General Specification for Electrical Installation

in Government Buildings of the Hong Kong Special Administrative Region

2017 Edition (Incorporating Corrigendum No. GSEE02-2017)

The General Specification for Electrical Installation in Government Buildings of the Hong Kong Special Administrative Region 2017 Edition (hereinafter referred to as "General Specification for Electrical Installation 2017 edition") is reviewed from time to time to ensure that requirements stipulated in the document are clear, concise and in pace with technological advancements.

Corrigendum No. GSEE02-2017 is issued to incorporate updates and revisions to the General Specification for Electrical Installation 2017 edition (incorporating Corrigendum No. GSEE01-2017) which are highlighted in the ensuing summary of major changes.

Electronic version of the General Specification for Electrical Installation 2017 edition incorporating Corrigendum No. GSEE02-2017 can be viewed on the ArchSD Internet website.

After an introductory period of 3 months, the General Specification for Electrical Installation 2017 edition (incorporating Corrigendum No. GSEE02-2017) shall apply to all tenders to be invited on or after 1 April 2020.

(12/2019)

MAJOR CHANGES IN THE CORRIGENDUM (NO. GSEE02-2017) OF THE

GENERAL SPECIFICATION FOR ELECTRICAL INSTALLATION

IN GOVERNMENT BUILDINGS OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION

2017 EDITION

Old Ref. No.	New Ref. No.	Major Changes
TABLE OF CONTENTS		
B1.3	B1.3	To change "Guard and Railing for Moving or Rotating Parts of Equipment" as "Guard and Railing for Dangerous Parts of Equipment".
PART B – INSTALLATION METHODOLOGY		
SECTION B1 – GENERAL		
B1.3	B1.3	To change **"GUARD AND RAILING FOR MOVING OR ROTATING PARTS OF EQUIPMENT"** as **"GUARD AND RAILING FOR DANGEROUS PARTS OF EQUIPMENT"** To change 1st paragraph "All moving or rotating parts of equipment shall be provided…, together with any amendments made thereto" as "All dangerous parts of equipment shall be effectively guarded…, and with any amendments made thereto". To change 2nd paragraph "…Railings shall be made of 32 mm diameter galvanised mild steel pipe and railing fittings." as "Railings shall be made of galvanised mild steel pipes not less than 32 mm and not greater than 50 mm in external diameter and railing fittings.".
B2.2.1	B2.2.1	To change 3rd paragraph "…Cables for 3 phase circuit shall be 450/750 V grade or above." as "… Cables for 3-phase circuit shall be 450/750 V grade or above.".

Old Ref. No.	New Ref. No.	Major Changes
B2.4.2	B2.4.2	To change 1st paragraph "Cables shall have CSA not less than 1.0 mm2 for 6 A circuits, 1.5 mm2 for 10 A circuits and 2.5 mm2 for 16 A circuits." as "Cables shall have CSA not less than 1.5 mm2 for 10 A or below circuits and 2.5 mm2 for 16 A circuits."
SECTION B3 - INSTALLATION OF POWER CABLES, CABLE TRAYS AND CABLE LADDERS		
B3.3	B3.3	To change "When power cables are laid in an enclosed trench, the cables shall be installed in accordance with the installation methods 18, 19 and 20 of Appendix 7 of the Code of Practice for the Electricity (Wiring) Regulations. Correction factors shall be applied to the current ratings as indicated in Table A5(6) of the Code of Practice for the Electricity (Wiring) Regulations, where applicable." as "When power cables are laid in an enclosed trench, the cables shall be installed in accordance with the installation methods 118, 119 and 120 of Appendix 7 of the Code of Practice for the Electricity (Wiring) Regulations. Correction factors shall be applied to the current-carrying capacities as indicated in Table A5(6) of the Code of Practice for the Electricity (Wiring) Regulations, where applicable."
B3.7.1	B3.7.1	To change 4th paragraph "Every compression joint shall be of a type which has been the subject of a test certificate as described in IEC 61238-1:2003…" as "Every compression joint shall be of a type which has been the subject of a test certificate as described in IEC 61238-1-1:2018, IEC 61238-1-2:2018, IEC 61238-1-3:2018…".
B3.8.5	B3.8.5	To change the 1st paragraph "Cable terminations shall generally comply with IEC 60702-2:2015/Amd 1:2015." as "Cable terminations shall generally comply with IEC 60702-2:2002/Amd 1:2015. ". To change the 4th paragraph "Where a mineral insulated cable is terminated…., and of an appropriate size in accordance with IEC 60702-2:2015/Amd 1:2015." as "Where a mineral insulated cable is terminated…., and of an appropriate size in accordance with IEC 60702-2:2002/Amd 1:2015.".

Old Ref. No.	New Ref. No.	Major Changes
SECTION B4 - INSTALLATION OF GENERAL LIGHTING AND POWER		
B4.4.3	B4.4.3	To change "The installation of socket outlets …shall comply with IEC 60079-0:2011 and other associated parts of the standard …" as "The installation of socket outlets…shall comply with IEC 60079-0:2017 and other associated parts of the standard …" .
SECTION B5 - INSTALLATION OF DOMESTIC APPLIANCES		
B5.1.1	B5.1.1	To change 3rd paragraph "…Fuse-links shall comply with IEC 60127-1:2015 and the other associated Parts…" as "Fuse-links shall comply with IEC 60127-1:2006/Amd 1:2011/Amd 2:2015 and the other associated Parts…". To change 4th paragraph "Flexible cables for final connection to domestic appliances shall be white in colour unless otherwise specified, and shall be circular, sheathed, twin core with circuit protective conductor (CPC) to IEC 60189-1:2007 and the associated parts of the standard; and IEC 60227-1:2007 and the associated parts of the standard (PVC-insulated) or to IEC 60245-1:2008…" as "Flexible cables for final connection to domestic appliances shall be white in colour unless otherwise specified, and shall be circular, sheathed, twin core with circuit protective conductor (CPC) to IEC 60189-1:2018 and the associated parts of the standard; and IEC 60227-1:2007 and the associated parts of the standard (PVC-insulated) or to IEC 60245-1:2003/Amd 1:2007… ".
B5.4.1	B5.4.1	To read "Exhaust fans shall each be installed on the structural opening by means of a steel mounting plate…" as "Exhaust fans, where appropriate, shall each be installed on the structural opening by means of a steel mounting plate…".
B5.6.2	B5.6.2	To change paragraph 1 "…Three phase water heater shall either be controlled by a 4-pole switch of adequate rating and with pilot light or by …" as "…Three-phase water heater shall either be controlled by…"..

