MEICA - Specification - Electrical installations

Guidance: LIT 13230 Published: 08/10/2021

Audience: Environment Agency

What's this document about?

This document sets out the MEICA specification to be followed by all Environment Agency staff and suppliers when specifying the requirements for the design, installation, inspection and testing of low voltage (up to 1000 volts) electrical installations. Any variation to this standard must be applied for through the concession process.

! Users must read MEICA – Specification - General prior to using MEICA any Specifications.

Who does this apply to?

This specification applies to:

- Environment Agency Staff;
- External suppliers working on MEICA projects.

Contact for queries and feedback

- MEICA.Directorate@environment-agency.gov.uk
- Please give anonymous feedback for this document.

Contents

Introduction

Scope

This specification defines the requirements for the design, construction, inspection and testing of low voltage electrical installations (up to 1000 V).

Other requirements

The low voltage electrical installation must also comply with:

- MEICA - Specification - General
- this specification;
- project datasheets;
- any other documentation issued by the Environment Agency.

Note: Where such documentation imposes additional requirements to the Standards listed in Related Documents, the requirements of the specific project documentation take preference.

Whole life costs

In addition to the documentation requirements in MEICA - Specification - General , the following must be submitted as part of the tender:

- electrical installation power output and specific energy consumption.

Critical Assets

Low voltage installations installed or being designed for Critical Assets must be assessed under OI 17_17 Critical Assets.

Design life

The table below sets out the minimum design life.

Equipment Type	Design Life
Low voltage electrical installations	20 years

General

Service conditions and application

The electrical installation must be capable of satisfactory operation within the following temperature ranges:

- Internal: from -10 degrees Celsius (^{o}C) to 40^{o}C (with an average in any 24-hour period of not more than 35^{o}C) and relative humidity up to 80 per cent;
- External: from -15^{o}C to 40^{o}C (with an average in any 24-hour period of not more than 35^{o}C) and relative humidity up to 95 per cent.

Particular requirements to meet special service conditions in terms of temperature, altitude and degree of pollution must be complied with or special agreements made with the Environment Agency.

Special locations

The IET Guidance Note 7: ‘Special Locations’ must be adhered to for installations in special locations where additional measures are required to comply with BS 7671.

Electrical system characteristics

The design of the installation must consider the minimum following characteristics of the electrical system:

- voltage, frequency and number of phases;
- maximum prospective short circuit current;
- earthing arrangement (TN or TT supply);
- external earth fault loop impedance (Ze);
- type and rating of protection device external to installation;
- harmonic voltage and current distortion;
- load capability of supply source.

! Important If a new power supply application is to be submitted, a TNS earthing arrangement must be requested.

Hazardous area installations

All equipment selected for use in a hazardous area must have undergone an appropriate conformity assessment procedure (CAP) to demonstrate compliance with the essential health and safety requirements of 2014/34/EU (A TEX 95) as enacted in the UK by:

- Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 2016

The design, selection and erection of the electrical installations in explosive atmospheres must comply with all appropriate parts of BS EN 60079 and as a minimum the following.

- Electrical apparatus that does not comply with IEC standards or equivalent must not be used in hazardous areas.
- Isolation/disconnection of circuits must always be in a non-hazardous area.
- Cable joints are not permitted in hazardous areas.
- Labels for all intrinsically safe (IS) equipment and junction boxes must be coloured blue with white lettering.
- The IS circuit cable outer sheath and IS terminals must be coloured light blue.

On completion of the erection/installation, initial inspection of the apparatus and installation must be carried out in accordance with appropriate parts of BS EN 60079.

Selection of equipment and components

General

Surface-mounted fittings/accessories must be used with surface wiring.

Recessed-mounted fitting/accessories must be used with concealed wiring.

High Efficiency Lighting Units (HELUs) and White Light Emitting Diodes (LEDs) can be used for interior and exterior lighting. Lighting control measures such as localised switching and time switching may be considered to optimise efficiency of lighting system.

Further guidance on daylight installations is given BS EN 17037

Distribution boards

Distribution boards must comply with BS EN 61439-3 and BS 7671.

If upstream overcurrent protection is provided, the incoming supply switching and isolation device can be:

- circuit breaker;
- circuit breaker with integral residual current device (RCD) (residual current circuit breaker with overload protection, RCBO);
- fuse switch disconnector; or
- switch disconnector.

The neutral and earth bars provided in the distribution board must have terminals equal to the total number of outgoing ways on the board.

The loading of the branch circuits must not exceed 80% of the rating of the branch circuit protective device rating.

The distribution board must be provided with 30% spares circuit positions. Approximately 50% of the spares circuit positions must be provided with circuit protective devices. The remaining positions must be provided with necessary facilities that require only the addition of the circuit protective device for future use.

Control boxes, junction boxes, local control stations

Local isolators must be provided where shown on the outline block cable diagrams. These must be manufactured from glass-reinforced plastic (GRP), polycarbonate or an appropriate material approved by the Environment Agency.

All cables must be bottom entry into the unit. The Supplier must ensure there is adequate surface area on the bottom gland plate to gland and terminate all required cables.

Gland plates and cable boxes shall be designed/installed so to minimise the effects of eddy currents; single core cable gland plates shall be made from non-ferrous material.

Emergency stop pushbutton and pushbutton control stations must be provided where shown on the outline block cable diagrams. These must be manufactured from glass reinforced plastic (GRP), polycarbonate or an appropriate material approved by the Environment Agency. All cables must be bottom entry into the unit.

Junction boxes must be provided where shown on the outline block cable diagrams. These must be manufactured from GRP, polycarbonate or an appropriate material approved by the Environment Agency.

The local final cabling from junction boxes to individual connection points must be provided with allocated tag numbers, identified and shown on the cable schedules and detailed block cable diagrams. Propriety cables associated with instruments must be identified and included on the cable schedules.

The doors of isolators, control stations and the covers of junction boxes must be fitted with:

- a red/white/red Traffolyte hazard label ‘Danger [XX] Volts – Isolate Before Opening’;
- a yellow/black/yellow Traffolyte warning label ‘Isolate at [Specified location] Before Opening’; and
- other applicable safety labels identifying the potential danger in accordance with appropriate parts of BS 5499 and BS ISO 3864. See also Labels and safety signs.

All enclosures must be provided with an adequate means of earthing.

Terminals must be clipped to rails fixed to the back of the enclosure or supported off brackets integral with the enclosure.

Socket outlets

Plugs and socket outlets must comply with BS EN IEC 60309 and BS 1363.

Socket outlets for installation in offices, laboratories, mess rooms, accommodation and similar public areas must be rated at 13 Amperes (A) and 250 V, and comply with BS 1363.

All 230 V final circuit socket outlets must be protected by a suitable rated residual current device. Please refer to BS 7671 for maximum disconnection time.

All general purpose 13 A sockets must have automatic shutters closing phase and neutral apertures when not in use.

