

608-13-05 Socket-outlets shall be protected individually, or in groups of not more than three, by a residual current device complying with BS 4293 and having the characteristics specified in Regulation 412-06 and must not be bonded to the PME terminal.

For a PME supply the protective conductor of each socket-outlet circuit shall be connected to an earth electrode and shall comply with Regulations 413-02-18 to 413-02-20.

608-13-06 Grouped socket-outlets shall be on the same phase.

SECTION 609

(Reserved for Marinas)

SECTION 610

(Reserved for future use)

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SECTION 611

HIGHWAY POWER SUPPLIES AND STREET FURNITURE

611-01 Scope

611-01-01 The requirements of this section shall apply to installations comprising highway distribution circuits, street furniture and other street located equipment. They shall not apply to supplier's works as defined by The Electricity Supply Regulations 1988 as amended in accordance with Regulation 110-02.

611-01-02 Any measure prescribed in this section of the Regulations shall also apply to similar equipment located in other areas used by the public but not designated as a highway or part of a building.

Protection for safety

611-02 Protection against electric shock

611-02-01 Where a measure for protection against direct contact in accordance with Regulation 412-01 is used then:

- (i) protection by obstacles shall not be used, and
- (ii) where protection is provided by placing out of reach, it shall only apply to low voltage overhead lines constructed to the standard required by The Electricity Supply Regulations 1988 as amended, and
- (iii) except when the maintenance of equipment is to be restricted to skilled persons specially trained, where items of street furniture or street located equipment are within 1.5 m of a low voltage overhead line, protection against direct contact with the overhead line shall be provided by means other than placing out of reach.

611-02-02 A door in street furniture or street located equipment used for access to electrical equipment shall not be used, to meet Regulation 412-03-01, as a barrier or an enclosure. To satisfy the purposes of protection against direct contact the requirements of Regulation 412-03-04 shall be applied. An intermediate barrier shall be provided to prevent contact with live parts, such barrier affording a degree of protection of at least IP2X or IPXXB and removable only by the use of a tool.

611-02-03 Protection against indirect contact in accordance with Regulation 413-01 shall not be provided by:

- (i) a non-conducting location
- (ii) earth-free equipotential bonding
- (iii) electrical separation.

611-02-04 A maximum disconnection time of 5 s shall apply to all circuits feeding fixed equipment used in highway power supplies for compliance with the requirements of Regulation 413-02-04.

611-02-05 Where protection against indirect contact is provided by using earthed equipotential bonding and automatic disconnection in accordance with Regulation 413-01-01(i) metallic structures not connected to or part of the street furniture or street located equipment shall not be connected to the main earthing terminal as extraneous-conductive-parts under Regulation 413-02-02.

611-03 Devices for isolation and switching

611-03-01 Where it is intended that isolation and switching will be carried out only by instructed persons and subject to Regulation 461-01-02 for TN systems the requirement of Regulation 460-01-02 is considered to be fulfilled if the means of isolation is provided by a suitably rated fuse-carrier.

611-03-02 Where the supplier's cut-out is used as the means of isolation of a highway power supply the approval of the supplier shall be obtained.

Selection and erection of equipment

611-04 Identification of cables

611-04-01 On completion of an installation including highway distribution circuits and highway power supplies, detailed records in accordance with Regulation 514-09 shall be provided with the Completion and Inspection Certificate required by Regulation 741-01-01.

611-04-02 Except where the method of cable installation does not permit marking the installation of underground cable shall comply with Regulation 522-06-03.

611-04-03 Ducting, marker tape or cable tiles used with highway power supply cable shall be suitably colour coded or marked for the purpose of identification and shall be distinct from other services.

611-04-04 The requirement of Regulation 514-12 need not be applied where the highway power supply installation is subject to a programmed inspection and testing procedure.

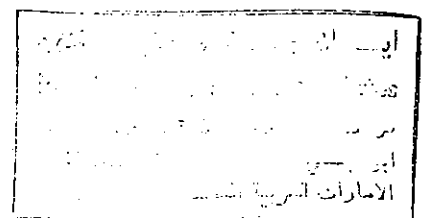
611-05 External influences

611-05-01 Deleted by Amendment No. 1.

611-06 Temporary supplies

611-06-01 Temporary supplies taken from street furniture shall not reduce the safety of the permanent installation and shall generally be in accordance with Section 604.

611-06-02 On every temporary supply unit there shall be a durable label externally mounted stating the maximum sustained current to be supplied from that unit.



PART 7
INSPECTION AND TESTING
CONTENTS

CHAPTER 71	INITIAL VERIFICATION
711	GENERAL
712	INSPECTION
713	TESTING
CHAPTER 72	ALTERATIONS AND ADDITIONS TO AN INSTALLATION
721	GENERAL
CHAPTER 73	PERIODIC INSPECTION AND TESTING
731	GENERAL
732	INSPECTION AND TESTING
CHAPTER 74	CERTIFICATION AND REPORTING
741	GENERAL
742	INITIAL VERIFICATION
743	ALTERATIONS AND ADDITIONS
744	PERIODIC INSPECTION AND TESTING

PART 7
INSPECTION AND TESTING
CONTENTS

CHAPTER 71 INITIAL VERIFICATION

- 711 GENERAL
- 712 INSPECTION
- 713 TESTING
- 713-01 General
- 713-02 Continuity of protective conductors including main and supplementary equipotential bonding
- 713-03 Continuity of ring final circuit conductors
- 713-04 Insulation resistance
- 713-05 Site applied insulation
- 713-06 Protection by separation of circuits
- 713-07 Protection against direct contact by a barrier or an enclosure provided during erection
- 713-08 Insulation of non-conducting floors and walls
- 713-09 Polarity
- 713-10 Earth fault loop impedance
- 713-11 Earth electrode resistance
- 713-12 Functional testing

CHAPTER 72 ALTERATIONS AND ADDITIONS TO INSTALLATIONS

- 721 GENERAL

CHAPTER 73 PERIODIC INSPECTION AND TESTING

- 731 GENERAL
- 732 INSPECTION AND TESTING

CHAPTER 74 CERTIFICATION AND REPORTING

- 741 GENERAL
- 742 INITIAL VERIFICATION
- 743 ALTERATIONS AND ADDITIONS
- 744 PERIODIC INSPECTION AND TESTING

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CHAPTER 71

INITIAL VERIFICATION

711 GENERAL

711-01-01 Every installation shall, during erection and/or on completion before being put into service be inspected and tested to verify, so far as is reasonably practicable, that the requirements of the Regulations have been met.

Precautions shall be taken to avoid danger to persons and to avoid damage to property and installed equipment during inspection and testing.

711-01-02 The result of the assessment of general characteristics required by Sections 311, 312 and 313, together with the information required by Regulation 514-09-01 shall be made available to the person or persons carrying out the inspection and testing.

712 INSPECTION

712-01-01 Inspection shall precede testing and shall normally be done with that part of the installation under inspection disconnected from the supply.

712-01-02 The inspection shall be made to verify that the installed electrical equipment is:

- (i) in compliance with Section 511 (this may be ascertained by mark or by certification furnished by the installer or by the manufacturer), and
- (ii) correctly selected and erected in accordance with the Regulations, and
- (iii) not visibly damaged or defective so as to impair safety.

712-01-03 The inspection shall include at least the checking of the following items, where relevant to the installation and, where necessary, during erection:

- (i) connection of conductors
- (ii) identification of conductors
- (iii) routing of cables in safe zones or protection against mechanical damage, in compliance with Section 522
- (iv) selection of conductors for current-carrying capacity and voltage drop, in accordance with the design
- (v) connection of single-pole devices for protection or switching in phase conductors only
- (vi) correct connection of accessories and equipment
- (vii) presence of fire barriers and protection against thermal effects
- (viii) methods of protection against electric shock
 - (a) protection against both direct and indirect contact, i.e.:
 - SELV
 - limitation of discharge energy
 - (b) protection against direct contact (including measurement of distances where appropriate), i.e.:
 - protection by insulation of live parts
 - protection by a barrier or an enclosure
 - protection by obstacles
 - protection by placing out of reach
 - protection by PELV
 - (c) protection against indirect contact:
 - earthed equipotential bonding and automatic disconnection of supply
 - presence of earthing conductors
 - presence of protective conductors
 - presence of main equipotential bonding conductors

- presence of supplementary equipotential bonding conductors
- presence of earthing arrangements for combined protective and functional purposes
- use of Class II equipment or equivalent insulation
- non-conducting location (including measurement of distances, where appropriate)
 - absence of protective conductors
- earth-free local equipotential bonding
 - presence of earth-free equipotential bonding conductors
- electrical separation
- (ix) prevention of mutual detrimental influence
- (x) presence of appropriate devices for isolation and switching correctly located
- (xi) presence of undervoltage protective devices
- (xii) choice and setting of protective and monitoring devices (for protection against indirect contact and/or protection against overcurrent)
- (xiii) labelling of protective devices, switches and terminals
- (xiv) selection of equipment and protective measures appropriate to external influences
 - (xv) adequacy of access to switchgear and equipment
 - (xvi) presence of danger notices and other warning signs
 - (xvii) presence of diagrams, instructions and similar information
 - (xviii) erection methods.

713 TESTING

713-01 General

713-01-01 The tests of Regulations 713-02 to 713-09 where relevant shall be carried out in that sequence.

If any test indicates a failure to comply, that test and any preceding test, the results of which may have been influenced by the fault indicated, shall be repeated after the fault has been rectified.

Some methods of test are described in Guidance Note Number 3, Inspection & Testing, published by the Institution of Electrical Engineers. Other methods are not precluded provided they give valid results.

713-02 Continuity of protective conductors including main and supplementary equipotential bonding

713-02-01 A continuity test shall be made. It is recommended that the test be carried out with a supply having a no-load voltage between 4 V and 24 V, d.c. or a.c., and a short-circuit current of not less than 200 mA.

713-03 Continuity of ring final circuit conductors

713-03-01 A test shall be made to verify the continuity of each conductor including the protective conductor, of every ring final circuit.

713-04 Insulation resistance

713-04-01 The insulation resistance between live conductors and between each live conductor and Earth shall be measured before the installation is connected to the supply. The PEN conductor in TN-C systems shall be considered as part of the earth. Where appropriate during this measurement, phase and neutral conductors may be connected together.

713-04-02 The insulation resistance measured with the test voltages indicated in Table 71A shall be considered satisfactory if the main switchboard, and each distribution circuit tested separately with all its final circuits connected but with current-using equipment disconnected, has an insulation resistance not less than the appropriate value given in Table 71A.

713-04-03 Measurements shall be carried out with direct current. The testing apparatus shall be capable of supplying the test voltage indicated in Table 71A when loaded with 1 mA.

TABLE 71A

Minimum values of insulation resistance

Circuit nominal voltage (V)	Test voltage d.c. (V)	Minimum insulation resistance (MΩ)
SELV and PELV	250	0.25
Up to and including 500 V with the exception of the above systems	500	0.5
Above 500 V	1000	1.0

713-04-04 When the circuit includes electronic devices, only a measurement to protective earth shall be made with the phase and neutral connected together. Precautions may be necessary to avoid damage to electronic devices.

713-05 Site applied insulation

713-05-01 Where insulation applied on site in accordance with Regulation 412-02 is intended to provide protection against direct contact, it shall be verified that the insulation is capable of withstanding, without breakdown or flashover, an applied voltage test equivalent to that specified in the British Standard for similar type-tested equipment.

713-05-02 Where protection against indirect contact is provided by supplementary insulation applied to equipment during erection in accordance with Regulation 413-03, it shall be verified by test:

- (i) that the insulating enclosure affords a degree of protection not less than IP2X or IPXXB, and
- (ii) that the insulating enclosure is capable of withstanding, without breakdown or flashover, an applied voltage test equivalent to that specified in the British Standard for similar type tested equipment.

713-06 Protection by separation of circuits

713-06-01 The separation of circuits shall be verified in accordance with Regulation 713-06-02 for protection by SELV, Regulation 713-06-03 for protection by PELV and Regulation 713-06-04 for protection by electrical separation.

713-06-02 The separation of live parts from those of other circuits and from earth, according to Regulation 411-02, shall be verified by a measurement of the insulation resistance. The resistance values shall be in accordance with Table 71A.

713-06-03 The separation of live parts from those of other circuits according to Regulation 471-14 shall be verified by a measurement of the insulation resistance. The resistance values obtained shall be in accordance with Table 71A.

713-06-04 The separation of live parts from those of other circuits and from earth, according to Regulation 413-06 shall be verified by a measurement of the insulation resistance. The resistance values obtained shall be in accordance with Table 71A.

713-06-05 Functional Extra-Low Voltage circuits shall meet all the test requirements for low voltage circuits.

713-07 Protection against direct contact by a barrier or an enclosure provided during erection

713-07-01 Where protection against direct contact is intended to be afforded by a barrier or an enclosure provided during erection in accordance with Regulation 412-03, it shall be verified by test that each enclosure or barrier affords a degree of protection not less than IP2X or IPXXB or IP4X as appropriate, where that regulation so requires.

713-08 Insulation of non-conducting floors and walls

713-08-01 Where protection against indirect contact is to be provided by a non-conducting location intended to comply with Regulations 413-04 and 471-10, the resistance of the floors and walls of the location to the main protective conductor of the installation shall be measured at not less than three points on each relevant surface, one of which shall be not less than 1 m and not more than 1.2 m from any extraneous-conductive-part in the location. The other two measurements shall be made at greater distances.

713-08-02 Any insulation or insulating arrangement of extraneous-conductive-parts intended to satisfy Regulation 413-04-07(iii):

- (i) when tested at 500 V d.c. shall not be less than 0.5 megohm, and
- (ii) shall be able to withstand a test voltage of at least 2 kV a.c. r.m.s., and
- (iii) shall not pass a leakage current exceeding 1 mA in normal conditions of use.

713-09 Polarity

713-09-01 A test of polarity shall be made and it shall be verified that:

- (i) every fuse and single-pole control and protective device is connected in the phase conductor only, and
- (ii) centre-contact bayonet and Edison screw lampholders to BS EN 60238 in circuits having an earthed neutral conductor have the outer or screwed contacts connected to the neutral conductor, and
- (iii) wiring has been correctly connected to socket-outlets and similar accessories.

713-10 Earth fault loop impedance

713-10-01 Where protective measures are used which require a knowledge of earth fault loop impedance, the relevant impedances shall be measured, or determined by an alternative method.

Where the alternative method described in Regulation 413-02-12 (see Table 41C) is used, the impedance of the protective conductor of the circuit concerned shall also be measured.

713-11 Earth electrode resistance

713-11-01 Where protective measures are used which require a knowledge of the earth electrode resistance, this shall be measured.

713-12 Functional testing

713-12-01 Where protection against indirect contact or supplementary protection against direct contact is to be provided by a residual current device, its effectiveness shall be verified by a test simulating an appropriate fault condition and independent of any test facility incorporated in the device.

713-12-02 Assemblies, such as switchgear and controlgear assemblies, drives, controls and interlocks, shall be subjected to a functional test to show that they are properly mounted, adjusted and installed in accordance with the relevant requirements of these Regulations.

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CHAPTER 72

ALTERATIONS AND ADDITIONS TO AN INSTALLATION

721 GENERAL

721-01-01 The relevant requirements of Chapter 71 shall apply to alterations and additions.

721-01-02 It shall be verified that every alteration or addition complies with the Regulations and does not impair the safety of an existing installation.

CHAPTER 73

PERIODIC INSPECTION AND TESTING

731 GENERAL

731-01-01 Periodic inspection and testing of every installation, where required, shall be carried out in accordance with the requirements of this Chapter.

731-01-02 Inspection comprising careful scrutiny of the installation shall be carried out without dismantling or with partial dismantling as required, supplemented by testing to verify compliance with Sections 731 and 732 and as far as possible to provide for:

- (i) the safety of persons and livestock against the effects of electric shock and burns, in accordance with Regulation 120-01, and
- (ii) protection against damage to property by fire and heat arising from an installation defect, and
- (iii) the identification that the installation is not damaged or deteriorated so as to impair safety, and
- (iv) the identification of installation defects or non-compliance with the requirements of the Regulations which may give rise to danger.

732 INSPECTION AND TESTING

732-01-01 The frequency of periodic inspection and testing of an installation shall be determined by the type of installation, its use and operation, the frequency of maintenance and the external influences to which it is subjected.

732-01-02 The inspection and testing shall not cause danger to persons or livestock and shall not cause damage to property and equipment even if the circuit is defective.

732-01-03 The results of periodic inspection and testing shall be recorded on a report, signed by the person carrying out the inspection or a person authorised to act on their behalf and forwarded to the originator of the request for the inspection in accordance with Section 744 of the Regulations.

CHAPTER 74

CERTIFICATION AND REPORTING

741 GENERAL

741-01-01 Following the initial verification required by Chapter 71 or Chapter 72, a Completion Certificate in the form set out in Appendix 6, together with a schedule of test results, shall be given to the person ordering the work.

The schedule of test results shall record the results of the appropriate tests detailed in Regulations 713-02 to 713-12.

Those responsible for the design, construction and initial verification of a large or complex installation shall, as appropriate, give to the person ordering the work an equivalent form of Completion Certificate which takes account of their respective responsibilities for the safety of that installation, together with a schedule of test results.

741-01-02 Following the periodic inspection and testing described in Chapter 73, a Periodic Inspection Report in the form set out in Appendix 6, together with a schedule of test results, shall be given to the person ordering the work.

The schedule of test results shall record the results of the appropriate tests detailed in Regulations 713-02 to 713-12.

742 INITIAL VERIFICATION

742-02-01 The inspection shall comply with the requirements of Chapter 71 and any defects or omissions revealed by the inspection shall be made good before a Completion Certificate is issued.

742-02-02 The Completion Certificate shall be signed by a competent person or persons stating that the installation has been designed, constructed and inspected and tested in accordance with the Regulations.

743 ALTERATIONS AND ADDITIONS

743-01-01 The requirements of Section 742 for the issue of a Completion Certificate shall apply to all the work of the alterations or additions. Any defects or omissions revealed in that work shall be made good before a Completion Certificate is issued.

The contractor or other person responsible for the new work, or a person authorised to act on their behalf, shall report in writing, to the person ordering the work any defects found in related parts of the existing installation.