Old Ref. No.	New Ref. No.	Major Changes
SECTION B7 - INSTALLATION OF EARTHING SYSTEM		
B7.10.1	B7.10.1	To change 2nd paragraph "When a separate cable is used as a CPC, the cable shall be insulated to IEC 60227-1:2007 and the associated parts of the standard, IEC 60189-1:2007 and the associated parts of the standard (BS 6004:2012, Table 1a) or better unless its CSA is greater than 6 mm2." as ". When a separate cable is used as a CPC, the cable shall be insulated to IEC 60227-1:2007 and the associated parts of the standard, IEC 60189-1:2018 and the associated parts of the standard (BS 6004:2012, Table 1a) or better unless its CSA is greater than 6 mm2.".
B7.12.1	B7.12.1	To change 1st paragraph "…and an operating time not exceeding 40 ms at a residual current of 150 mA as governed by IEC 61008-1:2013/Amd 2 Corr 1:2014 and the associated parts of the standard / IEC TR60755:2008." as "and an operating time not exceeding 40 ms at a residual current of 150 mA as governed by IEC 61008-1:2010/Amd 2:2013 Corr 1:2014 and Amd 1:2012 Corr 1:2016 and IEC TR60755: 2017.
SECTION B8 - MISCELLANEOUS INSTALLATIONS		
B8.2.5	B8.2.5	To change "Bell transformers shall be air-cooled and double wound complying with EN 60742:1995. …" as "Bell transformers shall be air-cooled and double wound complying with BS EN 61558-2-8:2010….".
B8.3.1 (a)	B8.3.1 (a)	To change "Electrical equipment and wiring of electrical installations exposed to potentially explosive atmospheres shall be constructed and protected to the requirements specified for hazardous areas in IEC 60079-0:2011 and the associated parts of the standard and equivalent such as BS EN 50014 to 50039 and relevant …" as "Electrical equipment and wiring of electrical installations exposed to potentially explosive atmospheres shall be constructed and protected to the requirements specified for hazardous areas in IEC 60079-0:2017 and relevant…".

Old Ref. No.	New Ref. No.	Major Changes
B8.3.1 (c)	B8.3.1 (c)	To change "…for hazardous areas in the Electricity Safety Code Part 1 and 15 of the Institute of Petroleum Model Code of Safe Practice in the Petroleum Industry or Marketing Safety Code of the Institute of Petroleum or equivalent such as BS EN 50014 to 50039 and relevant FM (Factory Mutual) or UL (Underwriters Laboratory) standards under ANSI or equivalent standard acceptable by relevant authorities." as "… for hazardous areas in the Electricity Safety Code Part 1 and 15 of the Institute of Petroleum Model Code of Safe Practice in the Petroleum Industry or Marketing Safety Code of the Institute of Petroleum or equivalent such as IEC 60079:2018 SER series and relevant FM (Factory Mutual) or UL (Underwriters Laboratory) standards under ANSI or equivalent standard acceptable by relevant authorities."
B8.3.2 (c)	B8.3.2 (c)	To change "… type of gaseous prevalent environment shall conform with IEC 60079-20-1:2010/Corr 1:2012 and the associated Parts of the Standard." as "… type of gaseous prevalent environment shall conform with ISO/IEC 80079-20-1:2017/Corr 1:2018 and the associated Parts of the Standard."
B8.3.4	B8.3.4	To change "... Group IIA and Group IIB inflammable gases and vapours as specified in IEC 60079-20-1:2010/Corr 1:2012 with temperature classification of T6 (85 C)⋯." as "⋯Group IIA and Group IIB inflammable gases and vapours as specified in ISO/IEC 80079-20-1:2017/Corr 1:2018 with temperature classification of T6 (85°C)…".
B8.3.6	B8.3.6	To change "Unless otherwise specified, luminaires shall comply with IEC 60079-0:2007 and the associated parts of the standard and shall be suitable for use in Zone 1 where gases exist is of Group IIA or Group IIB classification as specified in IEC 60079-20-1:2010/Corr 1:2012 with temperature classification of T6 (85oC)…." as "Unless otherwise specified, luminaires shall comply with IEC 60079-0:2017 and shall be suitable for use in Zone 1 where gases exist is of Group IIA or Group IIB classification as specified in ISO/IEC 80079-20-1:2017/Corr 1:2018 with temperature classification of T6 (85oC)...."

Old Ref. No.	New Ref. No.	Major Changes
B8.3.8	B8.3.8	To change 1st paragraph "…in accordance with the method of BS 476-4:2014 to the full thickness of the floor, wall or partition. Alternatively…" as "in accordance with the method of BS 476-4:1970 Corr 1:2014 to the full thickness of the floor, wall or partition. Alternatively…".
B8.4.8	B8.4.8	To change 2nd paragraph as "…the control-gear shall be of 600/1,000 V grade to IEC 60502-1:2004 and the associated parts …" as "the control-gear shall be of 600/1,000 V grade to IEC 60502-1:2004/Amd 1:2009 and the associated parts…".
SECTION B9 - INSTALLATION OF ELECTRIC MOTORS AND HIGH VOLTGE EQUIPMENT		
B9.5.1 (d)	B9.5.1 (d)	To change "Before steelworks is painted, it shall be treated and degreased by an approved method such as grit blasting to ISO 8502:2006 or chemical pickling…" as "Before steelworks is painted, it shall be treated and degreased by an approved method such as grit blasting or chemical pickling…".
PART C – MATERIAL AND EQUIPMENT SPECIFICATION		
SECTION C1 - GENERAL		
C1.3	C1.3	To change 1st paragraph "Insulating tapes for low voltage applications shall comply with IEC 60454 3 1:2002 pressure sensitive adhesive tape…" as "Insulating tapes for low voltage applications shall comply with IEC 60454-3-1:1998/Amd 1:2001 pressure sensitive adhesive tape type…".
C1.7	C1.7	To change 2nd paragraph "Protection against corrosion shall be achieved by means of hot-dip galvanisation, anti-rust painting or enamel, or the use of stainless steel. If stainless steel sheet is specified, it shall be to ISO 683-13:1986, Table 3 "Type of Condition and Surface Condition of Stainless Steel Products" Symbol F9 for matt finish and Symbol F8 for polished finish." as "Protection against corrosion shall be achieved by means of hot-dip galvanisation, anti-rust painting or enamel, or the use of stainless steel to ANSI 304.".