Outlet and switch boxes located outdoors must be suitable for the environment where outlets are to be installed and be a minimum of IP65 enclosures in accordance with BS EN 60529/IEC 60529 made of a corrosion-resistant material such as fibreglass, copper-free aluminium, galvanised steel or stainless steel.

Fused connection unit

Fused connection units must be rated at 13 A and 250 V, and comply with BS 1363. They must incorporate a correctly rated cartridge fuse link complying with BS 1362.

The fused connection units can be switched or unswitched, and must be provided with a flex outlet in front.

Shaver sockets

All shaver socket outlets must be dual voltage (250/120 V AC) complying with BS EN 61558-2-5. They must incorporate a double wound isolating transformer with thermal overload protection on the primary side.

Industrial plug and socket outlets

Industrial plug and socket outlets must comply with BS EN 60309 and must consist of a single-phase or three-phase unit rated at 16, 32, 63, 125 A.

All industrial plug and socket units must be provided with an integral isolator and interlocked to prevent socket contacts from breaking the load current.

Isolators

For a single phase system, the isolators must be double pole and comply with BS EN 60669. For a three phase system, the isolators must be four pole and comply with BS EN 60947.

Ceiling rose

Ceiling roses must comply with BS 67. They must have three terminals and an earth terminal.

Plug-in ceiling roses used for lighting fixture connections must comply with BS 6972.

Accessory mounting boxes

Plastic mounting boxes must be used with polyvinyl chloride (PVC) conduits.

Steel accessory boxes must be used with metallic conduits.

The accessory mounting boxes must comply with BS 4662.

Lighting switches

All lighting switches must be rated at 250 V and must comply with BS EN 60669.

In a multi-gang switch box, different phases or dissimilar voltages must be separated by earthed metallic barriers.

Installation of electrical equipment

General

All support steelwork required for the electrical installation must be installed electrically clear of floor-reinforcing metalwork.

The floor screed area below the switchgear and in front of withdrawable equipment must be level within the manufacturer's recommendations but, as a minimum, ±3 mm over the whole area.

Packing material and constraints must be removed and equipment thoroughly cleaned.

Before the switchboard is commissioned, withdrawable portions of switchgear and motor control centres must be checked for correct mating with the stationary portions and correct function of locking devices.

The Supplier is responsible for locating all minor equipment not otherwise located on the drawings (for example, control stations, junction boxes, etc.) to ensure all services are co-ordinated with other services on-site.

Local control stations must be mounted adjacent to their equipment.

Distribution boards must be provided with an interior sub-circuit identification schedule to indicate the equipment served.

Bus duct

Where bus ducting is used (for example, to connect transformers to switchgear), the Supplier must carry out the installation in accordance with the manufacturer's recommendations and drawings with regard to route locations, support steelwork and, if applicable, building penetrations.

Bus ducting can be any one of the following types (all are supplied in pieces for site assembly):

- air-insulated copper bar assemblies;
- sleeved copper bar assemblies;
- encapsulated copper bar assemblies.

Bus ducting systems must be supplied complete with butt right-angled, tee and flexible inter-connecting kits and connection insulation kits as applicable. The manufacturer must also supply all support assemblies for encapsulated bus ducting.

The Supplier is responsible for the installation of air-insulated and sleeved copper bar types of bus ducting.

The Supplier is also responsible for the installation of encapsulated type bus ducting but under the supervision of the manufacturer's representative.

Transformers

The Supplier must ensure that transformers are installed in the locations shown on the drawings and in accordance with the manufacturer's drawings and recommendations.

Only designated jacking and lifting points must be used when the transformers are being put into position. Where there are separate lifting facilities for tank tops, cores and coils, these must be removed or rendered unusable during transport and erection.

Where bus ducting is to be used for connections to transformers and reactor terminals, checks must be made before the tank base is bolted or welded down to ensure the bus ducting connections can be made without imposing stress on the bus ducting copper-work or transformer terminal bushings.

When correctly located and inspected, an insulation test must be carried out and recorded:

- between each phase and earth/ground; and
- between high-voltage (HV) and low-voltage (LV) windings.

On completion of the installation of all fittings and cables, etc., an insulation test of all windings and connections must be made.

The following apply where applicable.

- The fluid level in transformers and the colour of any breathing desiccants must be checked and rectified where necessary.
- Transformer oil or other liquid insulation must be checked/tested in accordance with the manufacturer's recommendations.
- The transformer tap changer must be securely padlocked in its required position. The Supplier must provide approved types of padlock and keys to the Environment Agency.

- Any transformer protection measures must be checked/tested prior to energising the transformer.

Batteries, battery chargers and inverters

Refer to MEICA - specification - Rechargeable Batteries for information regarding the installation of batteries, battery chargers and inverters.

Generators

Refer to MEICA - Specification - Engine Generating Sets for information regarding the installation of generating engines and associated equipment.

Cable selection

General

Cables must be selected and sized in accordance with latest edition of BS 7671.

The cable manufacturer must be approved and licensed by the British Approved Service Cables (BASEC). The outer sheath of cable must be embossed with the BASEC logo. Following the United Kingdom's exit from the European Union, on the 1st January 2021 BASEC is the only appointed approval agency of cables to UKCA (UK Conformity Assessed) certification, which replaces CE certification.

General selection criteria

Power cables must be selected in accordance with their suitability for the application and operating environment. Available power cables are detailed within BS 7671 Table 4A3; cables not in this table must be approved by the Environment Agency before purchase.

! Important

Cable selection must match insulation type with application and operational environment.

Cables must be sized to operate within their current carrying capacity and as determined by the maximum continuous insulation temperature.

Cables must have copper conductors complying with BS EN 13602.

The minimum cross-section of cables must be as follows

- power cables 2.5 mm^2
- control cables 0.75 mm^2;

- signal/instrument cables 0.75 mm^2;
- data transmission cables 0.5 mm^2.

The colours of wiring insulation must be as shown in the table below.

Abbreviation	Meaning
L1 Phase 1	Brown
L2 Phase 2	Black
L3 Phase 3	Grey
N Neutral	Blue
110 V AC Control only	Red
110 V AC Power	Brown and Blue
48 V AC and below	Pink
Star contactor link and current transformer (CT) secondaries	Brown
DC positive	Brown
DC negative	Grey
Intruder/interlocking voltage circuits (entire circuit must be continuous and consistent colour)	Orange
Telemetry	White
Instrumentation 4–20 mA analogue	White
Protective earth conductors	Green and yellow *
Functional earth	Cream
Intrinsically safe (IS) circuit	Light blue
*On sites with issues of theft and for larger protective earth conductors installed in the field black coloured cables can be used with cable ends marked with green and yellow tape to identify the cable. This must be approved by the Environment Agency prior to purchasing the cables.	

! Important

The Supplier shall review appropriate standard to assess the need to apply for an exemption quoting the appropriate IEC, BS or BS EN to support the exemption.

Cable segregation/separation

As per BS 7671, the cables must be classified as follows:

- Band 1: Extra low voltage cables (signal / instrument, data transmission and telecommunication);
- Band 2: Low voltage cables (power and control cables);
- intrinsically safe cables;
- HV cables.