744 PERIODIC INSPECTION AND TESTING

744-01-01 In accordance with Chapter 73 the results and extent of a periodic inspection and test of an installation, or any part thereof, shall be recorded on a Periodic Inspection Report and given, by the person carrying out the inspection or a person authorised to act on their behalf, to the person ordering the inspection.

744-01-02 Dangerous conditions arising from non-compliance with these Regulations together with any limitations of the inspection and testing in accordance with Section 732, shall be recorded.

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Appendices

CONTENTS

Appendix	page
1 British Standards to which reference is made in the Regulations	151
2 Statutory Regulations and associated memoranda	159
3 Time/Current characteristics of overcurrent protective devices	161
4 Current-carrying capacity and voltage drop for cables and flexible cords	173
5 Classification of external influences	242
6 Completion Certificate and Periodic Inspection Report forms	253

APPENDIX 1

BRITISH STANDARDS TO WHICH REFERENCE IS MADE IN THE REGULATIONS

Note: Certain British Standards have been withdrawn since the issue of the 16th Edition in 1991. From the date of withdrawal, certificates and marks already awarded may continue to apply to production until a date specified in the superseding standard. During the period between these dates, the withdrawn standard may be specified in contracts. It should be noted however that this appendix may not list such standards, as only current British Standards are listed with some references to superseded standards.

BS Number	Title	Referenced in Regulations
BS 31 : 1940(1988)	Specification. Steel conduit and fittings for electrical wiring.	521-04-01(i)
BS 67 : 1987	Specification for ceiling roses.	553-04-01(i)
BS 88 :	Low-voltage fuses Part 1 : 1988 General requirements. Also numbered BS EN 60269-1 : 1994 Part 2 : Specification for fuses for use by authorized persons (mainly for industrial applications). Part 6 : 1988 (1992) Specification of supplementary requirements for fuses of compact dimensions for use in 240/415 V a.c. industrial and commercial electrical installations.	433-02-02 433-02-04 Table 41B1 Table 41C Table 41D Table 471A Table 604B1 Table 605B1 Appx. 4
BS 196 : 1961	Specification for protected-type non-reversible plugs, socket-outlets, cable-couplers and appliance-couplers with earthing contacts for single-phase a.c. circuits up to 250 volts.	Table 55A 553-01-05 553-02-01
BS 476 :	Fire tests on building materials and structure. Part 4 : 1970(1984) Non-combustibility test for materials. Part 5 : 1979 Method of test for ignitability.	521-05-01 526-03-02(iv)
	Part 23 : 1987 Methods for determination of the contribution of components to the fire resistance of a structure.	521-05-01 526-03-02(v) 527-01-03 553-03-01 554-06-01 527-02-02
BS 546 : 1950(1988)	Specification. Two-pole and earthing pin plugs, socket-outlets and socket-outlet adaptors.	Table 55A 553-01-05
BS 559 : 1991	Specification for electric signs and high-voltage luminous-discharge-tube installations.	110-01-01(ix) 554-02-01
BS 646 : 1958(1991)	Specification. Cartridge fuse links (rated up to 5 amperes) for a.c. and d.c. service.	Table 55A 553-01-05(i)
BS 731 :	Flexible steel conduit for cable protection and flexible steel tubing to enclose flexible drives. Part 1 : 1952(1993) Flexible steel conduit and adaptors for the protection of electric cables.	521-04-01(ii)
BS 951 : 1986	Specification for clamps for earthing and bonding purposes.	514-13-01

BS Number	Title	Referenced in Regulations
BS 1361 : 1971(1986)	Specification for cartridge fuses for a.c. circuits in domestic and similar premises.	Table 41B1 Table 41C Table 41D Table 604B1 433-02-02 433-02-04 Appx. 4
BS 1362 : 1973(1992)	Specification for general purpose fuse links for domestic and similar purposes (primarily for use in plugs).	Table 41B1 Table 41C Table 41D Table 55A Table 604B1 553-01-05(i)
BS 1363 :	13A plugs, socket-outlets, adaptors and connection units. Part 1 : 1995 Specification for rewirable and non-rewirable 13A fused plugs. Part 2 : 1995 Specification for 13A switched and unswitched socket-outlets. Part 3 : 1995 Specification for 13A adaptors. Part 4 : 1995 Specification for 13A fused connection units: switched and unswitched.	433-02-04 Table 55A 553-01-04 553-01-05 553-04-01
BS 1710 : 1984(1991)	Specification for identification of pipelines and services.	514-02-01
BS 2754 : 1976	Memorandum. Construction of electrical equipment for protection against electric shock.	Part 2
BS 2848 : 1973	Specification for flexible insulating sleeving for electrical purposes.	543-03-02
BS 3036 : 1958(1992)	Specification. Semi-enclosed electric fuses (rating up to 100 amperes and 240 volts to earth).	Table 41B1 Table 41D Table 604B1 433-02-03 433-02-04 Appx. 3 Appx. 4
BS 3456 :	Specification for safety of household and similar electrical appliances. Part 201 : 1990 General requirements.	603-01-01
BS 3535 :	Isolating transformers and safety isolating transformers. Part 1 : 1990 General requirements. Part 2 : 1990 Specification for transformers for reduced system voltage.	411-02-02(i) 413-06-02(i) (a) 413-06-03(iv) 471-12-01 471-15-03(i) 553-01-05(ii) 601-09-01 602-07-02(iv)
BS 3676 :	Switches for household and similar fixed electrical installations. Part 1 : 1989 Specification for general requirements.	412-03-04(iii) 553-04-01 601-08-01(i) 602-07-02(iv)

BS Number	Title	Referenced in Regulations
BS 3858 : 1992	Specification for binding and identification sleeves for use on electric cables and wires.	514-06-01
BS 3871 :	Specification for miniature and moulded case circuit-breakers. Part 1 : 1965(1984) Miniature air-break circuit-breakers for a.c. circuits. (See also BS EN 60898).	433-02-04 Table 41B2 Table 41C Table 471A Table 604B2 Appx. 3 and 4
BS 3939 :	Graphical symbols for electrical power, telecommunications and electronic diagrams.	514-09-01
BS 4293 : 1983(1993)	Specification for residual current-operated circuit-breakers.	412-06-02(ii)
BS 4343 : 19 92	Specification for industrial plugs, socket-outlets and couplers for a.c. and d.c. supplies. Also numbered BS EN 60309-2 : 1992.	Table 55A 553-01-05 553-02-01 602-07-01 602-08-01 604-12-02 604-13-01 607-02-04 607-02-05 608-07-01 608-08-08(i) 608-08-08(iii) 608-13-02(ii)
BS 4363 : 1991	Specification for distribution assemblies for electricity supplies for construction and building sites.	604-09-01
BS 4444 : 1989	Guide to electrical earth monitoring and protective conductor proving.	543-03-05 607-02-05
BS 4491 :	Appliance couplers for household and similar general purposes.	553-02-01
BS 4568 : 1970	Specification for steel conduit and fittings with metric threads of ISO form for electrical installations.	521-04-01(iii)
BS 4573 : 1970(1979)	Specification for 2-pin reversible plugs and shaver socket-outlets.	553-01-05(ii)
BS 4607 :	Non-metallic conduits and fittings for electrical installations.	521-04-01(iv)
BS 4678 :	Cable trunking.	521-05-01
BS 4727 :	Glossary of electrotechnical, power, telecommunications, electronics, lighting and colour terms.	Part 2

BS Number	Title	Referenced in Regulations
BS 5042 : 1987	Specification for bayonet lampholders.	412-03-04 471-05-02 Table 55B 553-03-03 553-04-01(iii) 601-11-01
BS 5266 :	Emergency lighting.	110-01-01(x) 528-01-04
BS 5345 :	Code of practice for selection, installation and maintenance of electrical apparatus for use in potentially explosive atmospheres (other than mining applications or explosive processing and manufacture).	110-01-01(xi)
BS 5467 : 1989	Specification for cables with thermosetting insulation for electricity supply for rated voltages of up to and including 600/1000 V and up to and including 1900/3300 V.	514-06-01(iv) Appx. 4
BS 5490 : 1977(1985)	Specification for classification of degrees of protection provided by enclosures. (IP codes)	411-02-09(i) 412-03-01 412-03-02 412-03-04(iii) 412-05-03 413-03-04 471-14-02(i) 602-05-01 603-03-01(ii) 608-13-02(ii) 611-02-02 713-05-02(i)
BS 5518 : 1977	Specification for electronic variable control switches (dimmer switches) for tungsten filament lighting.	553-04-01
BS 5593 : 1978(1991)	Specification for impregnated paper-insulated cables with aluminium sheath/neutral conductor and three shaped solid aluminium phase conductors (CONSAC), 600/1000 V, for electricity supply.	546-02-04(ii)
BS 5655 :	Lifts and service lifts.	110-02-01(x) 528-02-06
BS 5733: 1979	Specification for general requirements for electrical accessories.	553-04-01(vi)
BS 5839 :	Fire detection and alarm systems for buildings.	110-01-01(xii) 528-01-04
BS 6004 : 1991	Specification for pvc-insulated cables (non-armoured) for electric power and lighting.	543-03-02 Appx. 4
BS 6007 : 1993	Specification for rubber-insulated cables for electric power and lighting.	608-08-08(ii) Appx. 4

BS Number	Title	Referenced in Regulations
BS 6053 : 1981(1991)	Specification for outside diameters of conduits for electrical installations and threads for conduits and fittings.	521-04-01(i) 521-04-01(ii) 521-04-01(iii)
BS 6099 :	Conduits for electrical installations. Part 1 : 1981 (1993) Specification of general requirements. Section 2.2 : 1982 (1988) Specification for rigid plain conduits of insulating material.	521-04-01(i) 521-04-01(ii) 521-04-01(iii) 521-04-01(iv)
BS 6141 : 1991	Specification for insulated cables and flexible cords for use in high temperature zones.	603-07-01
BS 6207 : 1991	Specification for mineral-insulated copper-sheathed cables with copper conductors.	546-02-07 Appx. 4
BS 6231 : 1990	Specification for pvc-insulated cables for switchgear and controlgear wiring.	Appx. 4
BS 6346 : 1989	Specification for pvc-insulated cables for electricity supply.	514-06-01(ii) Appx. 4
BS 6351 :	Electric surface heating. Part 1 : 1983 (1993) Specification for electric surface heating devices. Part 2 : 1983 (1993) Guide to the design of electric surface heating systems. Part 3 : 1983 (1993) Code of practice for the installation, testing and maintenance of electric surface heating systems.	110-01-01(xiv) 554-07-01
BS 6387 : 1994	Specification for performance requirements for cables required to maintain circuit integrity under fire conditions.	528-01-06
BS 6458 :	Fire hazard testing for electrotechnical products. Section 2.1 : 1984 Glow-wire test.	526-03-02(iii)
BS 6480 : 1988	Specification for impregnated paper-insulated lead or lead alloy sheathed electric cables of rated voltages up to and including 33000 V.	514-06-01(iii)
BS 6500 : 1994	Specification for insulated flexible cords and cables.	608-08-08(ii) Appx. 4
BS 6651 : 1992	Code of practice for protection of structures against lightning.	110-02-01(ix) 541-01-03
BS 6701 :	Code of practice for installation of apparatus intended for connection to certain telecommunications systems. Part 1 : 1990 General recommendations.	110-01-01(xiii) Table 51A 528-01-03 528-01-04
BS 6724 : 1990	Specification for armoured cables for electricity supply having thermosetting insulation with low emission of smoke and corrosive gases when affected by fire.	Appx. 4
BS 6765 :	Leisure accommodation vehicles: caravans. Part 3 : 1989 Specification for 12 V direct current extra-low voltage electrical installations.	608-01-01

BS Number	Title	Referenced in Regulations
BS 6883 : 1991	Specification for elastomer insulated cables for fixed wiring in ships and on mobile and fixed offshore units.	Appx. 4
BS 6972 : 1988	Specification for general requirements for luminaire supporting couplers for domestic, light industrial and commercial use.	553-04-01(ii)
BS 6991 : 1990	Specification for 6/10 amp two pole weather-resistant couplers for household, commercial and light industrial equipment.	553-02-01
BS 7001 : 1988	Specification for interchangeability and safety of a standardized luminaire supporting coupler.	553-04-01(ii)
BS 7071 : 1992	Specification for portable residual current devices.	412-06-02
BS 7211 : 1994	Specification for thermosetting insulated cables (non-armoured) for electric power and lighting with low emission of smoke and corrosive gases when affected by fire.	543-03-02 Appx. 4
BS 7288 : 1990	Specification for socket-outlets incorporating residual current devices. (S.R.C.Ds).	412-06-02
BS 7430 : 1991	Code of practice for earthing.	542-03-01
BS 7454 : 1991	Method for calculation of thermally permissible short-circuit currents taking into account non-adiabatic heating effects.	434-03-03 543-01-03
BS 7629 : 1993	Specification for thermosetting insulated cables with limited circuit integrity when affected by fire.	Appx. 4
BS EN 60073 : 1993	Specification for coding of indicating devices and actuators by colours and supplementary means. Replaces BS 4099. (See note).	514-01-01
BS EN 60238 : 1992	Specification for Edison screw lampholders Replaces BS 6776: 1990. (See note).	412-03-04 Table 55B 553-04-01(iii) 713-10-01(ii)
BS EN 60269-1 : 1994	Low-voltage fuses Part 1 : General requirements. Also numbered BS 88 : Part 1 : 1988.	
BS EN 60309 :	Plugs, socket-outlets and couplers for industrial purposes.	
BS EN 60309-1 : 1992	General requirements.	

BS Number	Title	Referenced in Regulations
BS EN 60309-2 : 1992	Dimensional interchangeability requirements for pin and contact-tube accessories of harmonised configurations. (Also numbered as BS 4343 : 1992).	Table 55A 553-01-05 553-02-01 602-07-01 602-08-01 604-12-02 604-13-01 607-02-04 607-02-05 608-07-01 608-08-08(i) 608-08-08(iii) 608-13-02(ii)
BS EN 60335-2-53 : 1991	Electric sauna heating appliances. (To be read in conjunction with BS 3456 Part 201).	603-01-01
BS EN 60439 :	Specification for low-voltage switchgear and controlgear assemblies.	
BS EN 60439-1 : 1994	Specification for type-tested and partially type-tested assemblies. Replaces BS 5486 : Part 1 : 1990. (See note).	413-03-01(i)b 543-02-04(ii)
BS EN 60439-2 : 1993	Particular requirements for busbar trunking systems (busways). Replaces BS 5486 : Part 2 : 1988. (See note).	521-01-02
BS EN 60439-4 : 1991	Particular requirements for assemblies for construction sites (ACS).	604-09-01
BS EN 60570 : 1994	Electrical supply track systems for luminaires. Replaces BS 4533: Section 102.57: 1990. (See note).	521-06-01
BS EN 60898 : 1991	Specification for circuit-breakers for overcurrent protection for household and similar installations. (See also BS 3871).	413-02-11 433-02-04 Table 41B2 Table 41C Table 471A Table 604B2 Appx. 3
BS EN 60947 :	Specification for low-voltage switchgear and controlgear.	
BS EN 60947-1 : 1992	General rules.	
BS EN 60947-2 : 1992	Circuit-breakers. Replaces BS 4752: Part 1:1977. (See note).	413-02-11 413-02-14 Appx. 4
BS EN 60947-3 : 1992	Switches, disconnectors, switch-disconnectors and fuse-combination units.	537-02-02
BS EN 60947-4	Contactors and motor-starters.	
BS EN 60947-4-1 : 1992	Electromechanical contactors and motor-starters.	435-01-01

BS Number	Title	Referenced in Regulations
BS EN 60950 : 1992	Specification for safety of information technology equipment including-electrical business equipment. Replaces BS 7002 : 1989. (See note)	607-01-01 607-02-02
BS EN 61008 : 1994	Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCB's). Part 1 : General rules.	412-06-02
BS EN 61009 : 1994	Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBO's). Part 1 : General rules.	412-06-02
BS EN 61011 : 1993	Electric fence energizers. Safety requirements for mains-operated electric fence energizers. Replaces BS 2632. (See note).	471-03-01 605-14-01
BS EN 61011-1 : 1993	Electric fence energizers. Safety requirements for battery-operated electric fence energizers suitable for connection to the supply mains. Replaces BS 6369. (See note).	471-03-01 605-14-01

APPENDIX 2

STATUTORY REGULATIONS AND ASSOCIATED MEMORANDA

1. In Great Britain the following classes of electrical installations are required to comply with the Statutory Regulations indicated below. The regulations listed represent the principal legal requirements. Information concerning these regulations may be obtained from the appropriate authority also indicated below.

Provisions relating to electrical installations are also to be found in other legislation relating to particular activities.

(i)	Electricity suppliers installations generally, subject to certain exemptions	The Electricity Supply Regulations 1988 as amended (SI 1988 No 1057 : ISBN 011 087057 3) (SI 1990 No 390 : ISBN 011 003390 6) (SI 1992 No 2961 : ISBN 011 025770 7) (SI 1994 No 533 : ISBN 011 043533 8)	President of the Board of Trade and Secretary of State for Trade and Industry, and Secretary of State for Scotland
(ii)	Building generally (for Scotland only), subject to certain exemptions	Building Standards (Scotland) Regulations 1990	Secretary of State for Scotland
(iii)	Work activity Places of work Non-domestic installations	The Electricity at Work Regulations 1989 (SI 1989 No 635 : ISBN 011 05635 X)	Health and Safety Commission
(iv)	Cinematograph installations	Cinematograph Regulations 1955, made under the Cinematograph Act, 1909, and/or Cinematograph Act, 1952	The Secretary of State for the Home Department, and Secretary of State for Scotland
(v)	Agricultural and horticultural installations	Agricultural (Stationary Machinery) Regulations 1959 as amended (SI 1959 No 1216, SI 1976 No 1247) (SI 1981 No 1414, SI 1989 No 2311)	Health and Safety Commission
(vi)	Theatres and other places licensed for public entertainment, music, dancing, etc.	Conditions of licence under: (a) in England and Wales, The Local Government (Miscellaneous provisions) Act 1982 (b) in Scotland, The Civic Government (Scotland) Act 1982	(a) The Secretary of State for the Home Department (b) Secretary of State for Scotland
(vii)	High voltage luminous tube signs	As (a) and (b) above	As (a) and (b) above

2. Failure to comply in a consumer's installation in Great Britain with the requirements of Chapter 13 of BS 7671, Requirements for Electrical Installations (the IEE Wiring Regulations 16th Edition) places the supplier in the position of not being compelled to commence or, in certain circumstances, to continue to give, a supply of energy to that installation.