Old Ref. No.	New Ref. No.	Major Changes
C2.1.6(ii)	C2.1.6(ii)	To change " (ii) Flame propagation : BS EN 60332-1-2:2004/Amd 1:2015 or BS EN 60332-3-24:2009" as "(ii) Flame propagation :BS EN 60332-1-2:2004/Amd 11:2016 or BS EN IEC 60332-3-24:2018"
C2.2.3	C2.2.3	To change 2nd paragraph "…Boxes of the preferred sizes as given in IEC 60670 1:2003 and other associated Parts of the Standard shall be used." as "…Boxes of the preferred sizes as given in IEC 60670 1: 2015 and other associated Parts of the Standard shall be used.".
C2.2.5	C2.2.5	To change 1st paragraph "…shall be tested to comply with IEC 61386-1:2008." as "…shall be tested to comply with IEC 61386-1:2008/Amd 1:2017.". To change 2nd paragraph "…both inside and outside in accordance with IEC 60670-1:2015 (e.g. hot-dip galvanised coating or sheradizing)." as " …both inside and outside against corrosion and shall be tested to comply with IEC 61386-1:2008/Amd 1:2017.".
C2.2.6	C2.2.6	To change "…they shall be protected against corrosion by a finish at least equal to the zinc coating specified in BS 3382-2:1961. Electro-brass plated …" as "…they shall be protected against corrosion by a finish at least equal to the zinc coating specified in BS 7371-12:2008. Electro-brass plated…".
C2.3.1	C2.3.1	To change "Rigid plain PVC conduits shall comply with IEC 61386-21:2002 and rigid plain PVC conduit fittings shall comply with IEC 61386-1:2008 and other associated Parts of the Standard. Conduits …" as "Rigid plain PVC conduits shall comply with IEC 61386-21:2002 and rigid plain PVC conduit fittings shall comply with IEC 61386-1:2008/AMD1:2017 and other associated Parts of the Standard. Conduits…"

Old Ref. No.	New Ref. No.	Major Changes
C2.3.2	C2.3.2	To change “Pliable conduits shall be formed of self-extinguishing plastic materials and shall comply with IEC 61386-22:2002 and pliable conduit fittings shall comply with IEC 61386-1:2008 and other associated Parts…” as “Pliable conduits shall be formed of self-extinguishing plastic materials and shall comply with IEC 61386-22:2002 and pliable conduit fittings shall comply with IEC 61386-1:2008/AMD 1:2017 and other associated Parts…”.
C2.3.4	C2.3.4	To change “Plain, moulded slip-type couplers and expansion type couplers to IEC 61386-1:2008 shall be used…” as “Plain, moulded slip-type couplers and expansion type couplers to IEC 61386-1:2008/AMD1:2017 shall be used…”.
C2.4.1	C2.4.1	To change 1st paragraph “Steel surface and raised floor trunking systems shall be compatible to the requirements laid down in IEC 61084-1:1993. The body…” as “Steel surface and raised floor trunking systems shall be compatible to the requirements laid down in IEC 61084-1:2017. The body…”. To change 2nd paragraph “Steel flush floor and underfloor trunking shall be compatible to the requirements laid down in IEC 61084-1:2007/Amd 1:1993 and IEC 61084 2 2:2007. The body …” as “Steel flush floor and underfloor trunking shall be compatible to the requirements laid down in IEC 61084-1:2017 and IEC 61084-2-2:2017. The body…”.
C2.4.2	C2.4.2	To change “Steel trunking and associated fittings, except service outlet panel of modular service outlet box, shall have class 3 protection against corrosion in accordance with BS 4678-4:1971, i.e. hot-dip zinc coating…” as “Steel trunking and associated fittings, except service outlet panel of modular service outlet box, shall have class 3 protection against corrosion in accordance with BS 4678-4:1982, i.e. hot-dip zinc coating…”.
C2.4.3	C2.4.3	To change 2nd paragraph “…The trunking systems shall be constructed with a degree of protection against water at least IPX4 according to IEC 60529:2013/Corr 2:2015.” as “…The trunking systems shall be constructed with a degree of protection against water at least IPX4 according to IEC 60529:1989/Amd1:1999/Amd2:2013 Corr 1: 2013 and Corr2:2015.”.