The cable guidelines for segregation are provided in the table below. Cables of different categories must cross each other at right angles.

Note The separation distance need not apply to short lengths of cables.

	Separation distance (mm)					
	Band 1	**Band 2**	**IS**	**HV**	**Other underground services**	**Other above ground services**
Band 1	–	300	50	500	150	500
Band 2	300	–	300	300	150	500
IS	50	300	–	500	150	500
HV	500	300	500	–	300	500

Cable sizing

Cables must be adequately rated for current-carrying capacity under normal and short-time fault conditions at the specified voltage.

Assessing the rating and cross section of any cable must be in accordance with BS 7671 and IEC 60287.

Where electrical design packages have been used, such as AMTECH, they must submit PDF copies of cable calculations and protection setting to the Environment Agency as part of their design submission. The AMTECH model for the works must also be submitted in its original file format to the Environment Agency.

Mineral insulated copper sheath (MICS) cables

All mineral insulated cables must comply with BS EN 60702 and must be 500 V grade unless otherwise specified.

Restrictions on the use of MICS cable are detailed below.

- MICS cable must not be used between discharge type lighting fittings and associated control equipment unless an appropriate surge suppressor has been correctly positioned in the circuit.
- When MICS cable is specified for a.c. power circuits or d.c. circuits, consideration must be given to inductive load switching and the possible need for surge diverters in the circuit.
- Through joints must comprise jointing sleeves and appropriate accessories supplied by the cable manufacturer for this purpose. After completion, the joint must be protected with a sleeve of material similar to the cable outer sheath.
- MICS cable installations must not be used in hazardous areas unless approved by the Environment Agency.

Cable, glands, pot seals, sleeving, tools and other accessories used together must be compatible and supplied by the same manufacturer. Glands must be a hexagon type and, where applicable, be certified or approved for use in the hazardous area concerned.

Terminations must be made using cold pot seals supplied by the cable manufacturer and the following procedures.

- The pot must be contained in the gland body and must not protrude into the equipment.
- The pot must be effectively screwed onto the cable sheath and its self-cutting thread fully engaged, or in the case of wedge type fittings, correctly fitted in accordance with the manufacturer's instructions.
- The manufacturer's recommendations for excluding moisture from the cable immediately prior to making an end seal termination must be observed rigidly.
- At terminations, conductors must be insulated with neoprene sleeving, or where connections are to be made into high temperature enclosures (for example, tungsten fittings, etc.), silicone rubber sleeving or sleeving as recommended by the cable manufacturer must be used.

In all cases, except where positive earth/ground continuity must be maintained such as via threaded entries of metallic enclosures, cable end seals with earth/ground bonding tails must be used. Earth/ground bonding tails must be properly terminated on earthed/grounded terminals provided for the purpose within the enclosures.

ICA cables

Instrumentation, control and automation (ICA) cables must be in accordance with BS EN 50288-7.

All panel and trunking cables must be of copper conductor with a minimum cross section area of 0.75 mm^2, PVC insulated and cross-linked polyethylene (XLPE) sheathed. Screened cables must have aluminium tape screen.

In general ICA cables are categorised as shown in the table below.

The conductors of any multi core cable must carry signals of the same category.

The conductors forming part of an intrinsically safe circuit must be contained within multi-core cables reserved solely for such circuits.

ICA cables running in parallel with other power cables must be separated as detailed in Cable segregation/separation.

Category	Application
1	Instrument power and control (above 50 V)
2	High level signalling (6–50 V DC) for digital status, analogue current and voltage signals
3	Low level signalling for telemetry, data transmission, telephones, etc.

Fibre optic cables

Fibre optic cables must each contain six secondary coated multi-mode graded index 50/125 mm^2 optical fibres together with two 0.9 mm diameter conductors insulated with polythene, stranded around a 1.83 mm diameter steel strand and plastic coated up to 2.4 mm diameter.

The cable core must be inner sheathed with low density polythene of radial thickness 2.5 mm.

A steel or plastic laminate tape 44 mm in width must be applied longitudinally under the bedding sheath.

The final outer sheath must be a 3 mm radial of high density polythene with an overall diameter of 25 mm.

The minimum cable bending radius must be in accordance with the manufacturer's recommendations.

Connectors shall be suitable for the type of cable being installed as well as the type of socket the cable will be connected to. Connectors shall comply with the relevant parts of BS EN 60874-1.

Connectors shall be attached to cables strictly in accordance with the connector manufacturer's instructions.

Patch panel shall be designed based on the requirements of the fibre optic network. Considerations shall be made for port types, number of ports, type of cable, mounting, etc.

Laser optimised multimode glass fibre type cables shall comply with relevant parts of BS EN IEC 60793-2-10. Plastic optical fibre type cables shall comply with relevant parts of BS EN 60793-1.

Cable installation

General

The cables for each circuit must be the type and size specified for that circuit.

All cable routes must be approved by the Environment Agency. There must be no deviation from the cable routes shown on drawings unless agreed by the Environment Agency.

Where cable is installed overhead, the locations of the cable tray and ladders must be designed to ensure that:

- there is no conflict between them and other equipment, steelwork, piping, ducting, etc.;
- they do not cause any hazard to personnel, block access ways or prevent removal of equipment.

The Environment Agency must be given the opportunity to examine the installation before backfilling of buried cables.

The bending radius of a cable must not be less than the manufacturer’s recommended minimum.

Cables must be run in continuous unbroken lengths. Joints are not permitted unless the route length exceeds the maximum manufactured drum length.

Unless otherwise specified, single core cables must be provided with an outer protective sheath (for example, PVC); if laid direct in the ground and/or if unsupported over any part of their entire length, they must include non-ferrous armouring.

Where single core cables are to be used for three-phase circuits, special attention must be given to minimising the likelihood and effects of circulating currents. Insulated glands for cable terminations must be fitted at one end and must be assembled and tested strictly in accordance with the manufacturer's instructions. Each set of single core cables comprising a three-phase circuit must be run close together and under no circumstances must ferrous metal be interposed between the single core cables. Trefoil formation must be used for each three-phase group of single core cables; this requirement can only be relaxed if agreed with the Environment Agency.

Cables must be installed in accordance with the manufacturer's recommendations.

Directly in the ground

All underground cables must be steel wire armoured and PVC sheathed.

Cables must be surrounded by not less than 75°mm of washed sand, loam or sifted soil under and over the cable. A first marker tape must be laid directly on top of the sand layer and the trench must be partially backfilled. The second marker tape must be laid at 300 mm below ground level and the remainder of trench backfilled with top soil.

HV cables (and where specified LV cables) must be protected by suitably sized concrete or earthenware cable covers. These covers must be laid directly above the 50 mm fill of screened material and must extend full width of the trench giving an overlap of at least 50 mm beyond the outer cables.

The minimum depth of cover required from cable to finished grade must be as shown in the table below.