Under Regulation 29 of The Electricity Supply Regulations 1988 as amended, any difference which may arise between a consumer and the supplier having reference to the consumer's installation shall be determined by a person nominated by the Secretary of State on the application of the consumer or consumer's authorised agent or the supplier.

3. Where it is intended to use protective multiple earthing the supplier and the consumer must comply with The Electricity Supply Regulations 1988 as amended.

4. For further guidance on the application of The Electricity at Work Regulations, reference may be made to the following publication:

(i) Memorandum of Guidance on The Electricity at Work Regulations 1989. (HS(R)25) ISBN 011 883963 2.

5. For installations in potentially explosive atmospheres reference should be made to:

(i) The Electricity at Work Regulations 1989 and HSE guidance booklet HS(G)22 "Electrical apparatus for use in potentially explosive atmospheres" ISBN 011 883746 X

(ii) The Highly Flammable Liquids and Liquefied Petroleum Gases Regulations 1972

(iii) The Petroleum (Consolidation) Act 1928

(iv) relevant British Standards.

Under The Petroleum (Consolidation) Act 1928 local authorities are empowered to grant licences in respect of premises where petroleum spirit is stored and as the authorities may attach such conditions as they think fit, the requirements may vary from one local authority to another. Guidance may be obtained from the Health and Safety Executive (Guidance Note HS(G)41. Petrol filling Stations : Instructions and Operation).

6. For installations in theatres and other places of public entertainment, and on caravan sites, the requirements of the licensing authority should be ascertained. Model Standards were issued by the Department of Environment in 1977 under the Caravan Sites and Control of Development Act 1960 as guidance for local authorities.

7. The Electrical Equipment (Safety) Regulations, administered by the Department of Trade and Industry, Consumer Safety Unit, contain requirements for safety of equipment designed or suitable for general use. Information on the application of the Regulations is given in guidance issued by the DTI.

8. The Plugs and Sockets etc. (Safety) Regulations 1994 (SI 1994/1768 ISBN 0 11 044768 9) of The Consumer Safety Act 1978, administered by the Department of Trade and Industry, containing requirements for the safety of plugs, sockets, adaptors and fuse links etc. designed for use at a voltage of not less than 50 volts.

9. Where a pictographic safety sign is used for a caution of risk of electric shock, The Safety Signs Regulations (SI 1980 No 1471), administered by the Health and Safety Executive, are applicable.

10. The Electrical Appliance (Colour Code) Regulations 1969 (SI 310) makes requirements for the colour coding of flexible cables and flexible cords to electrical appliances.

11. The Management of Health and Safety at Work Regulations 1992 implements European Directives 89/391/EEC and 91/383/EEC and requires employers and self employed persons to assess risks to workers and others who may be affected by their undertaking. (An Approved Code of Practice made under Section 16(1) of the HSW Act 1974).

12. Provision and Use of Work Equipment Regulations 1992 (SI 2932) implements European Directive 89/655/EEC and requires employers to ensure that all work equipment is suitable for the purpose for which it is used, it is properly maintained and appropriate training is given (see HSE Guidance Booklet L22).

13. The Electromagnetic Compatibility Regulations 1992 (SI 1992 No 2372) provide requirements for electrical and electronic products for electromagnetic compatibility.

14. Other Regulations relevant to electrical installation include:

The Personal Protective Equipment at Work Regulations 1992
(European Directive 89/656/EEC, HSE Booklet L25)

The Workplace (Health Safety and Welfare) Regulations 1992
(European Directive 89/654/EEC, HSE Booklet L24)

The Manual Handling Operations Regulations 1992
(European Directive 90/269/EEC, HSE Booklet L23).

APPENDIX 3

TIME/CURRENT CHARACTERISTICS OF OVERCURRENT PROTECTIVE DEVICES

This appendix gives the time/current characteristics of the following overcurrent protective devices:

figure 1	Fuses to BS 1361
figures 2A & 2B	Semi-enclosed fuses to BS 3036
figures 3A & 3B	Fuses to BS 88 Part 2 and Part 6
Miniature circuit-breakers (m.c.bs)	
figure 4	Type 1 to BS 3871
figure 5	Type 2 to BS 3871
figure 6	Type 3 to BS 3871
figure 7	Type B to BS EN 60898
figure 8	Type C to BS EN 60898
figure 9	Type D to BS EN 60898

In all of these cases time/current characteristics are based on the slowest operating times for compliance with the Standard and have been used as the basis for determining the limiting values of earth fault loop impedance prescribed in Section 413 of Chapter 41.

Maximum Earth Fault Loop Impedance

Regulations 413-02-09 and 413-02-13 specify maximum disconnection times for circuits. Regulations 413-02-10, 413-02-11 and 413-02-14 provide maximum earth fault loop impedances (Z_s) that will result in protective devices operating within the required disconnection times (of Regulations 413-02-09 and 413-02-13).

The maximum earth loop impedance for a protective device is given by:

$$Z_s = \frac{U_{oc}}{I_a}$$

where:

U_{oc} is the open circuit voltage at the distribution transformer.

I_a is the current causing operation of the protective device within the specified time.

For the purposes of Regulations 413-02-10 and 413-02-13 (Table 41B1, 41B2, 41D, 604B1, 604B2, 605B1 and 605B2) the open circuit voltage has been presumed to be 240 V for nominal supply voltage U_o of 230 V.

The tabulated values are applicable for supplies from regional electricity companies. For other supplies the designer will need to determine open circuit voltages and calculate Z_s accordingly.

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U. A. E. الامارات العربیة المتحدة

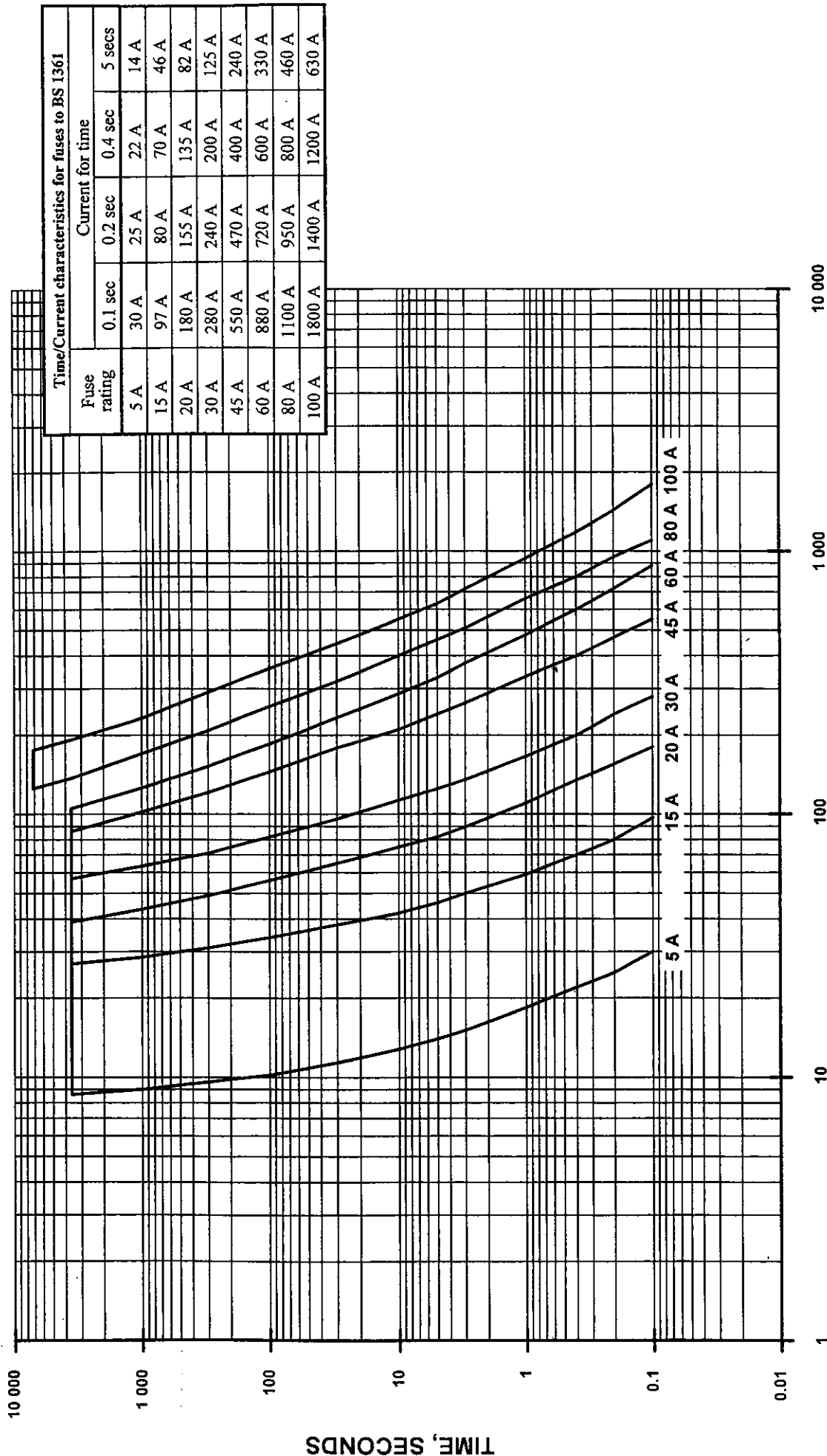
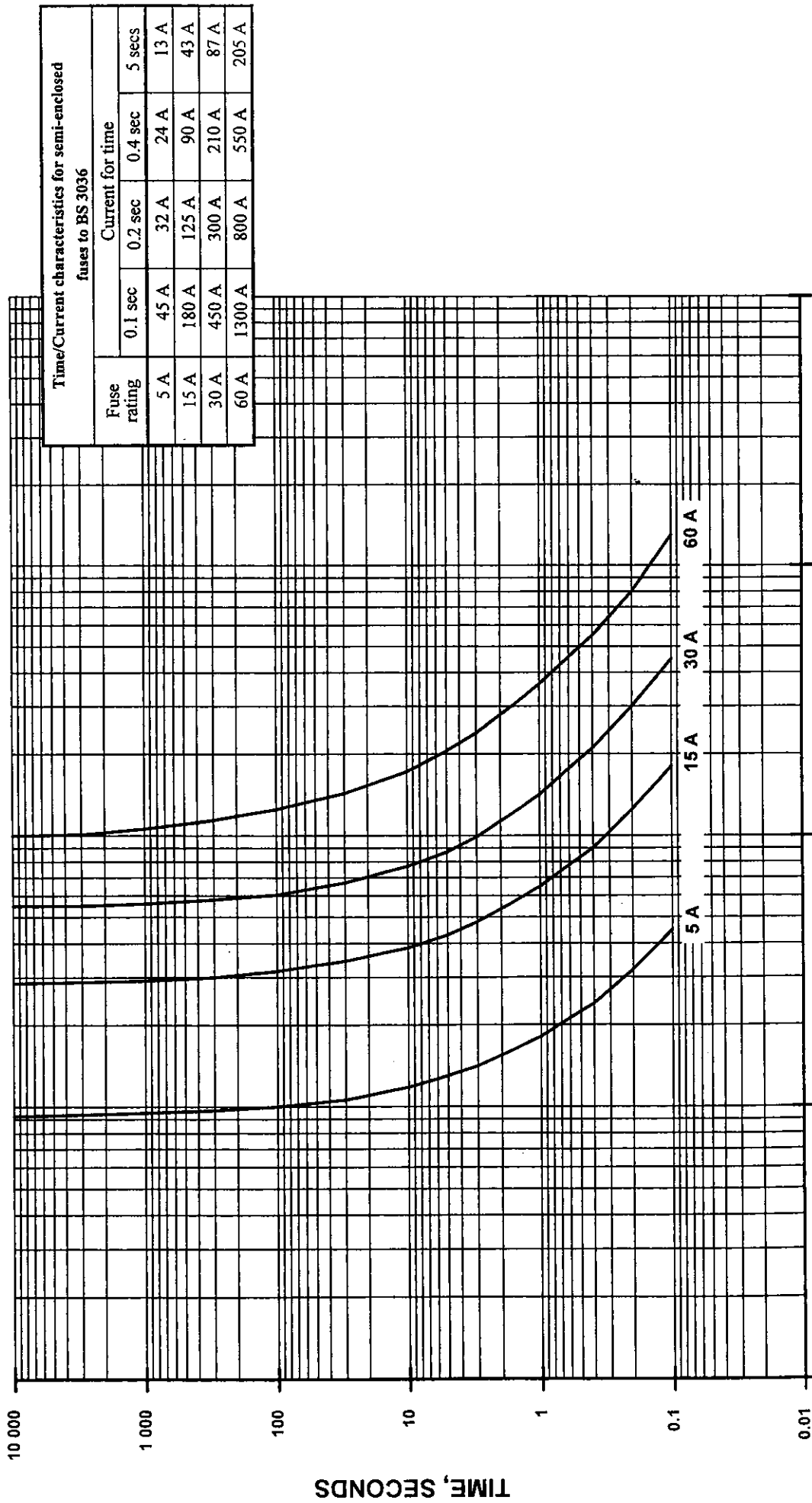


fig. 1 PROSPECTIVE CURRENT, r.m.s. AMPERES



PROSPECTIVE CURRENT, r.m.s. AMPERES

fig. 2A

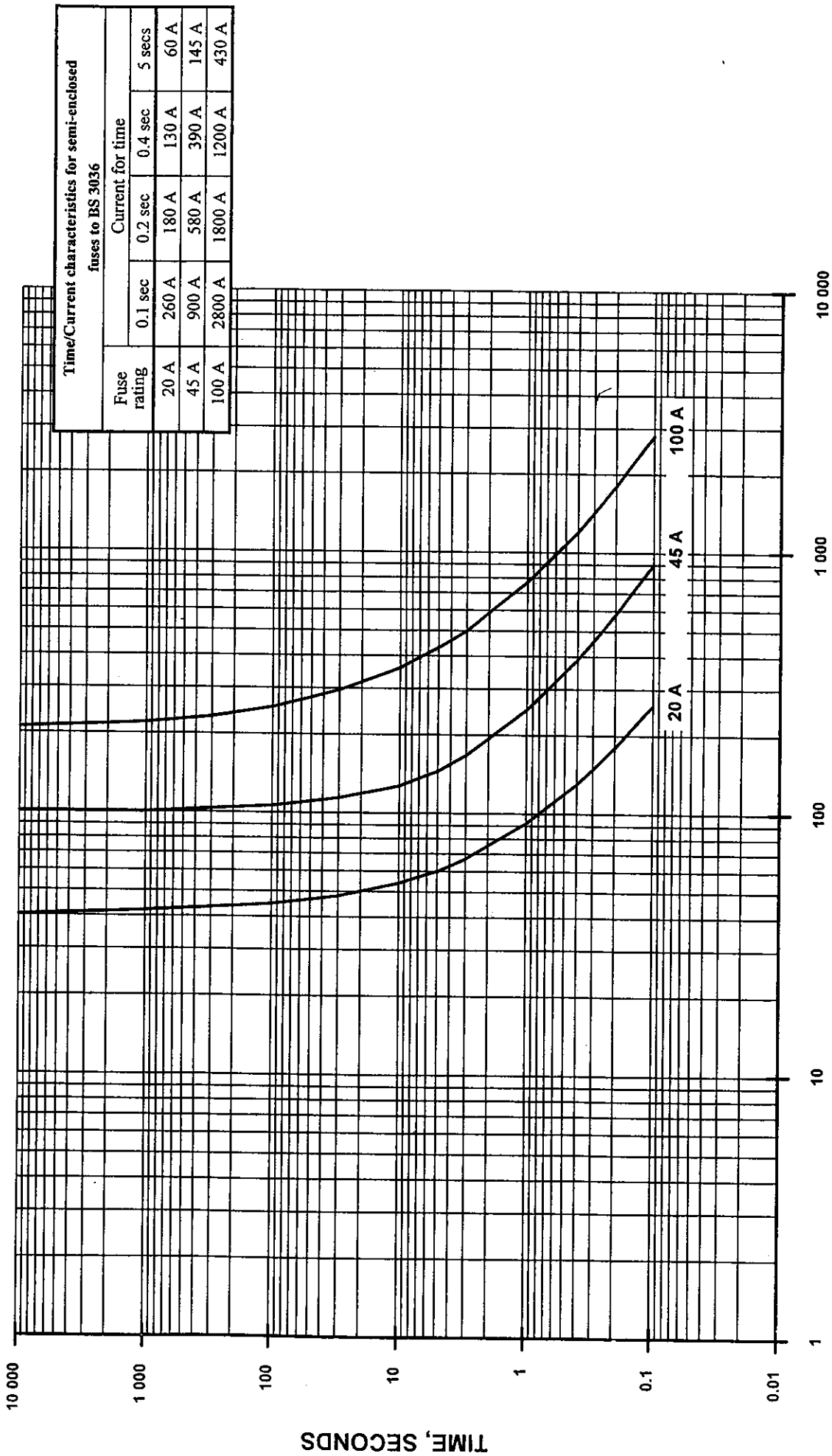
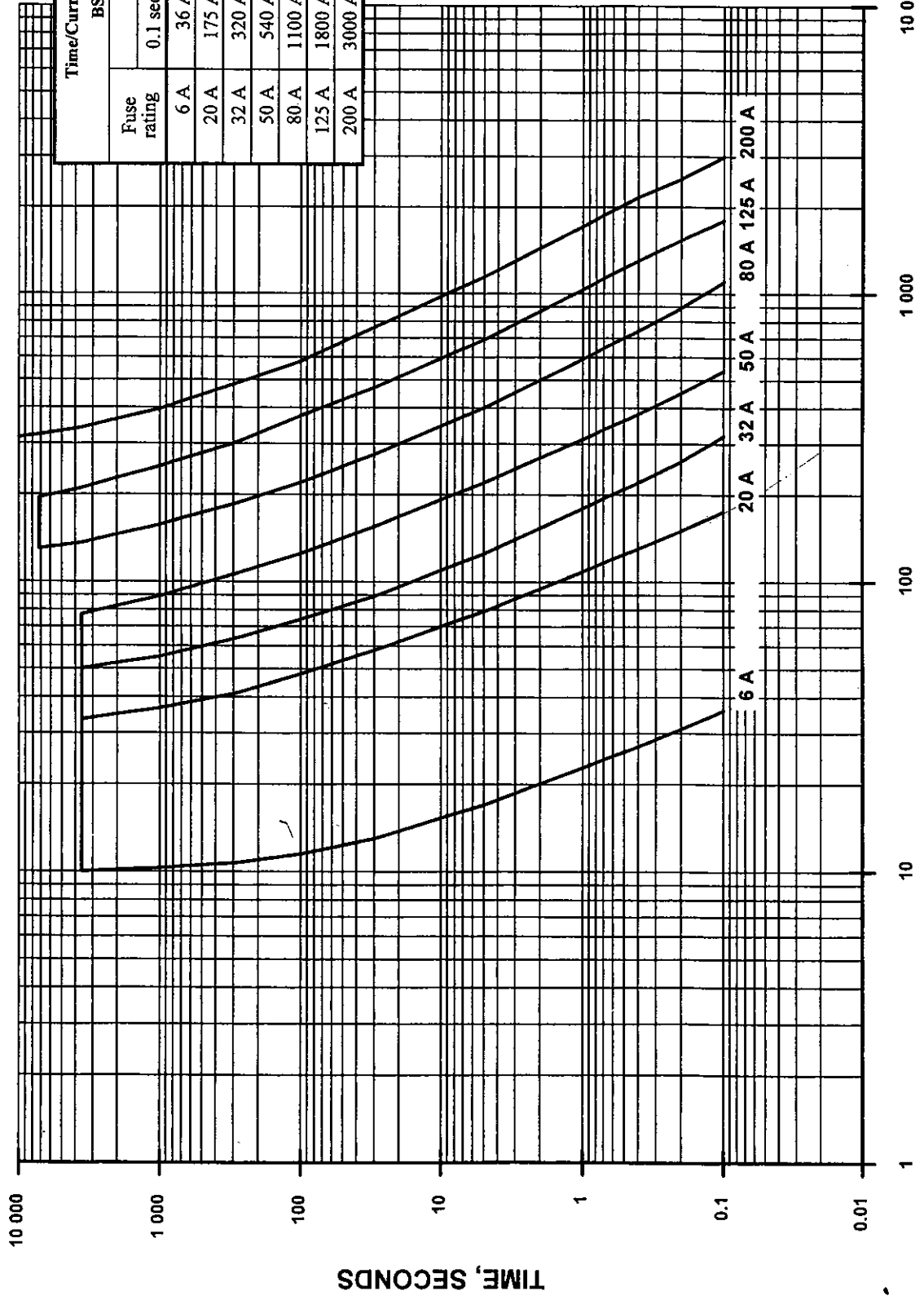