Old Ref. No.	New Ref. No.	Major Changes
C2.4.7	C2.4.7	To change "…Steel screws shall be protected against corrosion by a finish at least equal to the zinc coating specified in BS 3382-2:1961. Electro-brass plated …" as "…Steel screws shall be protected against corrosion by a finish at least equal to the zinc coating specified in BS 7371-12:2008. Electro-brass plated…".
C2.5	C2.5	To change 1st paragraph "PVC trunking and fittings shall comply with IEC 61084-1:2007/Amd 1:1993. The…" as "PVC trunking and fittings shall comply with IEC 61084-1: 2017. The…".
SECTION C3 - POWER CABLES AND ASSOCIATED CABLING FACILITIES		
C3.12.1	C3.12.1	To change 2nd paragraph "…cable ladder fittings and accessories shall be manufactured from stainless steel 316S31 to ISO 683 13:1986." as "…cable ladder fittings and accessories shall be manufactured from ANSI 316 stainless steel.".
SECTION C9 – LIGHT EMITTING DIODE LUMINAIRE & DRIVER		
C9.2.1	C9.2.1	To change the last quoted standard "IEC 62384:20011" as "IEC 62384:2006/Amd1:2009".
SECTION C10 - DOMESTIC APPLIANCES		
C10.2.1 (b)(ii)	C10.2.1 (b)(ii)	To change "IEC 60335-2-80:2014 Household and similar electrical appliances – Part 2-80 : Particular requirements for fans." as "IEC 60335-2-80:2015 Household and similar electrical appliances – Part 2-80 : Particular requirements for fans."
C10.15.1(f)(i)	C10.15.1(f)(i)	To change 2nd paragraph "BS EN 12897:2006 Specification for unvented hot water storage units and packages;" as "BS EN 12897:2016 Specification for unvented hot water storage units and packages;".
C10.24.1(a)	C10.24.1(a)	To change "The hand/face dryer shall comply with IEC 60335-2-23:2012." as "The hand/face dryer shall comply with IEC 60335-2-23:2016.".

Old Ref. No.	New Ref. No.	Major Changes
C10.31.3 (f)	C10.31.3 (f)	To change “Room cooler shall have obtained a Grade 1 Energy Label under the Energy Efficiency Labelling Scheme of Electrical and Mechanical Services Department.” as “Room cooler shall be operated with inverter and have obtained a Grade 1 Energy Label under the Energy Efficiency Labelling Scheme of Electrical and Mechanical Services Department.
C10.33.1(d)	C10.33.1(d)	To change “The LED table lamp shall be manufactured in a process conforming to the relevant quality assurance standard ISO 9000:2005.” as “The LED table lamp shall be manufactured in a process conforming to the relevant quality assurance standard ISO 9001:2015.”.
C10.33.4(e)(iii)	C10.33.4(e)(iii)	To change the last quoted standard “IEC 62384:2011” as “IEC 62384:2006/Amd1:2009”.
Section C13 - HIGH VOLTAGE SWITCHGEAR AND EQUIPMENT		
C13.3.1(f)	C13.3.1(f)	To change “IEC 60947-5-1:2009 - Control Switches” as “IEC 60947-5-1:2016 - Control Switches”.

ARCHITECTURAL SERVICES DEPARTMENT

BUILDING SERVICES BRANCH

GENERAL SPECIFICATION FOR ELECTRICAL INSTALLATION IN GOVERNMENT BUILDINGS OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION 2017 EDITION

Corrigendum No. GSEE02-2017

(Effective from 1 April 2020)

The following clauses are amended in the above edition of General Specification for Electrical Installation.

Clauses

TABLE OF CONTENTS

PART B – INSTALLATION METHODOLOGY

SECTION B1

GENERAL

B1.3 GUARD AND RAILING FOR DANGEROUS PARTS OF EQUIPMENT

All dangerous parts of equipment shall be provided with an approved guard and railing complying with the Factories and Industrial Undertakings (Guarding and Operation of Machinery) Regulations, together with any amendments made thereto.

Guards shall be of rigid and substantial construction and shall consist of heavy mild steel angle frames, hinged and latched with either heavy galvanised mild steel wire crimped mesh securely fastened to frames or galvanised sheet metal of

1.2 mm minimum thickness. All apertures shall be such that finger access to dangerous part is not possible. All sections shall be bolted or riveted. Railings shall be made of galvanised mild steel pipes not less than 32 mm and not greater than 50 mm in external diameter and railing fittings.

SECTION B2

INSTALLATION OF WIRING SYSTEMS

B2.2 WIRING IN STEEL TRUNKING SYSTEM

B2.2.1 General

Where steel trunking is specified, they shall be installed neatly on the surface of the walls, columns, beams or flushed with floor screeding and shall be installed along a vertical or a horizontal plane.

The complete trunking installation shall be mechanically and electrically continuous throughout, and effectively earthed.

Wiring system in trunking installation shall consist of non-sheathed copper cables or sheathed copper cables. Cables for 3-phase circuit shall be 450/750 V grade or above.

Cables in each final circuit and/or in each sub-main shall be bunched and tied or clipped together.

Particular precaution should be taken in situations where high temperature cables may be touched or where they may touch other materials.

Where cable trunking is required to be installed on floor to meet the site constraints and special environmental conditions, such as inside lift machine room, plant room, etc., this may be permissable subject to safety consideration, workmanship and approval by the Supervising Officer.

B2.4 SURFACE WIRING SYSTEM

B2.4.2 Minimum Size of Live Conductors and CPC

Cables shall have CSA not less than 1.5 mm2 for 10 A or below circuits and 2.5 mm^2 for 16 A circuits.

Flexible cables and flexible cords shall have CSA not less than 0.75 mm^2.

The minimum CSA of a CPC shall be 1.5 mm^2 if the CPC is integrated in a cable carrying the associated live conductors. The minimum CSA of a separate CPC shall be 2.5 mm^2 if protection against mechanical

damage is provided (e.g. sheathed cable), and 4 mm^2 if mechanical protection is not provided (e.g. non-sheathed cable).

CPC shall be properly sized in accordance with Section B7.

SECTION B3

INSTALLATION OF POWER CABLES, CABLE TRAYS AND CABLE LADDERS

B3.3 CABLE LAID IN ENCLOSED TRENCH

When power cables are laid in an enclosed trench, the cables shall be installed in accordance with the installation methods 118, 119 and 120 of Appendix 7of the Code of Practice for the Electricity (Wiring) Regulations. Correction factors shall be applied to the current-carrying capacities as indicated in Table A5(6) of the Code of Practice for the Electricity (Wiring) Regulations, where applicable.

B3.7 CABLE JOINT AND CABLE TERMINATION

B3.7.1 General

Unless otherwise specified in the Particular Specification and approved by the Supervising Officer, cable joint for power cable shall not be used for new electrical installation.

Joints and terminations of all power cables shall be made by skilled cable jointers who shall be approved by the Supervising Officer before work commences.