Accurate and detailed drawing records of buried cables must be prepared by the Supplier as each section of cable is installed. Recorded information on the 'as-built' drawings must include:

- dimensioned trench positions;
- duct and trench sections indicating circuits installed;
- location of underground joints taken by measurement from fixed and permanent landmarks.

Type of cable	Minimum depth of cover
Street lighting and telephone cables	600 mm
Power cables up to and including 1000V and control cables *	600 mm
Power cables above 1000 V	1000 mm
*In agricultural and horticultural premises where vehicles and mobile agricultural machines are operated, the minimum depth of cover should be 600 mm, with added mechanical protection. Cables in arable or cultivated ground must be buried at a depth of at least 1000 mm (Guidance Note 1 (705.522).	

As stated in Guidance Note 1 (522.8.10), a depth of burial of less than 500 mm is usually inadvisable as shallow laid cables may be inadvertently damaged by general gardening, etc. Cables that cannot be buried at a reasonable depth

should be specifically protected, e.g. by ducts encased in concrete, or installed along an alternative route.

As stated in Guidance Note 1 (708.521.1.1), in caravan parks, campgrounds and similar locations, cables must be buried at a depth of at least 600mm having additional mechanical protection, be placed well outside any caravan pitch or away from areas where tent pegs or ground anchors were expected to be hammered into the ground.

As stated in Guidance Note 1 (709.521.1.7), in marinas, the recommended minimum buried depth is 0.5 m.

In concrete trenches (including troughs)

Cables must be fixed to the walls of cable trenches by means of cable cleats bolted to vertical sections of heavy duty, galvanised, fixing channel fixed securely to the wall of the trench by an expansion bolt.

In cable ducts

Cables must be installed in rigid ducts of unplasticised PVC complying with BS 4660 and BS EN 13598 or corrugated plastic.

Sufficient ducts must be installed to provide 20% spare capacity and 50% spare for roadway crossing.

Ducts carrying different categories cables must be separated as per BS 7671 recommendations and also as per Cable segregation/separation.

Ducts must be left with a 1 m excess length of 8 mm diameter of nylon draw cord in place, anchored at each end.

Cables entering or leaving ducts must be sealed with a 100 mm thick ring of expanding polyurethane foam. Where the water table is identified as a problem, ducts must be sealed using Densomastic 16A sealant. The Supplier shall consider if gas and fire proof duct sealant is required – please see OI 17_17 SD02 Fire Minimum Technical Requirements for Fixed Assets.

Ducts passing through floors must terminate approximately 75 mm above the surface of the floor.

Cable ducts must extend for a minimum 1000 mm beyond the limit of roadways and paved areas.

Draw pits must be installed for every 50 m straight run length of ducts or at the change of direction of ducts. As a minimum, draw pits must be 750 mm × 750 mm × 1000 mm in size and must maintain the required cable separation and facilitate the minimum bending radius of the cable. If alternative standard draw pit sizes are required due to scheme requirements/constraints, the Supplier to

submit a Concession request - detailing the reason for deviation for the acceptance of the Environment Agency.

General cable routes

Cables must be allocated to ladders, trunking, trays or racks in the particular grouping arrangement detailed in drawings. Where specified, the racks must be colour-coded.

Care must be taken to maintain the segregation distances between power and instrumentation cables as detailed in Cable segregation/separation.

Electrical continuity must be maintained:

- between sections of cable tray or ladder by the use of flanged fishplates;
- between the tray or ladder and the main structure, either through earthed/grounded support steelwork or by earthing/grounding cable connections to the main structure at each end of the tray or ladder run.

Standard prefabricated bends, tees, reducers and other accessories must be used. Unless approved by the Environment Agency, sections fabricated on site from straight sections must not be used.

Tray

Metal cable trays up to and including 150 mm wide must be of medium duty type with minimum gauge of 0.9 mm.

Cable trays greater than 150 mm wide must be of heavy duty type and with minimum gauge of 1.4 mm.

Spacing between horizontal tray tiers must be a minimum of 300 mm.

The choice of materials for cable trays and ladders will depend on the severity of the environment and the design life of the installation. As a minimum requirement, they must be heavy duty mild steel hot dipped galvanised unless specified. For corrosive environments, deep galvanised Corten ‘A’ steel or Type 316 516 ‘marine’ grade stainless steel are acceptable materials. GRP may be used if weight saving is an important factor and adequate earthing is provided.

Where tray is to be installed in fire escape routes it, and all fittings, must be manufactured from metal as specified above. In these locations, fixings into the walls and ceilings must be by steel plugs. Plastic plugs are not permitted. Consideration must also be given to the fire resistance of the substrate that is being fixed to.

Plastic cable trays must be manufactured from rigid un-plasticised PVC having a thickness of not less than 3.0 mm. The material must be self-extinguishing and non-flammable.

Cable trays or ladders must be bolted or clamped to supports. Each length of cable tray must be bolted securely to an adjacent length with factory made coupling plates.

The cable tray support must be installed at regular intervals not exceeding the manufacturer's recommendations such that the weight of the cable is carried without deflection.

Welding to main structural steel work or drilling into concrete members is only permitted with the Environment Agency's approval.

Cables with an overall diameter of 40 mm and above must be fixed to the tray by cable cleats.

Single core cables making up three-phase circuits must normally be run in three-phase trefoil groups, securely clamped together to withstand the mechanical force produced by a short circuit fault. The manufacturer's recommended spacing must be used, supported by evidence of type tests having been performed under short circuit conditions.

All other cables with an overall diameter below 40 mm must be securely fastened to trays and ladders by nylon cable ties. Where cables are secured in fire evacuation routes they must be fixed with fire resistant metal cable clips.

Trunking

Trunking must be installed as a complete system including all necessary parts and accessories. Trunking must be sized to provide a spare capacity of 25%. Trunking ends must be fitted with removable end caps.

Steel trunking must be heavy duty, galvanised with minimum dimensions of 50 mm × 50 mm complying with BS EN 50085. Plastic trunking must be of high impact, self-extinguishing unplasticised PVC (uPVC).

The minimum gauge of steel trunking must be 2 mm. Trunking must be fitted with cable-retaining clips.

For vertical runs, cables must be supported with pin racks.

Trunking must be fixed with round-headed fixing screws or bolts.

Trunking must be kept clear of gas, water and process pipes by a minimum distance of 150 mm.

Appropriate bushes, couplings and flanges must be used for connections to conduit and junction boxes.

Support steelwork and fixings

The Supplier must provide supports necessary for mounting cable trays and cable ladders. These must be of a pre-fabricated construction supplied by the tray or ladder manufacturer to avoid on-site fabrication.

In addition, the Supplier must provide supports for the bus duct, control push button stations, socket outlets, lighting fittings, small power distributions boards, etc. These must also be of proprietary manufacture.

Unless otherwise specified, supports must be made from hot dipped galvanised steel in accordance with MEICA - Specification - Painting and Protection Systems.

Bolts, nuts and washers, etc. must be stainless steel. Shake-proof spring washers must be installed at all bolted connections.