fig. 2B

PROSPECTIVE CURRENT, r.m.s. AMPERES



**Time/Current characteristics for fuses to
BS 88: Part 2 and Part 6**

Fuse rating	Current for time			
	0.1 sec	0.2 sec	0.4 sec	5 secs
6 A	36 A	31 A	27 A	17 A
20 A	175 A	150 A	130 A	79 A
32 A	320 A	260 A	220 A	125 A
50 A	540 A	450 A	380 A	220 A
80 A	1100 A	890 A	740 A	400 A
125 A	1800 A	1500 A	1300 A	690 A
200 A	3000 A	2500 A	2200 A	1200 A

fig. 3A

PROSPECTIVE CURRENT, r.m.s. AMPERES

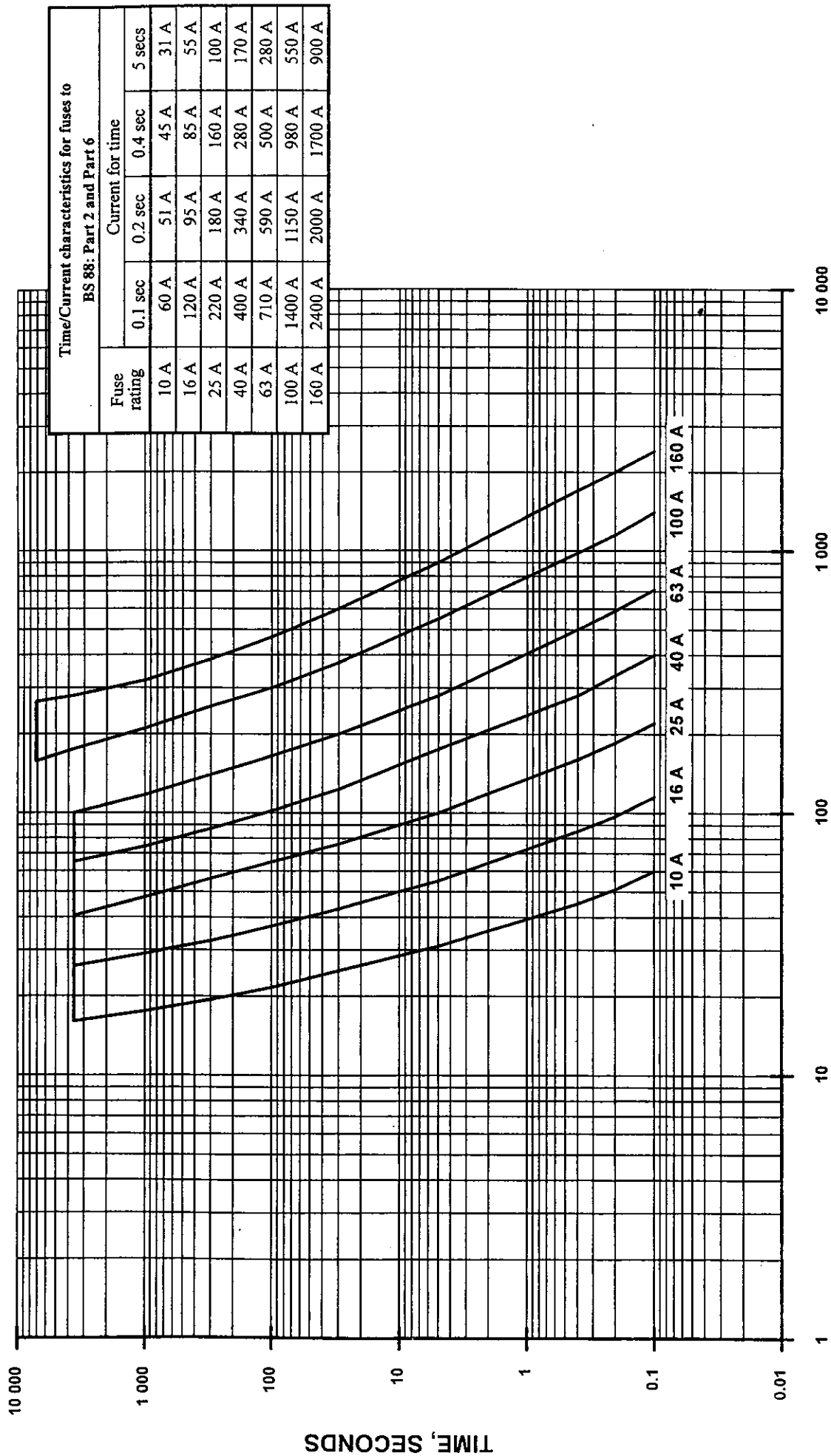
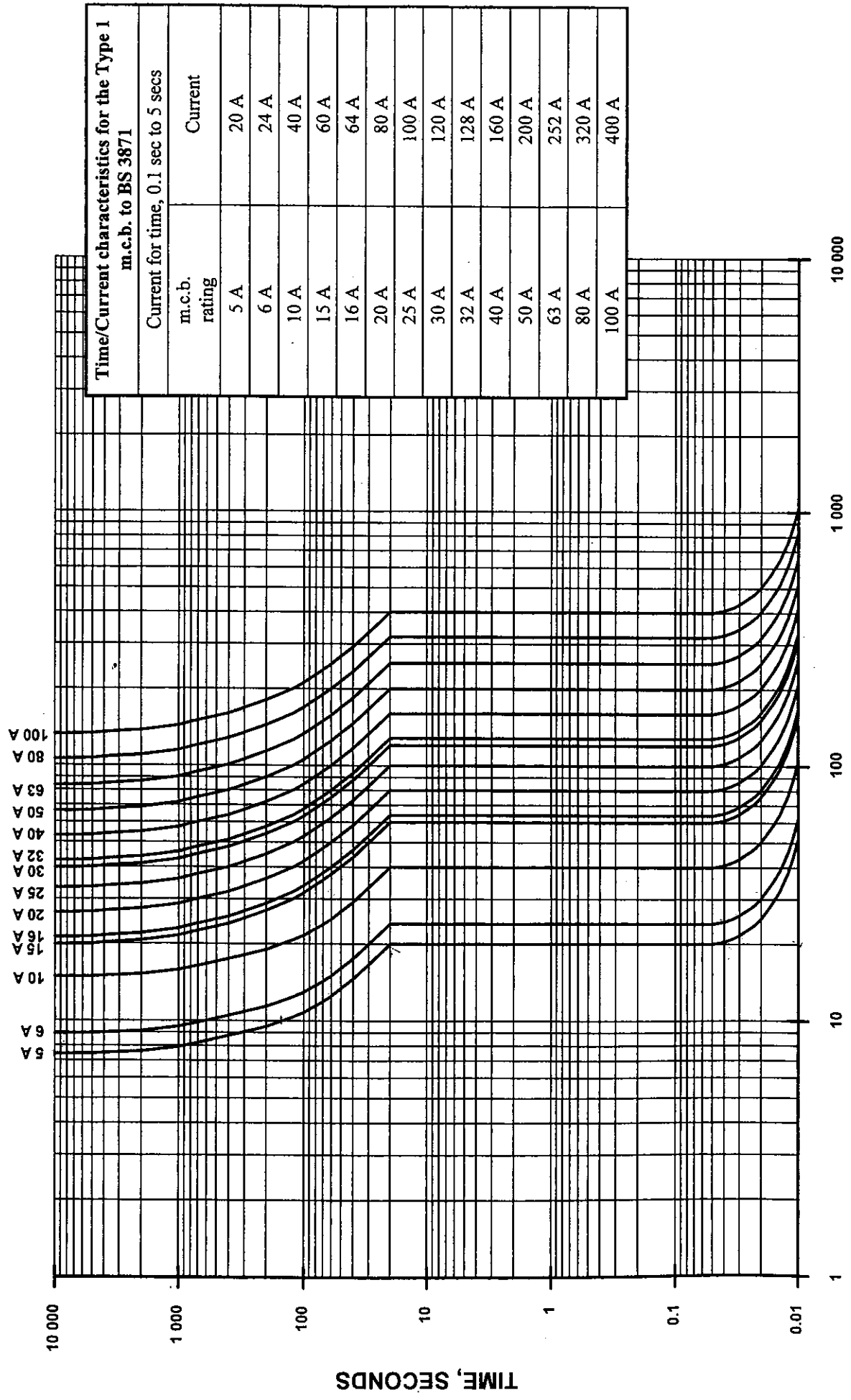


