of cables in ducts, on tray or ladder;
General arrangement drawings. Cabling topology schematics. Distribution point layout drawings;
Equipment room layout drawings. Interconnection diagrams;
and Work area layout drawings.
 - **Format:** Electronic drawing.
 - **Number of copies:** Two.
- **Submittal date:** At handover.
- **Cabling topology schematics:**
 - **Location:** Building distributor room and Main server room.
 - **Format:** Laminated A1 size paper print.
 - **Installation:** Wall mounted with cup and screw fixings.