Structural steel or pre-cast concrete members must not be drilled unless specifically approved by the Environment Agency. Fixing must be by means of clamping brackets.

Under no circumstances must welding or fixing operations be carried out on any process plant equipment, vessels, pipelines or structures unless specifically indicated on contract drawings and agreed in advance with the Environment Agency.

Conduit installations

Conduit fittings must be manufactured from hot dipped galvanised steel or super high impact heavy gauge PVC, with a minimum diameter of 20 mm complying with BS EN 61386-1 and BS 4607 respectively.

Conduit must be sized to accommodate the total number of circuits involved without exceeding the conduit fill limitation specified in IEC 60364-5-52.

Conduit systems must be electrically and mechanically continuous throughout and rigidly secured before wiring is commenced.

An adequate number of pull-boxes must be installed to facilitate wiring without strain or damage to cable.

Conduit must not be installed in the ground or in sand-filled trenches.

All conduit branches must be taken off at right angles. Diagonal runs are not permitted.

Conduits fixed to structural steel work must be secured by girder clips.

All concealed conduits must be installed to have full thickness cover of plaster.

Conduits must be provided with draw in boxes at suitable interval.

The spacing for fixing saddles must be not more than 900 mm for PVC conduit and not more than 1500 mm for steel conduit. Saddles must be fixed on either side of joint, bends, etc.

At expansion joints of structure, either flexible conduits must be used or expansion couplers must be provided across the joints.

Conduit threads must be cleanly cut to a finished length which leaves the minimum exposed length of thread when installed. Threads must be checked for correct size using an appropriate gauge. The leading edge and bore must be made smooth. Exposed bare metal must be cleaned and protected against corrosion using materials compatible with the original protective coating.

Locknuts must be used at all entries and be fully tight.

Wiring in conduit must be looped from point to point and, where joints are unavoidable, they must be made in junction boxes. Junction boxes must be adequately sized and fitted with fixed connector blocks rated for the circuit requirement.

For steel conduit, the whole system must be electrically and mechanically continuous. A test for earth continuity must be carried out before it is concealed by plaster.

Conduit for installations in hazardous areas must be solid drawn screwed galvanised steel complying with BS EN 60079, and fitted with stopper boxes as required. In straight runs, special long couplers allowing each conduit to enter for at least 25 mm must be used.

Flexible conduit must only be used for equipment that are withdrawable, are subject to vibration or at building expansion joints. Flexible conduits must terminate in suitable adaptors and be connected to rigid conduit via a conduit box.

Cable transits

Cables passing through a firewall leading from a safe area into a hazardous area must be fitted with approved proprietary cable transits gland plates. All penetrations through partitions, ceilings and walls must be fire-stopped. Where the fire stopping has not been installed and certified by a third party specialising in fire stopping, the fire stop solution must be proposed to the Environment Agency before use.

Cable identification

Each cable must be fitted with durable identification bands:

- at each end;
- at all points where it enters or leaves ducts and buildings; and
- at each change in direction.

Cables must be identified at each gland termination by their allocated number as indicated on the cable schedules by non-corrodible identification tags.

Similar tags must be attached to cables at either side of a transit unit or cable duct and at specified intervals over the entire length of cable.

Tags must be fixed with PVC coated stainless steel ties.

Cable cores must be identified at each terminal with individual number/letter combinations using non-split cylindrical ferrules.

Identification for multi-core cables, other than power cables, must be made up of three parts:

- terminal number;
- core number;
- cable number.

Cable jointing and termination

Cable joints and terminations must be carried out in accordance with the cable manufacturer's recommendations, with particular regard to the jointing or termination materials and the procedure proposed.

Jointing and termination of power cables must be carried out by trained and competent tradespeople who have passed an approved course of instruction and trained on the operating voltage levels involved.

Jointing and termination of high voltage cables must be carried out and supervised by specialists, preferably from cable manufacturers.

Prior to insulation of jointed conductors and earth/ground continuity bonds, joints must be proved by resistance measurement to maintain the electrical ratings of the cable conductor, metal sheath (if applicable) and armouring.

Cable glands must comply with BS 6121 and BS EN 62444. They must be fitted with weatherproof shrouds of PVC or another plastic material suitable for the environment. Flameproof glands must be used on flameproof installations.

Spare cores of control and instrumentation cables must be terminated at both ends, in spare terminal ways or at earth/ground terminals.

Individual cores of cables up to and including 10 mm^2 must be terminated on screw clamp/pressure plate type equipment terminals.

Cable-core termination must be by either crimped palm lugs or sleeves to match either post terminals or bolted-clamp terminals. Aluminium cores of power cables must be terminated using approved bimetallic connectors. Cable lugs and sockets must be of the correct size for the conductor.

Raised insulated barriers must be inserted between groups of terminals intended for wiring at different voltages and between individual phases of a three-phase supply.

No more than two conductors must be connected to one terminal (that is, one incoming and one outgoing conductor).

Terminals in marshalling boxes must be arranged so that 10% spare positions are furnished to allow for future modifications or additions.

Terminations must be neatly arranged, leaving length for one re-termination.

An adequate length of core tail must be provided to allow for generous spreading and laying of cores to their appropriate terminals.

Removable rail-mounted clamp type terminals must be provided for all mains wiring up to 35 mm^2.

Terminal numbers, voltage grouping and terminal block layout must correspond precisely with wiring diagrams so that quick and accurate identification of wiring can be made. All terminals must show the circuit wire number reference.

All telemetry terminals must be located on a single separated common rail.

Cable records

The Supplier must prepare a cable drumming schedule in order to minimise cable wastage and then keep this up-to-date.

The Supplier must maintain an up-to-date record of cables installed by marking up a copy of the cable schedule to indicate where variations in length, size, number of conductors and destinations occur.

The Supplier must also institute a recording system to record actual lengths of cable removed from the drum, the drum reference and the purpose for which each length is used.

Lighting and small power installations

General

The design and installation of indoor and outdoor lighting must comply with BS EN 12464. Road lighting must comply with BS 5489.

All luminaires and accessories must have an appropriate ingress protection (IP) rating and corrosion resistance suitable for the operating environment.

Luminaires must be supplied complete with:

- suitable lamp ballasts;
- installation accessories such as clamps, brackets, suspension chains, pendants, etc.

In areas housing rotating machinery, lighting must be arranged on multiple-phase circuits to prevent stroboscopic effects.

Where adjacent luminaires are connected to different phases of the supply, labels must be fitted internally, warning of the presence of the phase-to-phase voltage.

After installation, luminaires must be readily accessible for inspection, cleaning, maintenance and replacement without need of scaffolding. Where this is not possible, the Supplier must obtain approval from the Environment Agency.

Following installation of the lighting systems, the Supplier must, under night-time conditions:

- take readings of illumination levels throughout the plant or platform with the normal lighting system energised;
- energise the emergency lighting system only to prove adequacy;
- adjust the orientation of floodlight fixtures for maximum efficient use.