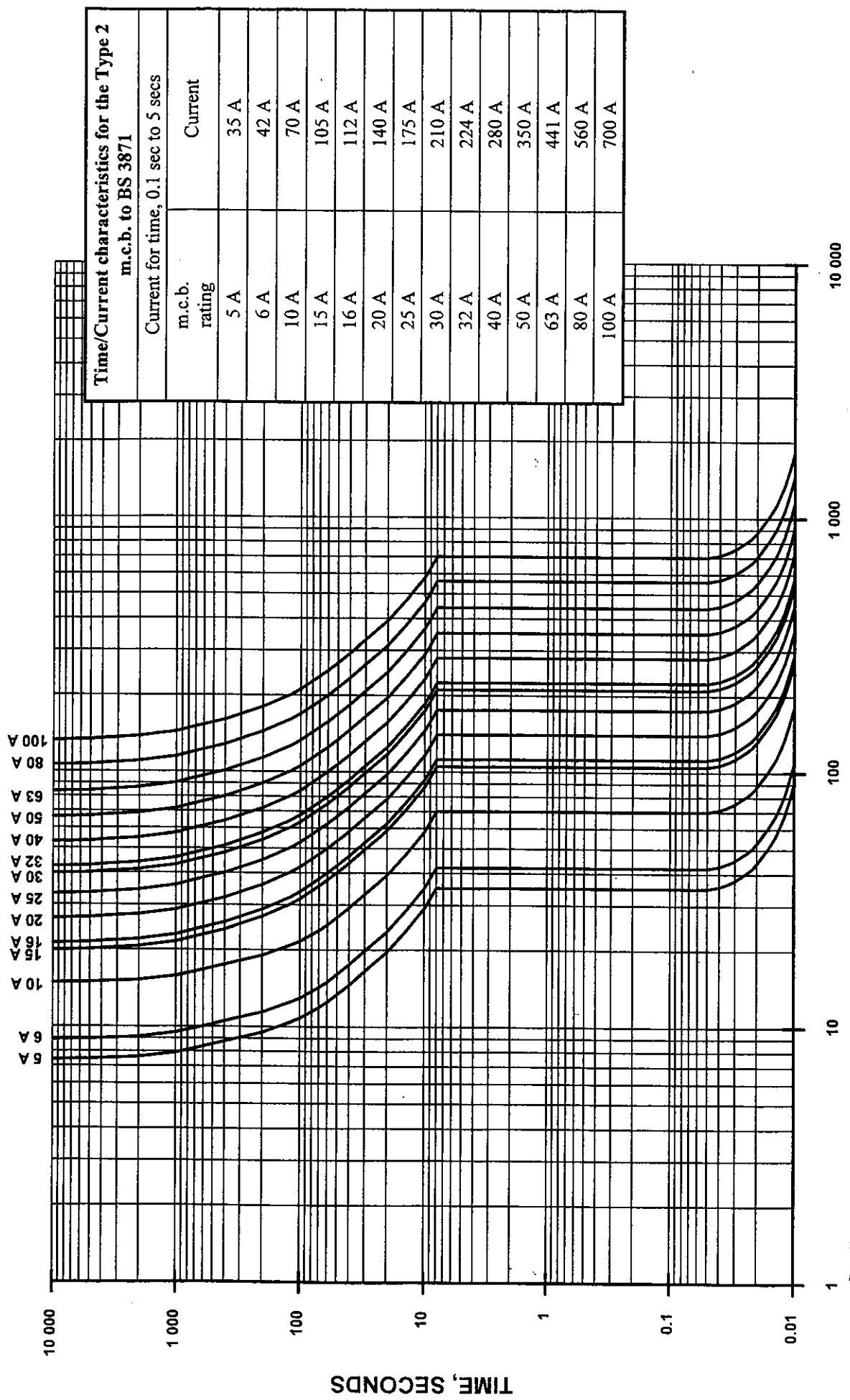
fig. 3B

PROSPECTIVE CURRENT, r.m.s. AMPERES



PROSPECTIVE CURRENT, r.m.s. AMPERES

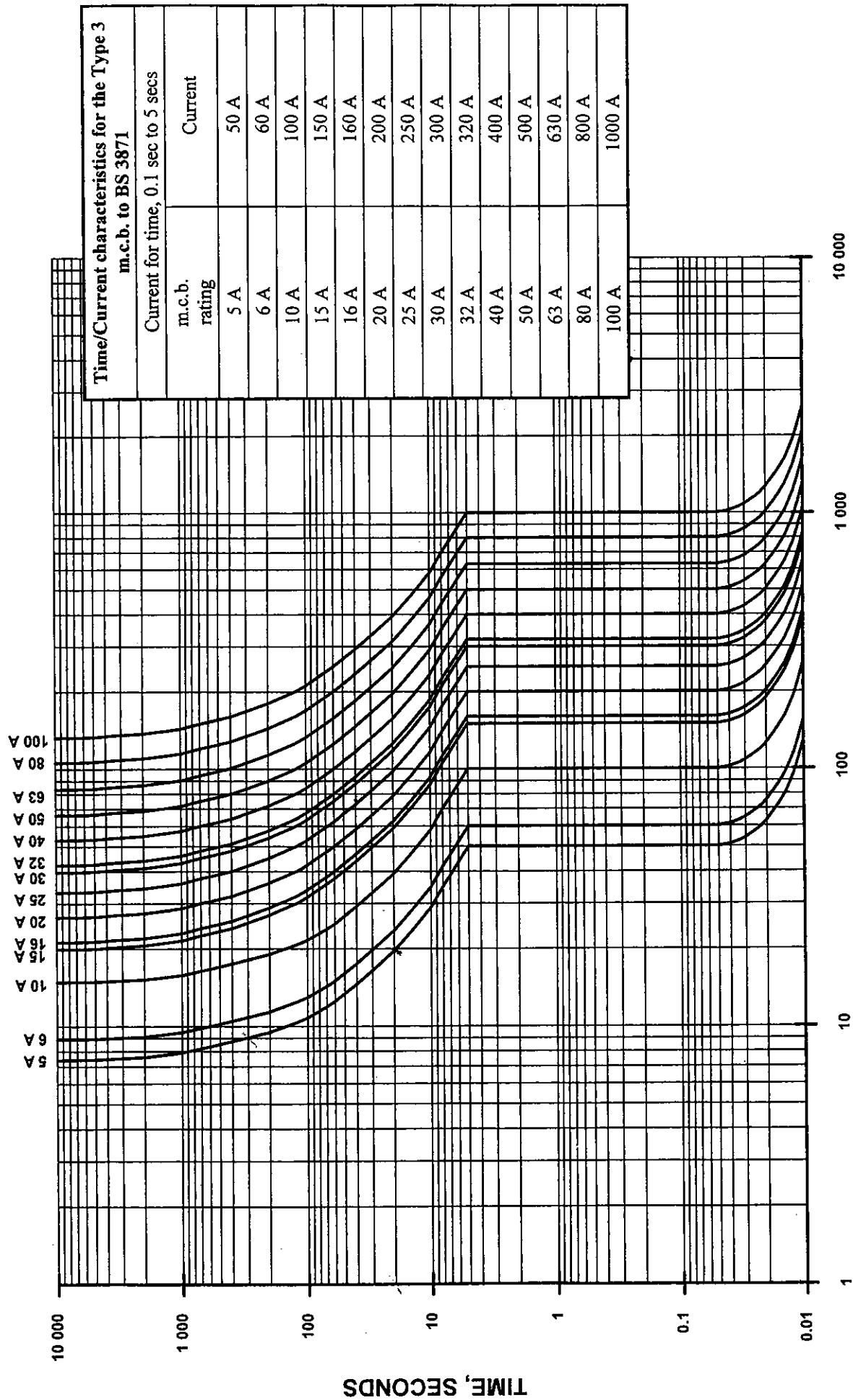
fig. 4



PROSPECTIVE CURRENT, r.m.s. AMPERES

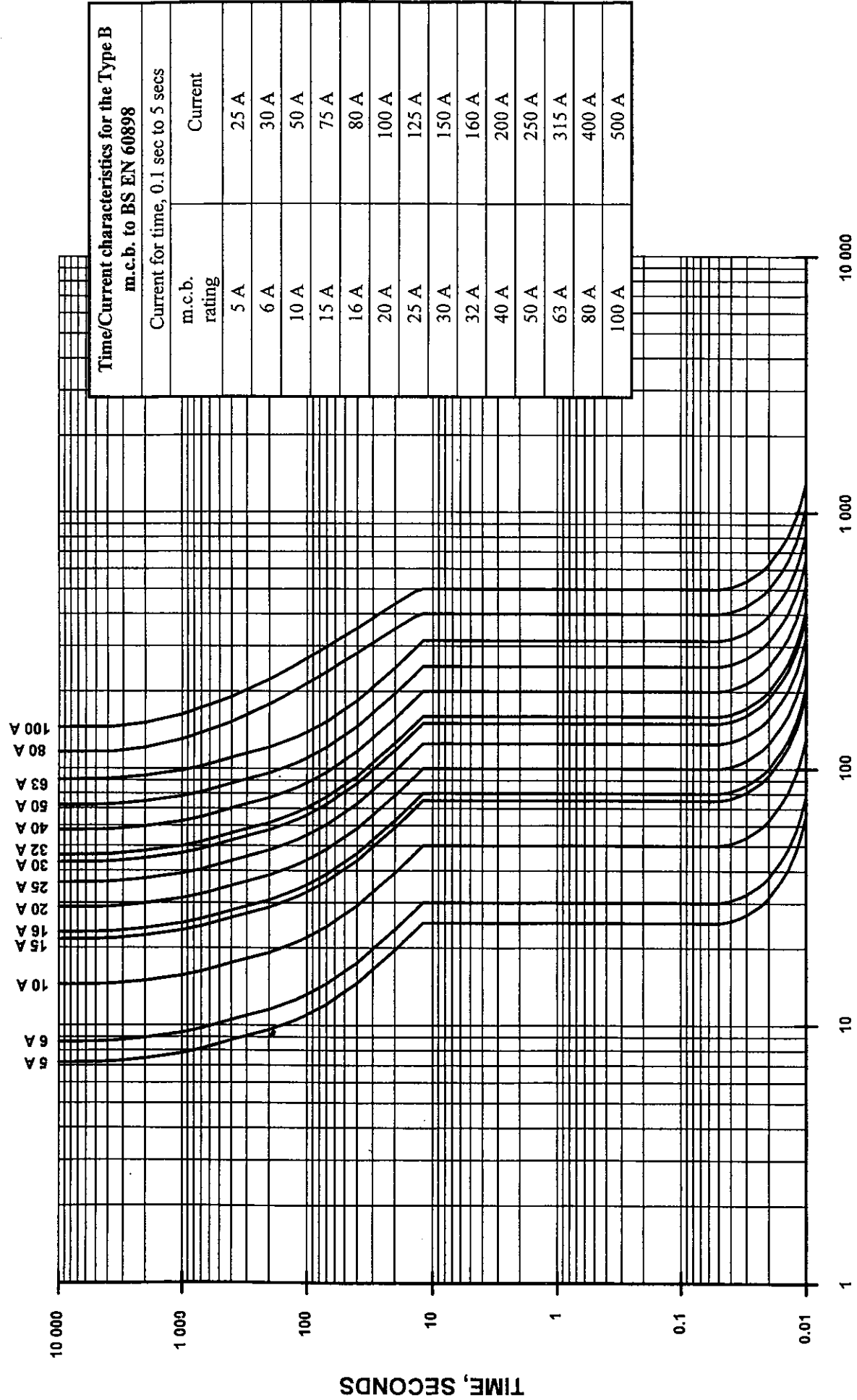
fig. 5

TIME, SECONDS



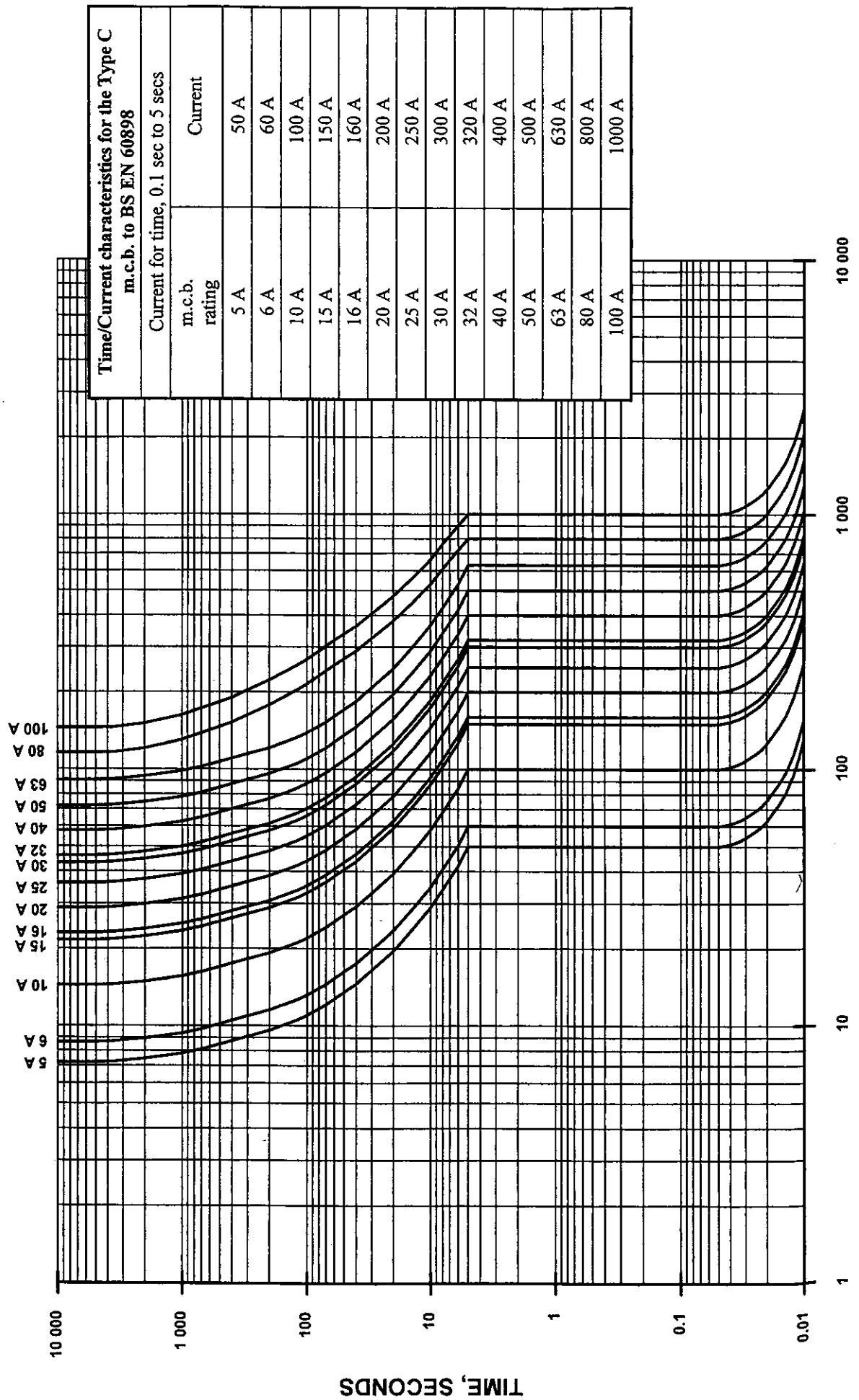
PROSPECTIVE CURRENT, r.m.s. AMPERES

fig. 6



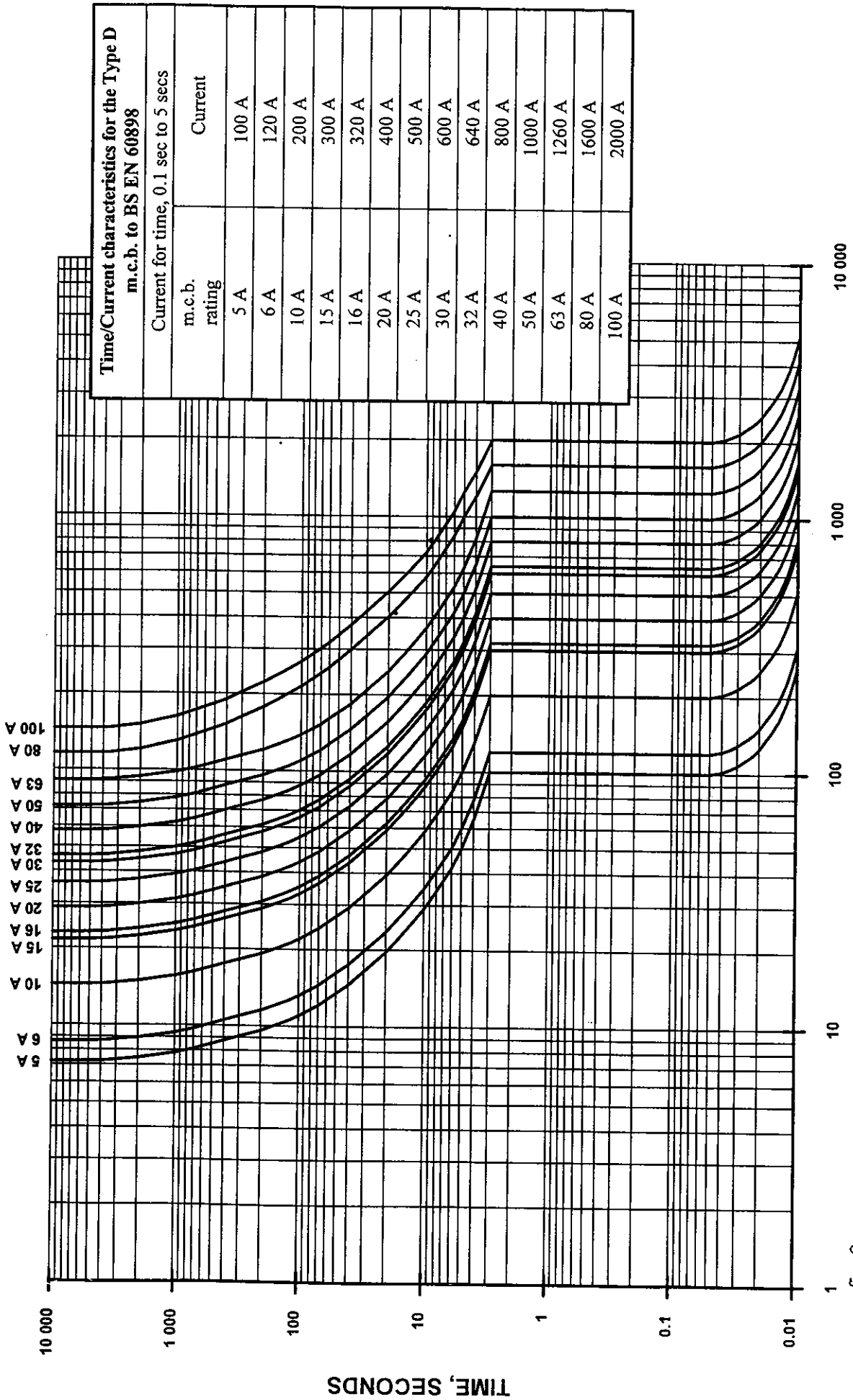
PROSPECTIVE CURRENT, r.m.s. AMPERES

fig. 7



PROSPECTIVE CURRENT, r.m.s. AMPERES

fig. 8



Time/Current characteristics for the Type D m.c.b. to BS EN 60898

Current for time, 0.1 sec to 5 secs

m.c.b. rating	Current
5 A	100 A
6 A	120 A
10 A	200 A
15 A	300 A
16 A	320 A
20 A	400 A
25 A	500 A
30 A	600 A
32 A	640 A
40 A	800 A
50 A	1000 A
63 A	1260 A
80 A	1600 A
100 A	2000 A

PROSPECTIVE CURRENT, r.m.s. AMPERES

fig. 9

APPENDIX 4

CURRENT-CARRYING CAPACITY AND VOLTAGE DROP FOR CABLES AND FLEXIBLE CORDS

CONTENTS

Preface to the tables.

Tables:

- 4A Schedule of Installation Methods of Cables (including Reference Method)
- 4B1 Correction factors for groups of more than one circuit of single-core cables, or more than one multicore cable
- 4B2 Correction factors for mineral insulated cables
- 4B3 Correction factors for cables in enclosed trenches
- 4C1 Correction factors for ambient temperature where protection is against short circuit only
- 4C2 Correction factors for ambient temperature where protection against overload is provided by a BS 3036 fuse

COPPER CONDUCTORS

PVC-INSULATED CABLES

- 4D1 Single-core non-armoured, with or without sheath
- 4D2 Multicore non-armoured
- 4D3 Single-core armoured (non-magnetic armour)
- 4D4 Multicore armoured

CABLES HAVING THERMOSETTING INSULATION

- 4E1 Single-core non-armoured, with or without sheath
- 4E2 Multicore non-armoured
- 4E3 Single-core armoured (non-magnetic armour)
- 4E4 Multicore armoured

85°C RUBBER-INSULATED CABLES

- 4F1 Single-core non-armoured
- 4F2 Multicore non-armoured

FLEXIBLE CABLES AND CORDS

- 4H1 60°C rubber-insulated flexible cables
- 4H2 85°C and 150°C rubber-insulated flexible cables
- 4H3 Flexible cords

MINERAL INSULATED CABLES

- 4J1 Bare and exposed to touch, or having an overall covering of pvc - for Reference Method 1
Bare and exposed to touch, or having an overall covering of pvc - for Reference Method 11
Bare and exposed to touch, or having an overall covering of pvc - for Reference Methods 12 and 13
- 4J2 Bare and neither exposed to touch nor in contact with combustible materials - for Reference Method 1
Bare and neither exposed to touch nor in contact with combustible materials - for Reference Methods 12 and 13

ALUMINIUM CONDUCTORS

PVC- INSULATED CABLES

- 4K1 Single-core non-armoured, with or without sheath
- 4K2 Multicore non-armoured
- 4K3 Single-core armoured (non-magnetic armour)
- 4K4 Multicore armoured

CABLES HAVING THERMOSETTING INSULATION

- 4L1 Single-core, non-armoured
- 4L2 Multicore, non-armoured
- 4L3 Single-core armoured (non-magnetic armour)
- 4L4 Multicore armoured

APPENDIX 4

CURRENT-CARRYING CAPACITY AND VOLTAGE DROP FOR CABLES AND FLEXIBLE CORDS

PREFACE TO THE TABLES

1. Basis of tabulated current-carrying capacity

The current-carrying capacity set out in this appendix takes account of IEC Publication 364-5-523 (1983), so far as the latter is applicable. For types of cable not treated in the IEC publication (e.g. armoured cables) the current-carrying capacities given in this appendix are based on data provided by ERA Technology Ltd, and the British Cable Makers' Confederation. See also the ERA Report 69-30 "Current rating standards for distribution cables"*.

The tabulated current-carrying capacity relates to continuous loading and is also known as the 'full thermal current rating' of the cable, corresponding to the conductor operating temperature indicated in the headings to the tables concerned. It is intended to provide for a satisfactory life of conductor and insulation subject to the thermal effects of carrying current for sustained periods in normal service. A cable may be seriously damaged, leading to early failure, or its service life may be significantly reduced, if it is operated for any prolonged period at a temperature higher than the indicated value.

In addition, there are other considerations affecting the choice of the cross-sectional area of a conductor, such as the requirements for protection against electric shock (see Chapter 41), protection against thermal effects (see Chapter 42), overcurrent protection (see Chapter 43 and item 5 below), voltage drop (see item 7 below) and the limiting temperatures for terminals of equipment to which the conductors are connected.

The tabulated current-carrying capacity relates to a single circuit in the installation methods shown in Table 4A, in an ambient air temperature of 30°C. The current-carrying capacities given in the tables for a.c. operation apply only to frequencies in the range 49 to 61 Hz. For other conditions appropriate correction factors are to be applied as described below.

The current ratings given for single-core armoured cable are for the condition of armour bonded at both ends and to earth.

Further information on cables installed in thermal insulation may be obtained from ERA Report 85-0111. "The temperature rise of cables passing through short lengths of thermal insulation"*.

*ERA Technology Ltd, Cleeve Road, LEATHERHEAD, Surrey, United Kingdom KT22 7SA.

2. Correction factors for current-carrying capacity

The current-carrying capacity of a cable for continuous service is affected by ambient temperature, by grouping, by partial or total enclosure in thermal insulating material and, for a.c., by frequency. This appendix provides correction factors in these respects as follows:

2.1 *Ambient temperature*

Tables 4C1 and 4C2 give the correction factor to be applied to the tabulated current-carrying capacity depending upon the actual ambient temperature of the location in which the cable is to be installed.

In practice the ambient air temperatures may be determined by thermometers placed in free air as close as practicable to the position at which the cables are installed or are to be installed, subject to the proviso that the measurements are not to be influenced by the heat arising from the cables; thus if the measurements are made while the cables are loaded, the thermometers should be placed about 0.5 m or ten times the overall diameter of the cable, whichever is the lesser, from the cables, in the horizontal plane, or 150 mm below the lowest of the cables.