No reduction in the number of strands of a cable core shall be allowed at a cable joint or termination.

Ferrules, compression connectors and bare portions of cable core resulting from a jointing or terminating process shall be insulated with an approved type of insulating tape, heat shrinkable tubing or approved means of insulating material after completion of process. Such insulating material shall have equal or better electrical and mechanical properities as those of the original insulation removed, and shall be adhered to the cores, securely and permanently. The final thickness shall be in a smooth contour throughout the whole length.

Every compression joint shall be of a type which has been the subject of a test certificate as described in IEC 61238-1-1:2018, IEC 61238-1-2:2018, IEC 61238-1-3:2018 and other associated parts of the standards. When a compression joint is made, the appropriate tools specified by the manufacturer of the joint connectors shall be used.

B3.8 SPECIAL REQUIREMENTS FOR MINERAL INSULATED CABLES

B3.8.5 Cable Termination

Cable terminations shall generally comply with IEC 60702-2:2002/Amd 1:2015.

The cable to be terminated shall be cut, screwed, sealed with cold compound and fitted with brass terminating glands, nuts, compression ring, gland body, sealing pot, disc and sleeves. The conductors shall be carried unbroken through the sealing pot to the terminal sockets or clamping screws.

Sealing shall be properly carried out to protect the cable ends from moisture and the insulation shall be thoroughly dry before the sealant is applied. The sealing material and material used to insulate the conductors when they emerge from the insulation shall have adequate insulating and moisture-proofing properties which shall be retained throughout the range of temperature they may be subjected to in service.

Where a mineral insulated cable is terminated at an insulating casing or enamelled/painted metal casing, the sealing pot shall be provided with a copper circuit protective conductor, complying with the requirements of IEC 60228:2004, and of an appropriate size in accordance with IEC 60702-2:2002/Amd 1:2015.

Where more than one cable terminates at a galvanised or zinc coated enclosure, the gland plate shall be of brass or insulating materials.

PVC shrouded terminating glands shall be used when the cables are fitted with PVC outer covering.

Only tools recommended by the manufacturer of the cables shall be used and the manufacturer's recommended methods of cable termination shall be adopted in all cases.

SECTION B4

INSTALLATION OF GENERAL LIGHTING AND POWER

B4.4 INSTALLATION OF SOCKET OUTLETS

B4.4.3 Socket Outlet at Hazardous Area

The installation of socket outlets in hazardous areas should be avoided as far as possible. Where it is absolutely essential to install a socket outlet in such area, the socket outlet shall comply with IEC 60079-0:2017 and other associated parts of the standard and shall be controlled by a sparkless switch. The socket outlet shall be interlocked with the plug so that removal or insertion shall not be possible unless the controlling switch is in the OFF position. The plug shall have shrouded pins and the design of the pin contacts shall be such as to guard against development of hot spots or sparking. Requirements for wiring installation in hazardous areas are specified in Clause B8.3.

SECTION B5

INSTALLATION OF DOMESTIC APPLIANCES

B5.1 GENERAL

B5.1.1 Connection to Appliances

Domestic appliances shall each be connected to the electrical supply through a suitable wiring accessory and a suitable length (preferably 1.5 m to 2 m) of flexible cable or PVC insulated cables enclosed in a flexible conduit.

For portable appliance, plug and socket shall be used. For fixed appliances, the wiring accessories shall be opened or removed only by means of a tool.

Wiring accessories shall meet the requirements of Section C4 and shall be installed as near as practicable to the appliances to be connected. Fuse-links shall comply with IEC 60127-1:2006/Amd 1:2011/Amd 2:2015 and the other associated Parts of the Standard and shall have current ratings suitable for the appliances to be controlled.

Flexible cables for final connection to domestic appliances shall be white in colour unless otherwise specified, and shall be circular, sheathed, twin core with circuit protective conductor (CPC) to IEC 60189-1:2018 and the associated parts of the standard; and IEC 60227-1:2007 and the associated parts of the standard (PVC-insulated) or to IEC 60245-1:2003/Amd 1:2007 and the associated parts of the standard (rubber-insulated), all with copper conductors. Twin core cables without earth wire are only allowed for double insulated appliances classified as Class II appliances under IEC 61140:2016. The cores of the flexible cables shall have identification colours in accordance with Section Table C3.7 in Section C3.

B5.4 EXHAUST FAN

B5.4.1 Fixing of Fan

Exhaust fans, where appropriate, shall each be installed on the structural opening by means of a steel mounting plate. Where an exhaust fan is intended to draw exhausted air through a fume cupboard, the fan shall be ducted to the fume cupboard by means of a pipe made of low smoke emission and halogen free PVC of suitable size and length.

B5.6 WATER HEATER AND WATER BOILER

B5.6.2 Other Type of Water Heater

Supply to a domestic thermal storage or instantaneous water heater shall be connected to an individual final circuit. Single phase water heater shall be controlled by a double-pole switch of adequate rating and with pilot light. Three-phase water heater shall either be controlled by a 4-pole switch of adequate rating and with pilot light or by a 20 A double-pole switch with pilot light through a 4-pole contactor of adequate rating.

In a concealed or surface conduit installation, the PVC insulated cables shall be enclosed in a conduit from the control switch to a standard circular conduit box fitted with a dome cover and then through a flexible conduit from the dome cover to the water heater. The dome cover and the conduit shall be fixed as near to the water heater as practicable.

In a surface wiring installation, the control switch shall be mounted on a moulded box or plastic pattress. Final connection to the water heater shall be taken from the control switch via a flexible cable, twin with CPC. The control switch shall be fixed as near to the water heater as practicable.

SECTION B7

INSTALLATION OF EARTHING SYSTEM

B7.10 SIZING OF PROTECTIVE CONDUCTOR

B7.10.1 General

The cross sectional area of a protective conductor, other than an equipotential bonding conductor, shall be determined by the Code of Practice for the Electricty (Wiring) Regulations Clause 11C , Table 11(1) to 11(7).