Levels of illumination

Levels of illumination must be in accordance with the Chartered Institution of Building Services Engineers (CIBSE) *Code for lighting*.

In general and unless otherwise specified, the lighting design and installation must achieve the average maintained luminance as per the table below.

Type of location	Average maintained luminance
Control rooms, motor control centre (MCC) rooms and switchrooms	300 lux
General offices	300 lux
Pump house	200 lux
Internal plant areas	150 lux
Stores	100 lux
External plant areas	50 lux
Major roads and car parks	20 lux
Outdoor substations	30 lux
Walkways and platforms	50 lux

Indoor Lighting

General-purpose luminaires

Luminaires must be of the light emitting diode (LED), fluorescent, tungsten or gas-discharge type as specified, and must comply with BS EN 60598.

General-purpose fluorescent luminaires must be manufactured from zinc-coated sheet steel of minimum thickness 0.7 mm with white epoxy polyester powder or equivalent finish. Luminaires must be fitted with a trough reflector or prismatic diffuser as specified.

Fluorescent luminaires must be of the switch-start type unless otherwise specified and must be complete with power factor correction capacitors sized to give an overall circuit power factor of 0.9.

Luminaires for installation in clean and dry areas must have a minimum degree of protection IP20 (without a diffuser) and IP40 (with a diffuser) to BS EN 60529.

Luminaires for use in a corrosive environment must have a GRP body with a prismatic acrylic or polycarbonate diffuser. The degree of protection must be IP65 to BS EN 60529. Covers must be sealed to the body with a neoprene gasket and must be secured using stainless steel fixing catches. The catches must be hinged to the body.

Recess-mounted luminaires must be arranged for mounting independent of the suspended ceiling into which they are fitted.

Bulkhead luminaires must be of the heavy-duty type and must have a diecast corrosion-resistant aluminium body and front frame with epoxy polyester powder or equivalent finish, and prismatic cover.

Covers fitted to luminaires located outdoors must be impact-resistant polycarbonate. The cover must be sealed to the body with a silicon rubber gasket and must be secured using stainless steel captive screws. Retaining hinges must be stainless steel.

Bulkhead luminaires for indoor location must have a minimum degree of protection IP54 and for outdoor location IPW55 to BS EN 60529.

Indoor lighting must be controlled by individual wall switches and/or occupancy sensors in each room or area.

Lighting switches must, in general, be placed 1.2–1.8 m above the finished floor or grade.

Indoor lighting circuits must be separate from outdoor lighting circuits.

Luminaires for hazardous areas

Luminaires for location in Zone 1 and Zone 2 hazardous areas must comply with BS EN 60079. The apparatus group and temperature class must be as specified.

LED lamps

LED lamps must comply with IEC 62560 and IEC 62031.

Currently there are many developments in lighting using LEDs. Where commercially available, LED lamps must be the preferred choice of lamp. The Supplier must submit technical details with their tender for any LED light products for approval by the Environment Agency.

As a minimum, LED lamps must comply with the following.

- LEDs must have a correlated colour temperature of 4,000–4,500K range (warm white). The colour rendering index (CRI) of the light produced by the light-emitting diodes of the lamps must be above 75.
- The individual LEDs must have rated life of 30,000–50,000 hours.
- The replacement LED lamps must have compatible fittings so they can be direct retrofit to incandescent, fluorescent and halogen lamps.
- LED lighting products must not contain mercury gases.
- Where specified, dimmable LED lights must be compatible with local dimmers on the market. The dimming range must provide effective
- dimming without flickering from 40% to 100% light output.
- LEDs must have a power supply efficiency of not less than 85% and an LED efficiency of not less than 90 lumens per watt (lm/W).

Other lamps

Energy-saving fluorescent lamps used as a direct replacement for tungsten filament lamps must have integral control gear and a minimum rated average life of 8,000 hours.

Tungsten filament lamps must comply with BS EN 60064 and BS EN 60432, and have a minimum rated average life of 2,000 hours.

Tungsten lamps must have a reinforced internal construction to provide increased resistance to filament breakage caused by jolts and vibration. Lamps for special applications must be as specified.

Tungsten lamps rated up to and including 150 W must be fitted with a bayonet-type lamp cap.

For lamp wattage above 150 W, the lamp cap must be of the Edison screw type. Lamp caps must comply with BS EN 60061.

Tubular fluorescent lamps must be of T5 (krypton filled, 16 mm diameter) or T8 (26 mm diameter), and must incorporate tri-phosphor internal coatings.

Fluorescent lamps must comply with BS 1853-2 and have caps of the bi-pin type. Unless otherwise specified, lamps for installation in industrial areas must have a correlated colour temperature of 3500K (white appearance) and for other areas must have a correlated colour temperature of 3000K (warm appearance). The minimum rated average lamp life must be 3,000 hours.

Mercury discharge lamps must comply with IEC 60188.

Emergency lighting

Emergency lighting must comply with BS 5266 and be designed to provide illumination for safe exit from operating areas in the event of power failure.

Emergency lighting must be provided for:

- critical rooms;
- control rooms;
- large electrical substations;
- critical instruments;
- safety eye wash/showers;
- safety equipment locations;
- laboratories;
- clinics;
- other areas where lighting failure might create safety hazards or may disrupt operations.

Emergency lighting must either have self-contained battery powered lamps to provide transitional emergency lighting or be powered from a central emergency battery bank supply.

For self-contained battery powered luminaires, a local key-operated test switch must be installed adjacent to normal lighting switches. The front plate of the switch must be engraved ‘Emergency Lighting – Test Switch’. Key switches must be grid type with a secret key. Such luminaires must have a permanent neon indication light indicating battery charge ‘healthy’.

Emergency exit lights must be provided for all emergency exits.

Outdoor lighting

Roadway lighting

The installation must be designed to avoid light pollution beyond the site boundary and upward into surrounding area.

The control system incorporating photoelectric cells must be provided with a 24-hour time switch to allow the user to override the automatic control system and to pre-set any periods when no lighting is required.

Roadway lighting columns must be constructed and installed in accordance with appropriate parts of BS EN 40. The base compartment door/cover must be fitted with a tamper-proof fastening.

Columns must have bolted base mounting plates for installation on concrete foundation blocks, which must incorporate bottom-entry cable ducts. Columns must be complete with baseboard, fuse unit and wiring between the fuse unit and luminaires.

The fuse unit must have:

- a non-hygroscopic plastic case designed to prevent the ingress of moisture and condensation;
- integral double-entry cable termination chamber with detachable front cover;
- enclosed-type fuse complying with IEC 60269-1.

Flood lighting

Floodlighting must be general-purpose LED or metal halide fixtures.

Floodlighting luminaires must be complete with a high-purity anodised aluminium reflector and a galvanised steel mounting bracket. Reflector characteristics must

be selected to suit the floodlight application. The final position and angles of floodlights must be determined during construction.

Floodlights must be mounted on stirrups.

Cable for connections to floodlights must be of adequate length to permit floodlights to be adjusted to the full range of their mountings.