Tables 4C1 and 4C2 do not take account of temperature increase, if any, due to solar or other infra-red radiation. Where cables are subject to such radiation, the current-carrying capacity may need to be specially calculated.

2.2 *Grouping*

Tables 4B1, 4B2 and 4B3 give the correction factor to be applied to the tabulated current-carrying capacity where cables or circuits are grouped.

2.3 Other frequencies

In extreme cases, notably for large multicore cables, the reduction in current-carrying capacity of cables carrying, for example, balanced 400 Hz a.c. compared with the current-carrying capacity at 50 Hz, may be as much as 50%. For small cables and flexible cords, such as may be used to supply individual tools, the difference in the 50 Hz and the 400 Hz current-carrying capacities may be negligible.

3. Effective current-carrying capacity

The current-carrying capacity of a cable corresponds to the maximum current that can be carried in specified conditions without the conductors exceeding the permissible limit of steady state temperature for the type of insulation concerned.

The values of current tabulated represent the effective current-carrying capacity only where no correction factor is applicable. Otherwise the current-carrying capacity corresponds to the tabulated value multiplied by the appropriate factor or factors for ambient temperature, grouping and thermal insulation, as applicable.

Irrespective of the type of overcurrent protective device associated with the conductors concerned, the ambient temperature correction factors to be used when calculating current-carrying capacity (as opposed to those used when selecting cable sizes) are those given in Table 4C1.

4. Relationship of current-carrying capacity to other circuit parameters

The relevant symbols used in the Regulations are as follows:

- I_z the current-carrying capacity of a cable for continuous service, under the particular installation conditions concerned.
- I_t the value of current tabulated in this appendix for the type of cable and installation method concerned, for a single circuit in an ambient temperature of 30°C.
- I_b the design current of the circuit, i.e. the current intended to be carried by the circuit in normal service.
- I_n the nominal current or current setting of the device protecting the circuit against overcurrent.
- I_2 the operating current (i.e. the fusing current or tripping current for the conventional operating time) of the device protecting the circuit against overload.
- C a correction factor to be applied where the installation conditions differ from those for which values of current-carrying capacity are tabulated in this appendix. The various correction factors are identified as follows:
 - C_a for ambient temperature
 - C_g for grouping
 - C_i for thermal insulation
 - C_t for operating temperature of conductor.

In all circumstances I_z must be not less than I_b and I_n also must be not less than I_b .

Where the overcurrent device is intended to afford protection against overload, I_2 must not exceed 1.45 I_z and I_n must not exceed I_z (see item 5 below).

Where the overcurrent device is intended to afford short circuit protection only, I_n can be greater than I_z and I_2 can be greater than 1.45 I_z . The protective device is then to be selected for compliance with Regulation 434-03-03.

5. Overload protection

Where overload protection is required, the type of protection provided does not affect the current-carrying capacity of a cable for continuous service (I_z) but it may affect the choice of conductor size. The operating conditions of a cable are influenced not only by the limiting conductor temperature for continuous service, but also by the conductor temperature which might be attained during the conventional operating time of the overload protection device, in the event of an overload.

This means that the operating current of the protective device must not exceed 1.45 I_z . Where the protective device is a fuse to BS 88 or BS 1361 or a miniature circuit-breaker to BS 3871 or BS EN 60898, this requirement is satisfied by selecting a value of I_2 not less than I_n .

In practice, because of the standard steps in nominal rating of fuses and circuit-breakers, it is often necessary to select a value of I_n exceeding I_b . In that case, because it is also necessary for I_z in turn to be not less than the

selected value of I_n , the choice of conductor cross-sectional area may be dictated by the overload conditions and the current-carrying capacity (I_z) of the conductors will not always be fully used.

The size needed for a conductor protected against overload by a BS 3036 semi-enclosed fuse can be obtained by the use of a correction factor, $1.45/2=0.725$, which results in the same degree of protection as that afforded by other overload protective devices. This factor is to be applied to the nominal rating of the fuse as a divisor, thus indicating the minimum value of I_t required of the conductor to be protected. In this case also, the choice of conductor size is dictated by the overload conditions and the current-carrying capacity (I_z) of the conductors cannot be fully used.

6. Determination of the size of cable to be used

Having established the design current (I_b) of the circuit under consideration, the appropriate procedure described in items 6.1 to 6.4 below will enable the designer to determine the size of the cable it will be necessary to use.

As a preliminary step it is useful to identify the length of the cable run and the permissible voltage drop for the equipment being supplied, as this may be an over-riding consideration (see Regulation 525-01 and item 7 of this appendix). The permissible voltage drop in mV, divided by I_b and by the length of run, will give the value of voltage drop in mV/A/m which can be tolerated. A voltage drop not exceeding that value is identified in the appropriate table and the corresponding cross-sectional area of conductor needed on this account can be read off directly before any other calculations are made.

The conductor size necessary from consideration of the conditions of normal load and overload is then determined. All correction factors affecting I_z (i.e. the factors for ambient temperature, grouping and thermal insulation) can, if desired, be applied to the values of I_t as multipliers. This involves a process of trial and error until a cross-sectional area is reached which ensures that I_z is not less than I_b and not less than I_n of any protective device it is intended to select. In any event, if a correction factor for protection by a semi-enclosed fuse is necessary, this has to be applied to I_n as a divisor. It is therefore more convenient to apply all the correction factors to I_n as divisors.

This method is used in items 6.1 to 6.3 and produces a value of current and that value (or the next larger value) can readily be located in the appropriate table of current-carrying capacity and the corresponding cross-sectional area of conductor can be identified directly. It should be noted that the value of I_t appearing against the chosen cross-sectional area is not I_z . It is not necessary to know I_z where the size of conductor is chosen by this method, but if it is desired to identify I_z the value is determined by the method indicated in item 3 above.

However, this method cannot be used for cables installed in enclosed trenches (installation methods 18, 19 and 20 of Table 4A) because the correction factors given in Table 4B3 are related to conductor cross-sectional areas. For such cables it is therefore necessary to use the process of trial and error described in the third paragraph above, selecting on a trial basis a particular size of cable from, for instance, voltage drop considerations.

6.1 *Where overload protection is afforded by a fuse to BS 88 or BS 1361, or a miniature circuit-breaker to BS 3871 or BS EN 60898.*

6.1.1 *For single circuits*

- DIVIDE the nominal current of the protective device (I_n) by any applicable correction factor for ambient temperature (C_a) given in Table 4C1.

- then further DIVIDE by any applicable correction factor for thermal insulation (C_i).

The size of cable to be used is to be such that its tabulated current-carrying capacity (I_t) is not less than the value of nominal current of the protective device adjusted as above:

$$I_t \geq \frac{I_n}{C_a C_i} \quad (1)$$

6.1.2 *For groups*

- DIVIDE the nominal current of the protective device (I_n) by the correction factor for grouping (C_g) given in Tables 4B1, 4B2 or 4B3:

$$I_t \geq \frac{I_n}{C_g} \quad (2)$$

Alternatively, it may be selected in accordance with the following formulae, provided that the circuits of the group are not liable to simultaneous overload:

$$I_t \geq \frac{I_b}{C_g}, \text{ and} \quad (3)$$

$$I_t \geq \sqrt{I_n^2 + 0.48 I_b^2 \left(\frac{1 - C_g^2}{C_g^2} \right)} \quad (4)$$

The size of cable to be used is to be such that its tabulated single-circuit current-carrying capacity (I_t) is not less than the value of I_t calculated in accordance with formula (2) above or, where formulae (3) and (4) are used not less than the larger of the resulting two values of I_t .

Where correction factors C_a and/or C_i are applicable, they are to be applied as divisors to the value of I_t determined by the above formulae.

6.2 *Where the protective device is a semi-enclosed fuse to BS 3036:*

6.2.1 *For single circuits*

- DIVIDE the nominal current of the fuse (I_n) by any applicable correction factor for ambient temperature (C_a) given in Table 4C2
- then further DIVIDE by any applicable correction factor for thermal insulation, (C_i)
- then further DIVIDE by 0.725.

The size of cable to be used is to be such that its tabulated current-carrying capacity (I_t) is not less the value of nominal current of the fuse adjusted as above:

$$I_t \geq \frac{I_n}{0.725 C_a C_i} \quad (5)$$

6.2.2 *For groups*

- DIVIDE the nominal current of the fuse I_n by 0.725 and by the applicable correction factor for grouping (C_g) given in Table 4B1, 4B2 or 4B3:

$$I_t \geq \frac{I_n}{0.725 C_g} \quad (6)$$

Alternatively, it may be selected by the following formulae, provided that the circuits of the group are not liable to simultaneous overload:

$$I_t \geq \frac{I_b}{C_g}, \text{ and} \quad (7)$$

$$I_t \geq \sqrt{1.9 I_n^2 + 0.48 I_b^2 \left(\frac{1 - C_g^2}{C_g^2} \right)} \quad (8)$$

The size of cable to be used is to be such that its tabulated single-circuit current-carrying capacity (I_t) is not less than the value of I_t calculated in accordance with formula (6) above or, where formulae (7) and (8) are used, not less than the larger of the resulting two values of I_t .

Where correction factors C_a and/or C_i are applicable, they are to be applied as divisors to the value of I_t determined by the above formulae.

6.3 *Where overload protection is not required:*

Where Regulation 473-01-04 applies, and the cable under consideration is not required to be protected against overload, the design current of the circuit (I_b) is to be divided by any applicable correction factors, and the size of the cable to be used is to be such that its tabulated current-carrying capacity (I_t) for the installation method concerned is not less than the value of I_b adjusted as above:

$$I_t \geq \frac{I_b}{C_a C_g C_i} \quad (9)$$

6.4 Variation of installation conditions along a cable route

The procedures in items 6.1 to 6.3 above are based on the assumption that all the conditions necessitating the use of correction factors apply to the same part of the route of the conductors of the circuit. Where various factors apply to different parts of the route, each part may be treated separately, or alternatively only the factor or combination of factors appropriate to the most onerous conditions encountered along the route may be applied to the whole of the route. It is permissible to obtain more precise factors by calculation of the various conductor temperature rises that will occur along such a route, provided that the appropriate limiting temperature of the conductor is nowhere exceeded (see Regulation 523-01).

7. Tables of voltage drop

In the tables, values of voltage drop are given for a current of one ampere for a metre run, i.e. for a distance of 1 m along the route taken by the cables, and represent the result of the voltage drops in all the circuit conductors. The values of voltage drop assume that the conductors are at their maximum permitted normal operating temperatures.

The values in the tables, for a.c. operation, apply only to frequencies in the range 49 to 61 Hz and for single-core armoured cables the tabulated values apply where the armour is bonded to earth at both ends. The values of voltage drop for cables operating at higher frequencies may be substantially greater.

For a given run, to calculate the voltage drop (in mV) the tabulated value of voltage drop per ampere per metre for the cable concerned has to be multiplied by the length of the run in metres and by the current the cable is intended to carry, namely the design current of the circuit (I_b) in amperes. For three-phase circuits the tabulated mV/A/m values relate to the line voltage and balanced conditions have been assumed.

For cables having conductors of 16 mm² or less cross-sectional area their inductances can be ignored and (mV/A/m)_r values only are tabulated. For cables having conductors greater than 16 mm², cross-sectional area the impedance values are given as (mV/A/m)_z, together with the resistive component (mV/A/m)_r and the reactive component (mV/A/m)_x.

The *direct* use of the tabulated (mV/A/m)_r or (mV/A/m)_z values, as appropriate, may lead to pessimistically high calculated values of voltage drop or, in other words, to unnecessarily low values of permitted circuit lengths.

For example, where the design current of a circuit is significantly less than the effective current-carrying capacity of the cable chosen, the actual voltage drop would be less than the calculated value because the conductor temperature (and hence its resistance) will be less than that on which the tabulated mV/A/m had been based.

As regards power factor in a.c. circuits the use of the tabulated mV/A/m values, (for the larger cable sizes, the tabulated (mV/A/m)_z values) to calculate the voltage drop is strictly correct only when the phase angle of the cable equals that of the load. When the phase angle of the cable does not equal that of the load, the direct use of the tabulated mV/A/m or (mV/A/m)_z values leads to a calculated value of voltage drop higher than the actual value. In some cases it may be advantageous to take account of the load power factor when calculating voltage drop.

Where a more accurate assessment of voltage drop is desirable the following methods may be used.

7.1 Correction for operating temperature

For cables having conductors of cross-sectional area 16 mm² or less the design value of mV/A/m is obtained by multiplying the tabulated value by a factor C_t , given by

$$C_t = \frac{230 + t_p - \left(C_a^2 C_g^2 - \frac{I_b^2}{I_t^2} \right) (t_p - 30)}{230 + t_p} \quad (10)$$

where t_p is the maximum permitted normal operating temperature, (°C)

This equation applies only where the overcurrent protective device is other than a BS 3036 fuse and where the actual ambient temperature is equal to or greater than 30°C

NOTE: For convenience, the above formula is based on the resistance-temperature coefficient of 0.004 per °C at 20°C for both copper and aluminium conductors.

For cables having conductors of cross-sectional area greater than 16 mm², only the resistive component of the voltage drop is affected by the temperature and the factor C_t is therefore applied only to the tabulated value of (mV/A/m)_r and the design value of (mV/A/m)_z is given by the vector sum of C_t (mV/A/m)_r and (mV/A/m)_x.

For very large conductor sizes where the resistive component of voltage drop is much less than the corresponding reactive part (i.e. when $x/r \geq 3$) this correction factor need not be considered.

7.2 Correction for load power factor

For cables having conductors of cross-sectional area of 16 mm^2 or less the design value of mV/A/m is obtained approximately by multiplying the tabulated value by the power factor of the load, $\cos \theta$.

For cables having conductors of cross-sectional area greater than 16 mm^2 the design value of mV/A/m is given approximately by:

$$\cos \theta (\text{tabulated } (\text{mV/A/m})_r) + \sin \theta (\text{tabulated } (\text{mV/A/m})_x)$$

For single-core cables in flat formation the tabulated values apply to the outer cables and may under-estimate for the voltage drop between an outer cable and the centre cable for cross-sectional areas above 240 mm^2 , and power factors greater than 0.8.

7.3 Combined correction for both operating temperature and load power factor

From items 7.1 and 7.2 above, where it is considered appropriate to correct the tabulated mV/A/m values for both operating temperature and load power factor, the design values of mV/A/m are given by:

for cables having conductors of 16 mm^2 or less cross-sectional area

$$C_t \cos \theta (\text{tabulated } \text{mV/A/m})$$

for cables having conductors of cross-sectional area greater than 16 mm^2

$$C_t \cos \theta (\text{tabulated } (\text{mV/A/m})_r) + \sin \theta (\text{tabulated } (\text{mV/A/m})_x).$$

8. Methods of installation of cables

Table 4A lists the methods of installation for which this appendix provides guidance for the selection of the appropriate cable size. The methods of installation distinguished by bold type are reference methods for which the current-carrying capacities given in Tables 4D1 to 4L4 have been determined. For the other methods, an indication is given of the appropriate reference method having values of current-carrying capacity which can safely be applied.

As stated in Regulation 521-07-01 the use of other methods is not precluded, where specified by a suitably qualified electrical engineer; in that case the evaluation of current-carrying capacity may need to be based on experimental work.

TABLE 4A

Schedule of Installation Methods of Cables (including Reference Method)

Installation method		Examples	Appropriate Reference Method for determining current-carrying capacity
Number	Description		
1	2	3	4
Open and clipped direct:			
1	Sheathed cables clipped direct to or lying on a non-metallic surface		Method 1
Cables embedded direct in building materials:			
2	Sheathed cables embedded directly in masonry, brickwork, concrete, plaster or the like (other than thermally insulating materials)		Method 1
In conduit:			
3	Single-core non-sheathed cables in metallic or non-metallic conduit on a wall or ceiling		Method 3
4	Single-core non-sheathed cables in metallic or non-metallic conduit in a thermally insulating wall or above a thermally insulating ceiling, the conduit being in contact with a thermally conductive surface on one side †		Method 4
5	Multicore cables having non-metallic sheath, in metallic or non-metallic conduit on a wall or ceiling		Method 3

† The wall is assumed to consist of an outer weatherproof skin, thermal insulation and an inner skin of plasterboard or wood-like material having a coefficient of heat transfer not less than 10 W/m²K. The conduit is fixed so as to be close to, but not necessarily touching, the inner skin. Heat from the cables is assumed to escape through the inner skin only.