Where a protective conductor does not form part of a cable and is not formed by or not contained in steel conduit, trunking, ducting or other metallic enclosure of a wiring system, the cross sectional area shall not be less than 2.5 mm^2 copper or equivalent if protection against mechanical protection is provided (e.g. sheathed cable), and 4 mm^2 copper or equivalent if mechanical protection is not provided (e.g. non-sheathed cable). When a separate cable is used as a CPC, the cable shall be insulated to IEC 60189-1:2018 and the associated parts of the standard, IEC 60189-1:2007 and the associated parts of the standard (BS 6004:2012, Table 1a) or better unless its CSA is greater than 6 mm^2.

B7.12 USE OF RESIDUAL CURRENT-OPERATED CIRCUIT BREAKER

B7.12.1 General

Every socket outlet circuit shall be protected by a residual current device. The residual current device shall have a rated residual operating current not exceeding 30 mA and an operating time not exceeding 40 ms at a residual current of 150 mA as governed by IEC 61008-1:2010/Amd 2:2013 Corr 1:2014 and Amd 1:2012 Corr 1:2016 and the associated parts of the standard / IEC TR60755: 2017.

Residual current-operated circuit breaker (RCCB) shall be installed for any final circuit where the earth fault loop impedance is too high to allow sufficient earth fault current to operate the overcurrent protective device within the specified automatic disconnection time of 0.2 second, 0.4 second or 5 seconds in accordance with Code 11B(b) of the Code of Practice for the Electricity (Wiring) Regulations. In such case, the product of the rated residual operating current in amperes of the residual current-operated circuit breaker and the earth fault loop impedance of the circuit shall not exceed 50 V.

Residual current-operated circuit breaker shall meet the requirements specified in Clause C5.7.

SECTION B8

MISCELLANEOUS INSTALLATIONS

B8.2 BELL AND AUDIBLE WARNING SYSTEM

B8.2.5 Bell Transformer

Bell transformers shall be air-cooled and double wound complying with BS EN 61558-2-8:2010. One side of the secondary (extra low voltage) winding shall be earthed. The reactance of the transformer winding shall be of such a value that a continuous short circuit across the terminals of the secondary winding shall not damage the transformer, or cause dangerous overheating.

The windings, core and terminals of the transformer shall be contained within an insulating plastic case.

B8.3 INSTALLATION IN HAZARDOUS AREAS

B8.3.1 General

(a) Electrical equipment and wiring of electrical installations exposed to potentially explosive atmospheres shall be constructed and protected to the requirements specified for hazardous areas in IEC 60079-0:2017 and relevant FM (Factory

Mutual) or UL (Underwriters Laboratory) standards under ANSI or equivalent standard acceptable by relevant authorities.

(c) Electrical equipment and wiring of electrical installations in building and premises for Categories 2 and 5 Dangerous Goods including those in building and premises for liquid petroleum gas storage and for petrol filling stations shall, in addition to the requirements in Clause 8.3.1 (a) and (b) above, comply with the requirements specified for hazardous areas in the Electricity Safety Code Part 1 and 15 of the Institute of Petroleum Model Code of Safe Practice in the Petroleum Industry or Marketing Safety Code of the Institute of Petroleum or equivalent such as IEC 60079:2018 SER series and relevant FM (Factory Mutual) or UL (Underwriters Laboratory) standards under ANSI or equivalent standard acceptable by relevant authorities.

B8.3.2 Electrical Equipment Selection

(c) The gas and vapour classification of electrical equipment which provides guidance for the safety usage of equipment in the type of gaseous prevalent environment shall conform with ISO/IEC 80079-20-1:2017/Corr 1:2018 and the associated Parts of the Standard.

B8.3.4 Conduit Fitting, Cable Glands, Terminal Box and Enclosure

Unless otherwise specified, conduit fittings, cable glands, terminal boxes and enclosures of apparatus (including accessories) shall be suitable for use with Group IIA and Group IIB inflammable gases and vapours as specified in ISO/IEC 80079-20-1:2017/Corr 1:2018 with temperature classification of T6 (85°C). Conduit fittings, cable glands and terminal boxes shall carry the registered flameproof mark and manufacturer's certificate number.

B8.3.6 Luminaire

Unless otherwise specified, luminaires shall comply with IEC 60079-0:2017 and shall be suitable for use in Zone 1 where gases exist is of Group IIA or Group IIB classification as specified in ISO/IEC 80079-20-1:2017/Corr 1:2018 with temperature classification of T6 (85^{o}C). Where tubular fluorescent luminaires are specified, they shall have starterless ballasts.

B8.3.8 Cables or Conduits Passing through Floor, Wall or Partition

Where cables or conduit passing through a floor, wall or partition that forms a gas or fire barrier, the hole provided for them shall be made good with material determined as incombustible in accordance with the method of BS 476-4:1970 Corr 1:2014 to the full thickness of the floor, wall or partition. Alternatively, cable glands or cable transits may be used for this purpose.

Where a run of conduit, irrespective of size, passes from a hazardous area to a non-hazardous area, a stopper box or sealing device shall be inserted at the hazardous area boundary or, failing this, on the side remote from the hazardous area.

B8.4 EXTERNAL LIGHTING SYSTEM

B8.4.8 Cable between Service Box and Luminaire

Cables from the neutral terminal block and the MCB to the luminaires shall be PVC insulated and PVC sheathed having CSA as specified. Arrangements shall be made to prevent the cores from being under tension where they are attached to terminals. All cables shall be contained within the poles. Rubber grommets shall be installed where cable passes through metal work.

Where sustained arc voltage of a discharge lamp exceeds 250 V, the cables used for connecting the lamp and the control-gear shall be of 600/1,000 V grade to IEC 60502-1:2004/Amd 1:2009 and the associated parts of the standard or as recommended by the lamp manufacturer. The length of cables shall not exceed the limit as recommended by the manufacturer.

Where flexible cables are recommended by manufacturer for termination at the luminaire, PVC insulated and PVC sheathed flexible cables shall be used. Such cables shall enter the luminaire by means of suitable waterproof compression glands.