Control boxes must be mounted adjacent to the fittings in a position easily accessible for maintenance and repair.

Electrical outlets

Electrical outlets

Electrical outlets/switches must be installed in accordance with the following.

- Industrial socket outlets must be used for process areas, switch rooms, workshop and garages.
- Electrical outlets/switches located in wash down areas or in other wet areas must be equipped with IP65 weatherproof covers and boxes.
- Electrical outlets/switches must be centrally located to provide ease of use for maintenance and operations.
- A branch circuit supplying welding plug outlets must serve no other equipment. Electrical outlets must be arranged in groups of not more than four outlets per circuit. The number of outlets on a circuit will determine the minimum cable size to be used.
- Welding outlets must be located within 30 m of any structure or area in which welding is to be performed.
- Outlet and switch boxes located outdoors must be IP65 enclosures in accordance with BS EN 60529 made of a corrosion-resistant material such as fibreglass, copper-free aluminium, or stainless steel.
- In office and control room areas, socket outlets must be installed 0.5 m above floor level. In plant areas, socket outlets must be installed 1.2 m above floor level. For critical assets, socket location must be above the assessed exceedance level. The height of socket outlets must only be changed with the approval of the Environment Agency.
- Residual current circuit breakers fitted to socket outlets must comply with BS EN 61008. They must have a tripping sensitivity of 30 mA with an operating time not exceeding 30 milliseconds.

Earthing and bonding

Compliance with standards

All earthing and equipotential bonding must be installed and tested in accordance with BS 7671 and BS 7430.

Earthing system design

An effective and safe earthing system for all plant, equipment, extraneous metalwork and electrical services installations within the complete site installation shall be designed and provided.

The earthing system must be designed and installed in accordance with BS 7430 and BS 7671.

Earthing grid systems for main power plant and electrical substation installations, including limits for ground potential rise step and touch potentials, must comply with the requirements of IEEE 80 *Guide for safety in AC sub-station grounding*.

The Supplier is responsible for the design of the earthing system and for the design co-ordination of the earthing system with the earthing of the main incoming power supply system.

The Supplier must supply all required design and also test documentation to the distribution network operator (DNO) when the installation is complete. A copy of these documents must be sent to the Environment Agency.

The earthing systems for instrumentation and control systems must be as specified in ICA earthing.

Selection and installation of earthing components

Components

Earth electrodes

Earth electrodes must consist of earth rods or earth plates or tapes bonded together in a grid. Buried metallic pipes and building steel structures must not be considered as a sole means of earthing and must be bonded to earth grid.

- Earth rods must be able to be extended, being each 1.2 m long and 16 mm diameter made up of copper-clad, high tensile steel. The rods must have hardened steel tips and driving caps. The extensible rods

must be threaded for screwed joints and applied with corrosion inhibiting paste at the joint. The separation distance between two adjacent installed rods must not be less than 1.25 times the length of the rod.

- Earth plates must be manufactured from 600 mm × 600 mm × 3 mm thick material and buried vertically in ground. Plates must be installed such that the top edge of the plate is a minimum of 1 m below ground and the separation distance between adjacent plates is not less than 2.5 m.
- Where earth tapes are used as earth electrode, the tapes must be bare annealed copper of minimum 20 mm × 3 mm size. They must be installed as a minimum 1 m below ground.
- The earth electrodes must be installed in soil of low resistivity, below the frost line. If necessary approved soil conditioning agents must be used. All earth electrodes must be provided with labelled earth pits. The earth pits with removable lids must be flush with finished ground level.

Earthing conductor

The earthing conductor must be sized according to the anticipated fault current. The earth electrodes must be joined in a grid by a bare copper earthing conductor of appropriate size. The sizing calculation must take into account corrosion factor for high resistivity soils.

When buried underground, the minimum cross-sectional area of earthing conductor must be:

- 2.5 mm^2 copper equivalent when protected against mechanical damage and corrosion;
- 16 mm^2 when not protected against mechanical damage;
- 25 mm^2 when not protected against corrosion.

All joints below ground must be made by exothermic welding.

All above ground joints at earthing pits must be made by copper clamps and phosphor bronze bolts.

All earthing cable terminations must be by lugs.

All contact surfaces to be joined must be cleaned and be free from paint.

All exposed joints and connections must be covered with a protective coating such as petroleum wax, heat-shrink sheathing, etc.

Circuit protective conductor

All exposed conductive parts of electrical equipment liable to become live under fault conditions must be connected to an earthing system by a circuit protective conductor (CPC).

The CPC must be run to and be terminated at each point in the wiring and at each accessory, apart from suspended lamp holders having no exposed conductive part. Metallic trunking and conduits must be bonded but not used as the circuit protective conductor.

The protective conductor must be selected and sized in accordance with BS 7671. All calculations must be submitted to the Environment Agency for approval.

Equipotential bonding conductor

All metallic pipes of incoming services (water, gas, heating, etc.) and all structural steelwork must be bonded to the main earthing terminal at the point of entry of these services by the main equipotential bonding conductor.

- The main protective bonding conductor must be designed in accordance with BS 7671.

Main earth bar

All system earths must be connected to a copper main earth bar mounted on an insulating stud.

The earth bar must be 50 mm × 6 mm and a minimum of 600 mm long with 10 mm diameter holes drilled at intervals of 50 mm.

The earth bar must be identified with a permanently engraved legend and label ‘Safety Earth. Do Not Remove.’

ICA earthing

The ICA system must have single point earth to prevent creation of earth loops.

The ICA earth must be connected to the main earth at one point only. ICA cable shields must be earthed at one point only.

The ICA earth conductors must be insulated.

The equipment chassis, panel frames, instrument AC power supply and transformer laminations must be connected to the electrical power earth.

A separate ICA copper earth bar of 75 mm^2 cross-sectional area must be mounted on insulators.

The ICA earth bar must be connected to the main earth bar by 16 mm^2 insulated copper wire having a resistance less than 0.2 Ω.

The cable screen must remain insulated from earthed conducting surfaces throughout its length.

All equipment in field-mounted ICA enclosures must be connected to the nearest earth bar by insulated earth wire.

Diode shunt barrier devices in intrinsically safe circuits must be bolted directly to an intrinsically safe earth reference bar.

Lightning protection

General

Lightning protection must be installed and tested for all buildings and/or plant structures in accordance with BS EN 62305. All new structures must be assessed for the need for lightning protection as detailed in BS EN 62305-2 and, if required, must be provided with lightning protection.

System design

The system shall be designed in accordance with BS EN 62305. The system must be designed to appear as part of the structure.

Exposed roof conductors must be placed so as to require a minimum displacement for future repair and maintenance of roofing.

Buildings with brown roofs and handrails may utilise the handrail as an air termination network provided this is:

- assessed as being suitable;
- connected to down-conductors or the building structural steel columns.

Earthing system

The lightning protection system must have an independent earthing system that must be interconnected to the power system earth grid.

The connection between the down-conductor and earth electrode must be accessible and contained within an inspection box.