TABLE 4A (continued)

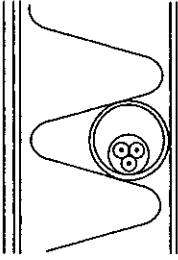
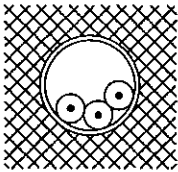
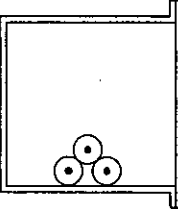
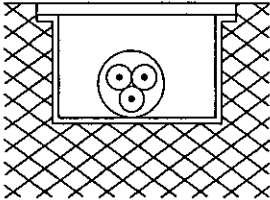
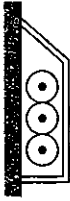
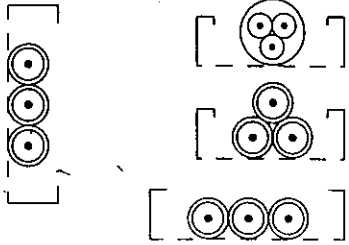
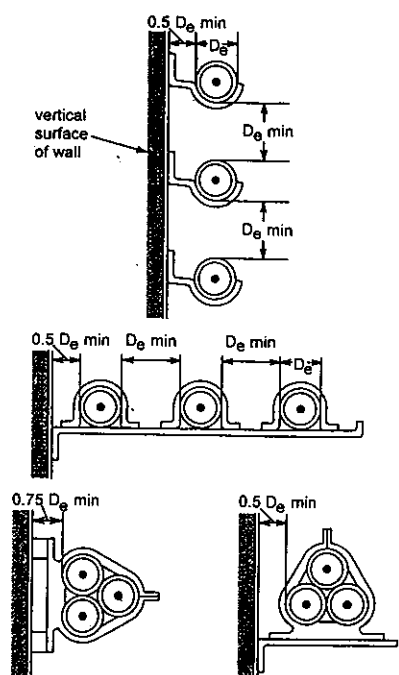
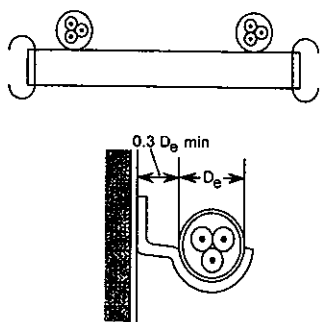

Installation method		Examples	Appropriate Reference Method for determining current-carrying capacity
Number	Description		
1	2	3	4
6	Sheathed cables in conduit in a thermally insulating wall etc. (otherwise as Reference Method 4)		Method 4
7	Cables in conduit embedded in masonry, brickwork, concrete, plaster or the like (other than thermally insulating materials)		Method 3
In trunking:			
8	Cables in trunking on a wall or suspended in the air		Method 3
9	Cables in flush floor trunking		Method 3
10	Single-core cables in skirting trunking		Method 3
On trays:			
11	Sheathed cables on a perforated cable tray, bunched and unenclosed. A perforated cable tray is considered as a tray in which the holes occupy at least 30% of the surface area		Method 11

TABLE 4A (continued)

Installation method		Examples	Appropriate Reference Method for determining current-carrying capacity
Number	Description		
1	2	3	4

In free air, on cleats, brackets or a ladder:

<p>12</p> <p>Sheathed single-core cables in free air (any supporting metalwork under the cables occupying less than 10% of the plan area):</p> <p>Two or three cables vertically one above the other, minimum distance between cable surfaces equal to the overall cable diameter (D_e); distance from the wall not less than $0.5D_e$</p> <p>Two or three cables horizontally, with spacings as above</p> <p>Three cables in trefoil, distance between wall and surface of nearest cable $0.5D_e$ or nearest cables $0.75D_e$</p>		<p>Method 12</p>
<p>13</p> <p>Sheathed multicore cables on ladder or brackets, separation greater than $2D_e$</p> <p>Sheathed multicore cables in free air distance between wall and cable surface not less than $0.3D_e$</p> <p>Any supporting metalwork under the cables occupying less than 10% of the plan area</p>		<p>Method 13</p>
<p>14</p> <p>Cables suspended from or incorporating a catenary wire</p>		<p>Method 12 or 13, as appropriate</p>

Cables in building voids:

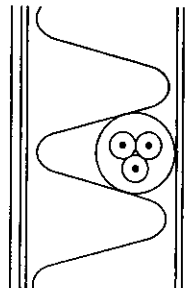
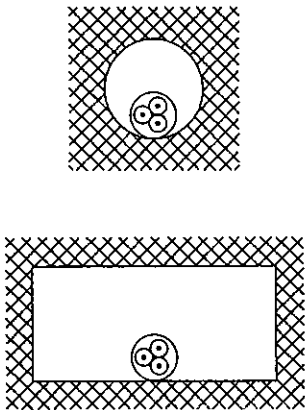
<p>15</p> <p>Sheathed cables installed directly in a thermally insulating wall or above a thermally insulating ceiling, the cable being in contact with a thermally conductive surface on one side (otherwise as Reference Method 4)</p>		<p>Method 4</p>
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TABLE 4A (continued)

Installation method		Examples	Appropriate Reference Method for determining current-carrying capacity
Number	Description		
1	2	3	4
16	Sheathed cables in ducts or voids formed by the building structure, other than thermally insulating materials		<p>Method 4</p> <p>Where the cable has a diameter D_e and the duct has a diameter not greater than $5D_e$ or a perimeter not greater than $20D_e$</p> <p>Method 3</p> <p>Where the duct has either a diameter greater than $5D_e$ or a perimeter greater than $20D_e$</p> <p>NOTE 1 - Where the perimeter is greater than $60D_e$, installation Methods 18 to 20, as appropriate, should be used.</p> <p>NOTE 2 - D_e is the overall cable diameter. For groups of cables D_e is the sum of the cable diameters.</p>

Cables in trenches:

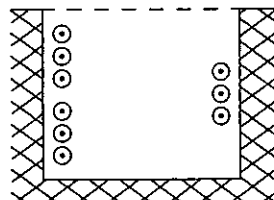
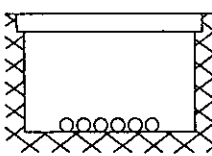
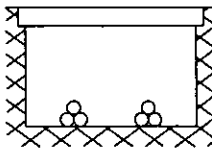
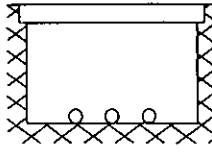
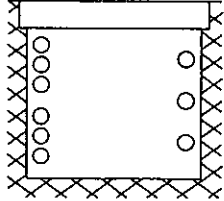
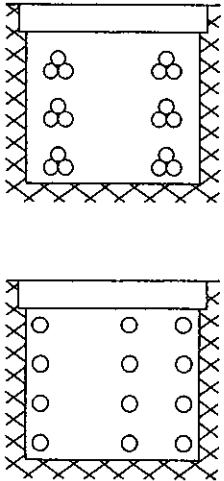
17	Cables supported on the wall of an open or ventilated trench, with spacings as indicated for Reference Method 12 or 13 as appropriate		Method 12 or 13, as appropriate
18	Cables in enclosed trench 450 mm wide by 300 mm deep (minimum dimensions) including 100 mm cover	<p>Two single-core cables with surfaces separated by a minimum of one cable diameter.</p>  <p>Three single-core cables in trefoil and touching throughout.</p>  <p>Multicore cables or groups of single-core cables with surfaces separated by a minimum of 50 mm</p> 	<p>Method 18</p> <p>Use rating factors in Table 4B3</p>

TABLE 4A (continued)

Installation method		Examples	Appropriate Reference Method for determining current-carrying capacity
Number	Description		
1	2	3	4
19	Cables in enclosed trench 450 mm wide by 600 mm deep (minimum dimensions) including 100 mm cover	<p>Single-core cables arranged in flat groups of two or three on the vertical trench wall with surfaces separated by one diameter with a minimum distance of 50 mm between groups. Multicore cables installed with surfaces separated by a minimum* of 75 mm. All cables spaced at least 25 mm from the trench wall.</p> 	Method 19 Use rating factors in Table 4B3
20	Cables in enclosed trench 600 mm wide by 760 mm deep (minimum dimensions) including 100 mm cover	<p>Single-core cables arranged in groups of two or three in flat formation with the surfaces separated by one diameter or in trefoil formation with cables touching.</p> <p>Groups separated by a minimum* of 50 mm either horizontally or vertically.</p> <p>Multicore cables installed with surfaces separated by a minimum* of 75 mm either horizontally or vertically. All cables spaced at least 25 mm from the trench wall.</p> 	Method 20 Use rating factors in Table 4B3

* Larger spacing to be used where practicable.

TABLE 4B1

Correction factors for groups of more than one circuit of single-core cables, or more than one multicore cable (to be applied to the corresponding current-carrying capacity for a single circuit in Tables 4D1 to 4D4, 4E1 to 4E4, 4F1 and 4F2, 4J1, 4K1 to 4K4, 4L1 to 4L4)**

Reference method of installation (see Table 4A)		Correction factor (C_g)													
		Number of circuits or multicore cables													
		2	3	4	5	6	7	8	9	10	12	14	16	18	20
Enclosed (Method 3 or 4) or bunched and clipped direct to a non-metallic surface (Method 1)		0.80	0.70	0.65	0.60	0.57	0.54	0.52	0.50	0.48	0.45	0.43	0.41	0.39	0.38
Single layer clipped to a non-metallic surface (Method 1)	Touching	0.85	0.79	0.75	0.73	0.72	0.72	0.71	0.70	-	-	-	-	-	-
	Spaced*	0.94	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Single layer multicore on a perforated metal cable tray, vertical or horizontal (Method 11)	Touching	0.86	0.81	0.77	0.75	0.74	0.73	0.73	0.72	0.71	0.70	-	-	-	-
	Spaced**	0.91	0.89	0.88	0.87	0.87	-	-	-	-	-	-	-	-	-
Single layer single-core on a perforated metal cable tray, touching (Method 11)	Horizontal	0.90	0.85	-	-	-	-	-	-	-	-	-	-	-	-
	Vertical	0.85	-	-	-	-	-	-	-	-	-	-	-	-	-
Single layer multicore touching on ladder supports (Method 13)		0.86	0.82	0.80	0.79	0.78	0.78	0.78	0.77	-	-	-	-	-	-

* Spaced by a clearance between adjacent surfaces of at least one cable diameter (D_e). Where the horizontal clearances between adjacent cables exceeds $2D_e$ no correction factor need be applied.

** When cables having differing conductor operating temperatures are grouped together, the current rating shall be based upon the lowest operating temperature of any cable in the group.

- Correction factor not tabulated.

Not applicable to mineral insulated cables see Table 4B2.

TABLE 4B2

Correction factors for mineral insulated cables installed on perforated tray, (to be applied to the corresponding current-carrying capacity for single circuits for reference method 11 in Table 4J1A)

Tray orientation	Arrangement of cables	Number of trays	Number of multicore cables or circuits						
			1	2	3	4	6	9	
Horizontal	Multiconductor cables touching	1	1.0	0.90	0.80	0.80	0.75	0.75	
Horizontal	Multiconductor cables spaced †	1	1.0	1.0	1.0	0.95	0.90	-	
Vertical	Multiconductor cables touching	1	1.0	0.90	0.80	0.75	0.75	0.70	
Vertical	Multiconductor cables spaced †	1	1.0	0.90	0.90	0.90	0.85	-	
Horizontal	Single conductor cables trefoil separated ††	1	1.0	1.0	0.95				
Vertical	Single conductor cables trefoil separated ††	1	1.0	0.90	0.90				

† Spaced by a clearance between adjacent surfaces of at least one cable diameter (D_e).

†† Separated by a clearance between adjacent surfaces of at least two cable diameters ($2D_e$).

- Correction factor not tabulated.

NOTES to Tables 4B1 and 4B2

- The factors in the table are applicable to groups of cables all of one size. The value of current derived from application of the appropriate factors is the maximum current to be carried by any of the cables in the group.
- If, due to known operating conditions, a cable is expected to carry not more than 30% of its grouped rating, it may be ignored for the purpose of obtaining the rating factor for the rest of the group.
For example, a group of N loaded cables would normally require a group reduction factor of C_g applied to the tabulated I_t . However, if M cables in the group carry loads which are not greater than $0.3 C_g I_t$ amperes the other cables can be sized by using the group rating factor corresponding to (N-M) cables.
- When cables having differing conductor operating temperatures are grouped together, the current rating shall be based on the lowest operating temperature of any cable in the group.
- Where the horizontal clearances between adjacent cables exceeds $2D_e$, no correction factor need be applied.

TABLE 4B3

Correction factors for cables installed in enclosed trenches
(Installation Methods 18, 19 and 20 of Table 4A)*

The correction factors tabulated below relate to the disposition of cables illustrated in items 18 to 20 of Table 4A and are applicable to the current-carrying capacities for Reference Methods 12 or 13 of Table 4A as given in the relevant tables of this appendix.

Conductor cross-sectional area	Correction factor									
	Installation Method 18				Installation Method 19			Installation Method 20		
	2 single-core cables, or 1 three- or four-core cable	3 single-core cables, or 2 two-core cables	4 single-core cables, or 2 three- or four-core cables	6 single-core cables, 4 two-core cables, or 3 three- or four-core cables	6 single-core cables, 4 two-core cables, or 3 three- or four-core cables	8 single-core cables, or 4 three- or four-core cables	12 single-core cables, 8 two-core cables, or 6 three- or four-core cables	12 single-core cables, 8 two-core cables, or 6 three- or four-core cables	18 single-core cables, 12 two-core cables, or 9 three- or four-core cables	24 single-core cables, 16 two-core cables, or 12 three- or four-core cables
1	2	3	4	5	6	7	8	9	10	11
(mm ²)										
4	0.93	0.90	0.87	0.82	0.86	0.83	0.76	0.81	0.74	0.69
6	0.92	0.89	0.86	0.81	0.86	0.82	0.75	0.80	0.73	0.68
10	0.91	0.88	0.85	0.80	0.85	0.80	0.74	0.78	0.72	0.66
16	0.91	0.87	0.84	0.78	0.83	0.78	0.71	0.76	0.70	0.64
25	0.90	0.86	0.82	0.76	0.81	0.76	0.69	0.74	0.67	0.62
35	0.89	0.85	0.81	0.75	0.80	0.74	0.68	0.72	0.66	0.60
50	0.88	0.84	0.79	0.74	0.78	0.73	0.66	0.71	0.64	0.59
70	0.87	0.82	0.78	0.72	0.77	0.72	0.64	0.70	0.62	0.57
95	0.86	0.81	0.76	0.70	0.75	0.70	0.63	0.68	0.60	0.55
120	0.85	0.80	0.75	0.69	0.73	0.68	0.61	0.66	0.58	0.53
150	0.84	0.78	0.74	0.67	0.72	0.67	0.59	0.64	0.57	0.51
185	0.83	0.77	0.73	0.65	0.70	0.65	0.58	0.63	0.55	0.49
240	0.82	0.76	0.71	0.63	0.69	0.63	0.56	0.61	0.53	0.48
300	0.81	0.74	0.69	0.62	0.68	0.62	0.54	0.59	0.52	0.46
400	0.80	0.73	0.67	0.59	0.66	0.60	0.52	0.57	0.50	0.44
500	0.78	0.72	0.66	0.58	0.64	0.58	0.51	0.56	0.48	0.43
630	0.77	0.71	0.65	0.56	0.63	0.57	0.49	0.54	0.47	0.41

* When cables having different conductor operating temperatures are grouped together the current rating shall be based on the lowest operating temperature of any cable in the group.

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TABLE 4C1

Correction factors for ambient temperature where protection is against short-circuit

NOTE: This table applies where the associated overcurrent protective device is intended to provide short-circuit protection only. Except where the device is a semi-enclosed fuse to BS 3036 the table also applies where the device is intended to provide overload protection.

Type of insulation	Operating temperature	Ambient temperature (°C)														
		25	30	35	40	45	50	55	60	65	70	75	80	85	90	95
Rubber (flexible cables only)	60°C	1.04	1.0	0.91	0.82	0.71	0.58	0.41	-	-	-	-	-	-	-	-
General purpose pvc	70°C	1.03	1.0	0.94	0.87	0.79	0.71	0.61	0.50	0.35	-	-	-	-	-	-
Paper	80°C	1.02	1.0	0.95	0.89	0.84	0.77	0.71	0.63	0.55	0.45	0.32	-	-	-	-
Rubber	85°C	1.02	1.0	0.95	0.90	0.85	0.80	0.74	0.67	0.60	0.52	0.43	0.30	-	-	-
Heat resisting pvc*	90°C	1.03	1.0	0.97	0.94	0.91	0.87	0.84	0.80	0.76	0.71	0.61	0.50	0.35	-	-
Thermosetting XLPE	90°C	1.02	1.0	0.96	0.91	0.87	0.82	0.76	0.71	0.65	0.58	0.50	0.41	0.29	-	-
Mineral	70°C sheath	1.03	1.0	0.93	0.85	0.77	0.67	0.57	0.45	0.31	-	-	-	-	-	-
	105°C sheath	1.02	1.0	0.96	0.92	0.88	0.84	0.80	0.75	0.70	0.65	0.60	0.54	0.47	0.40	0.32

NOTES:

1. Correction factors for flexible cords and for 85°C or 150°C rubber-insulated flexible cables are given in the relevant table of current-carrying capacity.
2. This table also applies when determining the current-carrying capacity of a cable.
3. * These factors are applicable only to ratings in columns 2 to 5 of Table 4D1.

TABLE 4C2

Correction factors for ambient temperature where the overload protective device is a semi-enclosed fuse to BS 3036.

Type of insulation	Operating temperature	Ambient temperature (°C)														
		25	30	35	40	45	50	55	60	65	70	75	80	85	90	95
Rubber (flexible cables only)	60°C	1.04	1.0	0.96	0.91	0.87	0.79	0.56	-	-	-	-	-	-	-	-
General purpose pvc	70°C	1.03	1.0	0.97	0.94	0.91	0.87	0.84	0.69	0.48	-	-	-	-	-	-
Paper	80°C	1.02	1.0	0.97	0.95	0.92	0.90	0.87	0.84	0.76	0.62	0.43	-	-	-	-
Rubber	85°C	1.02	1.0	0.97	0.95	0.93	0.91	0.88	0.86	0.83	0.71	0.58	0.41	-	-	-
Heat resisting pvc*	90°C	1.03	1.0	0.97	0.94	0.91	0.87	0.84	0.80	0.76	0.72	0.68	0.63	0.49	-	-
Thermosetting	90°C	1.02	1.0	0.98	0.95	0.93	0.91	0.89	0.87	0.85	0.79	0.69	0.56	0.39	-	-
Mineral: bare and exposed to touch or pvc covered	70°C sheath	1.03	1.0	0.96	0.93	0.89	0.86	0.79	0.62	0.42	-	-	-	-	-	-
Bare and not exposed to touch	105°C sheath	1.02	1.0	0.98	0.96	0.93	0.91	0.89	0.86	0.84	0.82	0.79	0.77	0.64	0.55	0.43

NOTES:

1. Correction factors for flexible cords and for 85°C or 150°C rubber-insulated flexible cables are given in the relevant table of current-carrying capacity.
2. * These factors are applicable only to ratings in columns 2 to 5 of Table 4D1.