Where four or more floodlights are mounted on a pole, the flexible cables shall be connected to the luminaires by means of a mild steel connector box with waterproof hinged cover. The connector box shall be fitted near to the top of the pole.

SECTION B9

INSTALLATION OF ELECTRIC MOTORS AND HIGH VOLTAGE EQUIPMENT

B9.5 HIGH VOLTAGE MOTOR CONTROL SWITCHBOARD

B9.5.1 General Requirements

(d) Before steelworks is painted, it shall be treated and degreased by an approved method or chemical pickling and an approved anti-rusting priming coat applied. The panels shall be externally finished in semi-gloss stoved enamel or cellulose to a colour to be approved by the Supervising Officer.

PART C – MATERIAL AND EQUIPMENT SPECIFICATION

SECTION C1

GENERAL

C1.3 INSULATING MATERIAL

Insulating tapes for low voltage applications shall comply with IEC 60454-3-1:1998/Amd 1:2001 pressure sensitive adhesive tape type F-PVC$_p$/90/0/T$_p$ (Plasticized PVC) and have a thickness of not less than 0.22 mm.

Non-impregnated paper, fabric, wood or press-hemp shall not be used for insulating purposes. Where synthetic resin bonded insulating boards are used, all cut edges shall be sealed with an approved varnish.

When insulating material complying with other standard specifications is offered, the EE Contractor shall satisfy the Supervising Officer that the quality of the insulating material offered is equal to or better than that specified in the appropriate IEC Standards.

C1.7 SHEET METAL WORK

Sheet metal boxes, meter chambers, etc. shall be manufactured from plain steel sheets. The thickness of steel sheet shall be as specified in the Particular Specification and subject to a minimum of 1.0 mm. Where necessary, suitable stiffeners shall be provided to give adequate rigidity.

Protection against corrosion shall be achieved by means of hot-dip galvanisation, anti-rust painting or enamel, or the use of stainless steel to ANSI304/316.

SECTION C2

WIRING SYSTEM: CABLES, CONDUITS, TRUNKING AND ACCESSORIES

C2.1 CABLES IN WIRING SYSTEM

C2.1.6 Fire Performance of Fire Resistant Cables

The materials for insulation and outer covering, if any, of fire resistant cable shall emit low level of smoke and corrosive gases when affected by fire. The cable shall be type tested to the following fire performance requirement:

(ii) Flame propagation : BS EN 60332-1-2:2004/Amd 11:2016
or
BS EN 60332-3-24:2018

C2.2 STEEL CONDUIT AND ACCESSORIES

C2.2.3 Steel Conduit Fitting

All steel conduit fittings shall comply with IEC 60670 1: 2015 and other associated Parts of the Standard.

Adaptable boxes complete with covers shall be of cast iron or galvanised steel. Boxes of the preferred sizes as given in IEC 60670-1:2003 and other associated Parts of the Standard shall be used.

Circular boxes, dome covers and hook covers shall be of galvanised malleable cast iron complying with IEC 60670-1:2015. Ceiling mounted boxes shall be of deep pattern type having an internal depth of not less than 60 mm.

Bushes and tube ends shall be of brass.

Distance (spacing) saddles shall be of galvanised cast iron. The screws for tightening and fixing the saddles shall be of brass.

Solid or inspection tee-pieces or elbows shall NOT be used on any conduit installation.

C2.2.5 Class of Protection against Corrosion

Steel conduits and couplers shall be hot-dip zinc coated or sheradized both inside and outside against corrosion and shall be tested to comply with IEC 61386-1:2008/Amd 1:2017.

Steel or ferrous conduit fittings shall be hot-dip zinc coated or sheradized both inside and outside against corrosion and shall be tested to comply with IEC 61386-1:2008/Amd 1:2017.

Metal boxes complete with covers for the enclosure of electrical accessories shall have heavy protection both inside and outside in accordance with IEC 60670-1:2015 (e.g. hot-dip galvanised coating or sheradizing).

C2.2.6 Screw

Screws used for fixing boxes and spacing saddle, and for tightening covers and spacing saddles shall have ISO metric threads. They shall be of brass or steel and if of steel they shall be protected against corrosion by a finish at least equal to the zinc coating specified in BS 7371-12:2008. Electro-brass plated screws or self tapping screws shall NOT be used.

C2.3 PLASTIC OR PVC CONDUIT AND ACCESSORIES

C2.3.1 Rigid Conduit and Conduit Fittings

Rigid plain PVC conduits shall comply with IEC 61386-21:2002 and rigid plain PVC conduit fittings shall comply with IEC 61386-1:2008/AMD1:2017 and other associated Parts of the Standard. Conduits shall have classification as below:

(a) According to mechanical properties - for heavy mechanical stress; and

(b) According to temperature - with a permanent application temperature range of -5°C to +60°C.

C2.3.2 Pliable Conduit

Pliable conduits shall be formed of self-extinguishing plastic materials and shall comply with IEC 61386-22:2002 and pliable conduit fittings shall comply with IEC 61386-1:2008/AMD 1:2017 and other associated Parts of the Standard. Conduits shall be suitable for installation, storage or transport at temperature range of -5°C to +60°C.

C2.3.4 Plastic Couplers

Plain, moulded slip-type couplers and expansion type couplers to IEC 61386-1:2008/AMD 1:2017 shall be used in the jointing of conduits. Adhesive/jointing cement for jointing shall be the type recommended by the manufacturer.

C2.4 STEEL TRUNKING AND ACCESSORIES

C2.4.1 Steel Trunking

Steel surface and raised floor trunking systems shall be compatible to the requirements laid down in IEC 61084-1:2017. The body and cover of the surface and raised floor trunkings shall be fabricated with sheet steel having a minimum thickness as indicated in Table C2.4.4-1.

Steel flush floor and underfloor trunking shall be compatible to the requirements laid down in IEC 61084-1:2017 and IEC 61084-2-2:2017. The body and access cover of the flush floor and underfloor trunkings shall be subjected to external mechanical loads and fabricated with sheet steel having a nominal thickness as indicated in Table C2.4.4-2.