Each down-conductor must be connected to an earth electrode through a screw-type test clamp mounted at a height not exceeding 1800 mm above ground level.

The lightning protection earth grid resistance must not be more than 10 Ω when not bonded with other services.

Air terminals

Air terminals must have base supports designed for the surface on which they are used and must be securely anchored.

All exposed metal eave troughs, roof vents, guy wires, antennas and air handling equipment must be bonded to the lightning protection (LPS) system in such a way that if struck a clear path to ground through the LPS is provided. Dissimilar metal components must not be connected together except by means of an approved bimetal transition fitting.

Bonding

The LPS must be bonded to structure/building electrical ground grids wherever these are available.

Inspection, testing and commissioning

General

The electrical installation must be inspected and tested in accordance with BS 7671.

Labels and safety signs

Design and fixing

All equipment must be clearly identified by individual labels.

The labels mounted on outside of an enclosure must be manufactured from laminated plastics and engraved so as to produce black letters 3 mm in height on a white background.

Lettering, colour and layout of safety signs must comply with the relevant parts of BS 5499 and BS ISO 3864 and the Health and Safety (Safety Signs and Signals) Regulations 1996.

Labels and safety signs must be written in English and be unambiguous, durable and legible.

Labels and safety signs must be attached using corrosion-resistant mechanical fixings. They must not be attached to covers or removable items.

Related Documents

Regulations

- Health and Safety (Safety Signs and Signals) Regulations 1996
- Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 2016
- The Waste Electrical and Electronic Equipment Regulations 2006 (as amended)

Code of Practice

- Guide for safety in AC sub-station grounding, IEEE 80, Institute of Electrical and Electronics Engineers, 2000.
- Code for lighting, CIBSE, 2002.
- Recommendations for the connection of generating plant to the distribution systems of licensed distribution network operators, Engineering Recommendation ER G59/2-1, Energy Networks Association, 2011.
- Specification for underground armoured cable protected against solvent penetration and corrosive attack, Publication 133, 2nd edition, EEMUA, 2011.

BS series

- BS 67 Specification for ceiling roses
- BS 1362 Specification for general purpose fuse links for domestic and similar purposes (primarily for use in plugs)
- BS 1363 13A plugs, socket-outlets, adaptors and connection units
- BS 1853-2 Tubular fluorescent lamps for general lighting service. Specification for lamps used in the United Kingdom not included in BS EN 60081, BS EN 60901, BS EN 61195 and BS EN 61199
- BS 4607 Non-metallic conduits and fittings for electrical installations
- BS 4660 Thermoplastics ancillary fittings of nominal sizes 110 and 160 for below ground gravity drainage and sewerage
- BS 4662 Boxes for flush mounting of electrical accessories. Requirements, test methods and dimensions
- BS 4678 Cable trunking
- BS 5266 Emergency lighting

- BS 5489 Code of practice for the design of road lighting
- BS 5499 Graphical symbols and signs. Safety signs including fire safety signs
- BS 6004 Electric cables. PVC insulated and PVC sheathed cables for voltages up to and including 300/500V, for electric power and lighting
- BS 6121 Mechanical cable glands
- BS 6972 Specification for general requirements for luminaire supporting couplers for domestic, light industrial and commercial use
- BS 7430 Code of practice for protective earthing of electrical installations
- BS 7671 Requirements for electrical installations. IET Wiring Regulations

BS EN series

- BS EN 40 Lighting columns
- BS EN 12464 Lighting of work places
- BS EN 13598 Plastics piping systems for non-pressure underground drainage and sewage
- BS EN 13602 Copper and copper alloys. Drawn, round copper wire for the manufacture of electrical conductors
- BS EN 17037 Daylight in buildings
- BS EN 62444 Cable glands for electrical installations
- BS EN 50085-2-1 Cable trunking systems and cable ducting systems for electrical installations. Cable trunking systems and cable ducting
- BS EN 50288 Multi-element metallic cables used in analogue and digital communication and control. Sectional specification for instrumentation and control cables
- BS EN 60061 Lamp caps and holders together with gauges for control of interchangeability and safety
- BS EN 60064 Tungsten filament lamps for domestic and similar general lighting purposes. Performance requirements
- BS EN 60079 Code of practice for selection, installation of electrical apparatus in potentially explosive atmospheres
- BS EN 60309 Plugs, socket outlets and couplers for industrial purposes
- BS EN 60432 Incandescent lamps. Safety specification
- BS EN 61439-3 Low-voltage switchgear and controlgear assemblies. Particular requirements for low-voltage switchgear and controlgear assemblies intended to be installed in places where unskilled persons have access to their use. Distribution boards
- BS EN 60529 Specification for degrees of protection provided by enclosures (IP Code)
- BS EN 60598 Luminaires
- BS EN 60669 Switches for household and similar fixed electrical installations

- BS EN 60702-1 Mineral insulated cables and their terminations with a rated voltage not exceeding 750V. Cables
- BS EN 60793 Optical Fibres
- BS EN 60874-1 Fibre optic interconnecting devices and passive components. Connectors for optical fibres and cables. Generic specification
- BS EN 60947-1 Low-voltage switchgear and controlgear. General rules
- BS EN 61008 Residual current operated circuit-breakers without integral overcurrent protection for households and similar uses
- BS EN 61558-2-5 Safety of transformers, reactors, power supply units and combinations thereof. Particular requirements and tests for transformer for shavers, power supply units for shavers and shaver supply units
- BS EN 61386-1 Conduit systems for cable management. General requirements
- BS EN 62305 Protection against lightning
- BS EN 62444 Cable glands for electrical installations

BS EN ISO Series

- BS ISO 3864 Graphical symbols. Safety colours and safety signs

IEC standards

- IEC 60055 Paper insulated metal sheathed cables for rated voltages up to 18/30kV
- IEC 60188 High-pressure mercury vapour lamps. Performance specifications
- IEC 60227 PVC insulated cables for voltages up to and including 450/750V
- IEC 60269 Low voltage fuses
- IEC 60287 Electric cables. Calculation of the current rating
- IEC 60309-2. Plugs, socket-outlets and couplers for industrial purposes.
- IEC 60364 Low voltage electrical installations
- IEC 60502 Power cables with extruded insulation and their accessories for rated voltages from 1kV up to 30kV
- IEC 60529 Degree of protection provided by enclosures (IP code)
- IEC 60793 Optical Fibres
- IEC 60947 Low-voltage switchgear and controlgear
- IEC 62031 LED modules for general lighting. Safety specifications
- IEC 62560 Self-ballasted LED-lamps for general lighting services by voltage >50V. Safety specification

Guidance note

- IET Guidance Note 1: Selection and Erection
- IET Guidance Note 3: Inspection and Testing
- IET Guidance Note 4: Protection Against Fire
- IET Guidance Note 5: Protection Against Electric Shock
- IET Guidance Note 7: Special Locations
- IET Guidance Note 8: Earthing and Bonding

Standard specifications

All MEICA specifications are listed in:

- MEICA - Specification - General