Manufacturer’s standard fittings such as tee or angle pieces, connectors, junction boxes, end caps, modular service outlet boxes and panels, etc. shall be used throughout the trunking system unless prior approval has been obtained from the Supervising Officer.

C2.4.2 Class of Protection against Corrosion

Steel trunking and associated fittings, except service outlet panel of modular service outlet box, shall have class 3 protection against

corrosion in accordance with BS 4678-4:1982, i.e. hot-dip zinc coating to BS EN 10143:2006 with a minimum coating designation of G275. The service outlet panel of modular service outlet box shall be epoxy coated unless otherwise specified.

C2.4.3 Construction

Steel surface and raised floor trunkings shall be of square or rectangular cross section. One side of the trunking shall be removable or hinged. No projection from screw or other sharp object will be allowed inside the trunking.

Steel flush foor and underfloor trunkings shall be designed and constructed to permit the laying of the trunking on a structural floor without ingress of water or cement whilst the floor is screeded or is cleaned by wet-treatment. The trunking systems shall be constructed with a degree of protection against water at least IPX4 according to IEC 60529:1989/Amd1:1999/Amd2:2013 Corr 1: 2013 and Corr2:2015.

The flush floor and underfloor trunkings shall be embedded in floor screed. The access cover surface of the flush floor trunking shall be flushed with the finished floor level.

C2.4.7 Screw

Screws used for securing a cover or connector and for fixing a trunking shall have ISO metric threads. They shall be of brass or steel. Steel screws shall be protected against corrosion by a finish at least equal to the zinc coating specified in BS 7371-12:2008. Electro-brass plated screws or self tapping screws shall NOT be used. Projection of screws inside a trunking or a trunking fitting will not be allowed.

C2.5 PLASTIC OR PVC TRUNKING AND ACCESSORIES

PVC trunking and fittings shall comply with IEC 61084-1: 2017. The nominal dimensions of PVC cable trunking shall be selected from any of the following numbers in mm:
12.5, 16.0, 20.0, 25.0, 32.0, 37.5, 40.0, 50.0, 75.0, 100.0 and 150.0

Cover for trunking shall be secured either by purpose-made rivets or clip-on mechanism to manufacturer's standard.

SECTION C3

POWER CABLES AND ASSOCIATED CABLING FACILITIES

C3.12 CABLE LADDER

C3.12.1 Material

Generally, unless otherwise specified, all cable ladder fittings and accessories mentioned below shall be manufactured from hot rolled steel to BS EN 10149-1:2013 and then hot dipped galvanised to ISO 1460:1992 and ISO 1461:2009 after fabrication.

For heavily corrosive environments where specified in the Contract, Specification or on the Drawings, cable ladder fittings and accessories shall be manufactured from AISI 316 stainless steel.

SECTION C9

LIGHT EMITTING DIODE LUMINAIRE & DRIVER

C9.2 ELECTRONIC DRIVER

C9.2.1 The electronic driver (driver) for the LED luminaire shall include the components of power factor correction, radio interference suppression and also dimming facility if it is specified. The driver shall conform to the following international standards if applicable:

IEC 62384:2006/Amd1: 2009	:	DC or AC supplied electronic control gear for LED modules – Performance requirements;

SECTION C10

DOMESTIC APPLIANCES

C10.2 900 MM, 1,200 MM and 1400 MM CEILING FAN

C10.2.1 General Requirements

(b) The fan shall conform to the latest edition of the following standards:

(ii) IEC 60335-2-80:2015 Household and similar electrical appliances – Part 2-80 : Particular requirements for fans.

C10.15 90-Litre AND 135-Litre THERMAL STORAGE ELECTRIC WATER HEATER

C10.15.1 General Requirements

(f) The water heater shall comply with the latest edition of the following standards:

C10.24 ELECTRIC HAND/FACE DRYER

C10.24.1 General Requirements

(a) The hand/face dryer shall comply with IEC 60335-2-23:2016.

C10.31 ROOM COOLER

C10.31.3 Performance Requirements

(f) Room cooler shall be operated with inverter and have obtained a Grade 1 Energy Label under the Energy Efficiency Labelling Scheme of Electrical and Mechanical Services Department.

C10.33 LED TABLE LAMP

C10.33.1 General Requirements

The LED table lamp shall be the lighting fitting including the driver, lamp source, diffuser, flexible cord and all necessary accessories.

(d) The LED table lamp shall be manufactured in a process conforming to the relevant quality assurance standard ISO 9001: 2015.

C10.33.4 Electrical Requirements

(e) The LED driver and the extra low voltage DC driver shall comply with the following standards where applicable:

(iii) IEC 62384:2006/Amd1:2009 DC or AC supplied electronic control gear for LED modules – Performance requirements;

SECTION C13

HIGH VOLTAGE SWITCHGEAR AND EQUIPMENT

C13.3 HIGH VOLTAGE - MOTOR CONTROL SWITCHBOARDS

C13.3.1 General Requirements

(f) Standards

The switchgear and cubicles for high voltage switchboard shall comply, in particular, with the following Standards where appropriate:

Table C13.3.1(f) - Standards

IEC 60269-1:2014	Low–voltage fuses – Part 1: General requirements
IEC 60051:1997	Direct acting indicating electrical measuring instruments and their accessories
IEC 60255-1:2009	Electrical protective relays
IEC 60282-1:2014	Fuses for voltages exceeding 1,000 V AC
IEC 61869-2:2012	Current transformers
IEC 61869-3:2011 & IEC 61869-5:2011	Voltage transformers
IEC 60947-5-1:2016	Control Switches
IEC 60376:2005	Sulphur hexafluoride for electrical equipment
IEC 62271-200:2011	A/C metal-enclosed switchgear and controlgear of rated voltage above 1 kV and up to and including 52 kV
IEC 62271-100:2012	A/C circuit breakers for rated voltage above 1 kV
IEC 62052-11:2003	Electricity meters
BS 6231:2006	PVC-insulated cables for switchgear and controlgear wiring
IEC 62271-1:2011	High-voltage switchgear and controlgear standards