COPPER CONDUCTORS

TABLE 4D1A

Single-core pvc-insulated cables, non-armoured, with or without sheath
(COPPER CONDUCTORS)

BS 6004
BS 6231
BS 6346

Ambient temperature: 30°C
Conductor operating temperature: 70°C

CURRENT-CARRYING CAPACITY (amperes):

Conductor cross-sectional area	Reference Method 4 (enclosed in conduit in thermally insulating wall etc.)		Reference Method 3 (enclosed in conduit on a wall or in trunking etc.)		Reference Method 1 (clipped direct)		Reference Method 11 (on a perforated cable tray horizontal or vertical)		Reference Method 12 (free air)		
	2 cables, single-phase a.c. or d.c.	3 or 4 cables, three-phase a.c.	2 cables, single-phase a.c. or d.c.	3 or 4 cables, three-phase a.c.	2 cables, single-phase flat and touching or trefoil	3 or 4 cables, three-phase flat and touching or trefoil	2 cables, single-phase flat and touching or trefoil	3 or 4 cables, three-phase flat and touching or trefoil	Horizontal flat spaced	Vertical flat spaced	Trefoil
1	2	3	4	5	6	7	8	9	10	11	12
(mm ²)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)
1	11	10.5	13.5	12	15.5	14	-	-	-	-	-
1.5	14.5	13.5	17.5	15.5	20	18	-	-	-	-	-
2.5	19.5	18	24	21	27	25	-	-	-	-	-
4	26	24	32	28	37	33	-	-	-	-	-
6	34	31	41	36	47	43	-	-	-	-	-
10	46	42	57	50	65	59	-	-	-	-	-
16	61	56	76	68	87	79	-	-	-	-	-
25	80	73	101	89	114	104	126	112	146	130	110
35	99	89	125	110	141	129	156	141	181	162	137
50	119	108	151	134	182	167	191	172	219	197	167
70	151	136	192	171	234	214	246	223	281	254	216
95	182	164	232	207	284	261	300	273	341	311	264
120	210	188	269	239	330	303	349	318	396	362	308
150	240	216	300	262	381	349	404	369	456	419	356
185	273	245	341	296	436	400	463	424	521	480	409
240	320	286	400	346	515	472	549	504	615	569	485
300	367	328	458	394	594	545	635	584	709	659	561
400	-	-	546	467	694	634	732	679	852	795	656
500	-	-	626	533	792	723	835	778	982	920	749
630	-	-	720	611	904	826	953	892	1138	1070	855
800	-	-	-	-	1030	943	1086	1020	1265	1188	971
1000	-	-	-	-	1154	1058	1216	1149	1420	1337	1079

NOTES:

- Where the conductor is to be protected by a semi-enclosed fuse to BS 3036, see item 6.2 of the preface to this appendix.
- The current-carrying capacities in columns 2 to 5 are also applicable to flexible cables to BS 6004 table 1(c) and to 90°C heat resisting pvc cables to BS 6231 tables 8 and 9 where the cables are used in fixed installations.

TABLE 4D1B

VOLTAGE DROP (per ampere per metre):

Conductor operating temperature: 70°C

Conductor cross-sectional area	2 cables, single-phase a.c.					3 or 4 cables, three-phase a.c.					
	Reference Methods 3 & 4 (enclosed in conduit etc. in or on a wall)	Reference Methods 1 & 11 (clipped direct or on trays, touching)	Reference Method 12 (spaced*)	Reference Methods 3 & 4 (enclosed in conduit etc. in or on a wall)	Reference Methods 1, 11 & 12 (in trefoil)	Reference Methods 1 & 11 (flat and touching)	Reference Method 12 (flat spaced*)				
1	2	3	4	5	6	7	8	9			
(mm ²)	(mV/A/m)	(mV/A/m)	(mV/A/m)	(mV/A/m)	(mV/A/m)	(mV/A/m)	(mV/A/m)	(mV/A/m)			
18	18	18	18	18	15	15	15	15			
4	11	11	11	11	9.5	9.5	9.5	9.5			
6	7.3	7.3	7.3	7.3	6.4	6.4	6.4	6.4			
10	4.4	4.4	4.4	4.4	3.8	3.8	3.8	3.8			
16	2.8	2.8	2.8	2.8	2.4	2.4	2.4	2.4			
25	1.75	1.80	1.75	1.75	1.50	1.50	1.50	1.50			
35	1.25	1.30	1.25	1.25	1.10	1.10	1.10	1.10			
50	0.93	0.95	0.93	0.93	0.81	0.80	0.80	0.80			
70	0.63	0.65	0.63	0.63	0.56	0.55	0.55	0.55			
95	0.46	0.49	0.47	0.47	0.42	0.41	0.41	0.41			
120	0.36	0.39	0.37	0.37	0.33	0.32	0.32	0.32			
150	0.29	0.31	0.30	0.29	0.27	0.26	0.26	0.26			
185	0.23	0.25	0.24	0.24	0.22	0.21	0.21	0.21			
240	0.180	0.195	0.185	0.185	0.17	0.160	0.160	0.160			
300	0.145	0.160	0.150	0.150	0.14	0.130	0.130	0.130			
400	0.105	0.130	0.120	0.115	0.12	0.105	0.105	0.105			
500	0.086	0.110	0.098	0.093	0.10	0.086	0.086	0.086			
630	0.068	0.094	0.081	0.076	0.08	0.072	0.072	0.072			
800	0.053	-	0.068	0.061	-	0.060	0.060	0.060			
1000	0.042	-	0.059	0.050	-	0.052	0.052	0.052			

NOTE: * Spacings larger than those specified in Method 12 (see table 4A) will result in larger voltage drop.

Multicore pvc-insulated cables, non-armoured
(COPPER CONDUCTORS)

BS 6004

BS 6346

BS 7629

Ambient temperature: 30°C

Conductor operating temperature: 70°C

CURRENT-CARRYING CAPACITY (amperes):

Conductor cross-sectional area	Reference Method 4 (enclosed in an insulated wall, etc.)		Reference Method 3 (enclosed in conduit on a wall or ceiling, or in trunking)		Reference Method 1 (clipped direct)		Reference Method 11 (on a perforated cable tray) or Reference Method 13 (free air)	
	1 two-core cable*, single-phase a.c. or d.c.	1 three-core cable* or 1 four-core cable, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-core cable* or 1 four-core cable, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-core cable* or 1 four-core cable, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-core cable* or 1 four-core cable, three-phase a.c.
1	2	3	4	5	6	7	8	9
(mm ²)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)
1	11	10	13	11.5	15	13.5	17	14.5
1.5	14	13	16.5	15	19.5	17.5	22	18.5
2.5	18.5	17.5	23	20	27	24	30	25
4	25	23	30	27	36	32	40	34
6	32	29	38	34	46	41	51	43
10	43	39	52	46	63	57	70	60
16	57	52	69	62	85	76	94	80
25	75	68	90	80	112	96	119	101
35	92	83	111	99	138	119	148	126
50	110	99	133	118	168	144	180	153
70	139	125	168	149	213	184	232	196
95	167	150	201	179	258	223	282	238
120	192	172	232	206	299	259	328	276
150	219	196	258	225	344	299	379	319
185	248	223	294	255	392	341	434	364
240	291	261	344	297	461	403	514	430
300	334	298	394	339	530	464	593	497
400	-	-	470	402	634	557	715	597

NOTES:

1. Where the conductor is to be protected by a semi-enclosed fuse to BS 3036, see item 6.2 of the preface to this appendix.
2. Circular conductors are assumed for sizes up to and including 16 mm². Values for larger sizes relate to shaped conductors and may safely be applied to circular conductors.
3. Cables to BS 7629 are rated for a conductor operating temperature of 70°C and are therefore included in this table, although the material used for the cable insulation is not pvc.
4. * With or without a protective conductor.

COPPER CONDUCTORS

TABLE 4D2B

VOLTAGE DROP (per ampere per metre): Conductor operating temperature: 70°C

Conductor cross-sectional area	Two-core cable, d.c.		Two-core cable, single-phase a.c.		Three- or four-core cable, three-phase a.c.				
	1	2	3		4				
(mm ²)	(mV/A/m)	(mV/A/m)	(mV/A/m)		(mV/A/m)				
1	44	29	44	29	38	25			
2.5	18	11	18	11	15	9.5			
4	11	7.3	11	7.3	6.4	3.8			
6	7.3	4.4	7.3	4.4	3.8	2.4			
10	4.4	2.8	4.4	2.8					
16	2.8		2.8						
			r	x	z	r	x	z	
25	1.75	1.75	1.75	0.170	1.75	1.50	0.145	1.50	1.50
35	1.25	1.25	1.25	0.165	1.25	1.10	0.145	1.10	1.10
50	0.93	0.93	0.93	0.165	0.94	0.80	0.140	0.81	0.81
70	0.63	0.63	0.63	0.160	0.65	0.55	0.140	0.57	0.57
95	0.46	0.46	0.47	0.155	0.50	0.41	0.135	0.43	0.43
120	0.36	0.36	0.38	0.155	0.41	0.33	0.135	0.35	0.35
150	0.29	0.29	0.30	0.155	0.34	0.26	0.130	0.29	0.29
185	0.23	0.23	0.25	0.150	0.29	0.21	0.130	0.25	0.25
240	0.180	0.180	0.190	0.150	0.24	0.165	0.130	0.21	0.21
300	0.145	0.145	0.155	0.145	0.21	0.135	0.130	0.185	0.185
400	0.105	0.105	0.115	0.145	0.185	0.100	0.125	0.160	0.160

COPPER CONDUCTORS

TABLE 4D3A

Single-core armoured pvc-insulated cables
(non-magnetic armour)
(COPPER CONDUCTORS)

BS 6346

Ambient temperature: 30°C
Conductor operating temperature: 70°C

CURRENT-CARRYING CAPACITY (amperes):

Conductor cross-sectional area	Reference Method 1 (clipped direct)		Reference Method 11 (on perforated cable tray)		Reference Method 12 (free air)						
	2 cables, single-phase a.c. or d.c. flat and touching	3 or 4 cables, three-phase a.c. flat and touching	2 cables, single-phase a.c. or d.c. flat and touching	3 or 4 cables, three-phase a.c. flat and touching	2 cables, single-phase a.c.		2 cables, d.c.		3 or 4 cables, three-phase a.c.		
					Horizontal flat spaced	Vertical flat spaced	Horizontal spaced	Vertical spaced	Horizontal flat spaced	Vertical flat spaced	3 cables trefoil
1	2	3	4	5	6	7	8	9	10	11	12
(mm ²)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)
50	193	179	205	189	229	217	229	216	230	212	181
70	245	225	259	238	287	272	294	279	286	263	231
95	296	269	313	285	349	332	357	340	338	313	280
120	342	309	360	327	401	383	415	396	385	357	324
185	447	399	469	422	511	489	548	525	490	456	425
240	525	465	550	492	593	568	648	622	566	528	501
300	594	515	624	547	668	640	748	719	616	578	567
400	687	575	723	618	737	707	885	851	674	632	657
500	763	622	805	673	810	777	1035	997	721	676	731
630	843	669	891	728	893	856	1218	1174	771	723	809
800	919	710	976	777	943	905	1441	1390	824	772	886
1000	975	737	1041	808	1008	967	1685	1627	872	816	945

NOTE:

Where the conductor is to be protected by a semi-enclosed fuse to BS 3036, see item 6.2 of the preface to this appendix.

TABLE 4D3B

VOLTAGE DROP (per ampere per metre):

Conductor cross-sectional area	2 cables			3 or 4 cables, three-phase a.c.											
	d.c.	2 cables, single-phase a.c.			Reference Methods 1 & 11 (touching)		Reference Method 12 (spaced*)		Reference Methods 1, 11 and 12 (in trefoil touching)		Reference Methods 1 & 11 (flat and touching)		Reference Method 12 (flat spaced*)		
1	2	3			4		5		6		7		7		
(mm ²)	(mV/A/m)	(mV/A/m)			(mV/A/m)		(mV/A/m)		(mV/A/m)		(mV/A/m)		(mV/A/m)		
	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z
50	0.93	0.22	0.95	0.92	0.30	0.97	0.80	0.190	0.82	0.79	0.26	0.84	0.79	0.34	0.86
70	0.63	0.21	0.68	0.66	0.29	0.72	0.56	0.180	0.58	0.57	0.25	0.62	0.59	0.32	0.68
95	0.46	0.20	0.52	0.51	0.28	0.58	0.42	0.175	0.45	0.44	0.25	0.50	0.47	0.31	0.57
120	0.36	0.195	0.43	0.42	0.28	0.50	0.33	0.170	0.37	0.36	0.24	0.43	0.40	0.30	0.50
150	0.29	0.190	0.37	0.34	0.27	0.44	0.27	0.165	0.32	0.30	0.24	0.38	0.34	0.30	0.45
185	0.23	0.190	0.32	0.29	0.27	0.39	0.22	0.160	0.27	0.25	0.23	0.34	0.29	0.29	0.41
240	0.180	0.180	0.27	0.23	0.26	0.35	0.175	0.160	0.23	0.20	0.23	0.30	0.24	0.28	0.37
300	0.145	0.180	0.24	0.190	0.26	0.32	0.140	0.155	0.21	0.165	0.22	0.28	0.20	0.28	0.34
400	0.105	0.175	0.22	0.180	0.24	0.30	0.120	0.130	0.195	0.160	0.21	0.26	0.21	0.25	0.32
500	0.086	0.170	0.21	0.165	0.23	0.29	0.105	0.145	0.180	0.145	0.20	0.25	0.190	0.24	0.30
630	0.068	0.165	0.195	0.150	0.22	0.27	0.091	0.145	0.170	0.135	0.195	0.23	0.175	0.22	0.28
800	0.053	0.160	0.185	0.145	0.21	0.25	0.082	0.140	0.160	0.125	0.180	0.22	0.170	0.195	0.26
1000	0.042	0.155	0.180	0.140	0.190	0.24	0.079	0.135	0.155	0.125	0.165	0.21	0.165	0.170	0.24

NOTE: * Spacings larger than those specified in Method 12 (see table 4A) will result in larger voltage drop.

COPPER CONDUCTORS

TABLE 4D4A

Multicore armoured pvc-insulated cables
(COPPER CONDUCTORS)

BS 6346

CURRENT-CARRYING CAPACITY (amperes): Ambient temperature: 30°C
Conductor operating temperature: 70°C

Conductor cross-sectional area	Reference Method 1 (clipped direct)		Reference Method 11 (on a perforated horizontal or vertical cable tray) or Reference Method 13 (free air)
	1 two-core cable, single-phase a.c. or d.c.	3 three- or four-core cable, three-phase a.c.	
1	2	3	5
(mm ²)	(A)	(A)	(A)
1.5	21	18	19
2.5	28	25	26
4	38	33	35
6	49	42	45
10	67	58	62
16	89	77	83
25	118	102	110
35	145	125	135
50	175	151	163
70	222	192	207
95	269	231	251
120	310	267	290
150	356	306	332
185	405	348	378
240	476	409	445
300	547	469	510
400	621	540	590
			683

NOTE:

Where the conductor is to be protected by a semi-enclosed fuse to BS 3036, see item 6.2 of the preface to this appendix.

TABLE 4D4B

VOLTAGE DROP (per ampere per metre): Conductor operating temperature: 70°C

Conductor cross-sectional area (mm ²)	Two-core cable, d.c.		Two-core cable, single-phase a.c.			Three- or four-core cable, three-phase a.c.				
	2	(mV/A/m)	3	(mV/A/m)	r	x	z	r	x	z
1.5	29	29	29	29						
2.5	18	18	18	18						
4	11	11	11	11						
6	7.3	7.3	7.3	7.3						
10	4.4	4.4	4.4	4.4						
16	2.8	2.8	2.8	2.8						
25	1.75	1.75	0.170	0.170	1.75	0.170	1.75	1.50	0.145	1.50
35	1.25	1.25	0.165	0.165	1.25	0.165	1.25	1.10	0.145	1.10
50	0.93	0.93	0.165	0.165	0.94	0.165	0.94	0.80	0.140	0.81
70	0.63	0.63	0.160	0.160	0.65	0.160	0.65	0.55	0.140	0.57
95	0.46	0.46	0.155	0.155	0.50	0.155	0.50	0.41	0.135	0.43
120	0.36	0.36	0.155	0.155	0.41	0.155	0.41	0.33	0.135	0.35
150	0.29	0.29	0.155	0.155	0.34	0.155	0.34	0.26	0.130	0.29
185	0.23	0.23	0.150	0.150	0.29	0.150	0.29	0.21	0.130	0.25
240	0.180	0.180	0.150	0.150	0.24	0.150	0.24	0.165	0.130	0.21
300	0.145	0.145	0.145	0.145	0.21	0.145	0.21	0.135	0.130	0.185
400	0.105	0.105	0.145	0.145	0.185	0.145	0.185	0.100	0.125	0.160

Single-core cables having thermosetting insulation, non-armoured, with or without sheath
(COPPER CONDUCTORS)

BS 5467
BS 7211

CURRENT-CARRYING CAPACITY (amperes):

Ambient temperature: 30°C
Conductor operating temperature: 90°C

Conductor cross-sectional area	Reference Method 4 (enclosed in conduit thermally insulating wall etc.)		Reference Method 3 (enclosed in conduit on a wall or in trunking etc.)		Reference Method 1 (clipped direct)		Reference Method 11 (on a perforated cable tray horizontal or vertical)		Reference Method 12 (free air)		
	2 cables, single-phase a.c. or d.c.	3 or 4 cables, three-phase a.c.	2 cables, single-phase a.c. or d.c.	3 or 4 cables, three-phase a.c.	2 cables, single-phase a.c. or d.c. flat and touching	3 or 4 cables, three-phase a.c. flat and touching or trefoil	2 cables, single-phase a.c. or d.c. flat and touching	3 or 4 cables, three-phase a.c. flat and touching or trefoil	Horizontal flat spaced	Vertical flat spaced	Trefoil
1	2	3	4	5	6	7	8	9	10	11	12
(mm ²)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)
1	14	13	17	15	19	17.5	-	-	-	-	-
1.5	18	17	22	19	25	23	-	-	-	-	-
2.5	24	23	30	26	34	31	-	-	-	-	-
4	33	30	40	35	46	41	-	-	-	-	-
6	43	39	51	45	59	54	-	-	-	-	-
10	58	53	71	63	81	74	-	-	-	-	-
16	76	70	95	85	109	99	-	-	-	-	-
25	100	91	126	111	143	130	158	140	183	163	138
35	124	111	156	138	176	161	195	176	226	203	171
50	149	135	189	168	228	209	293	215	274	246	209
70	189	170	240	214	293	268	308	279	351	318	270
95	228	205	290	259	355	326	375	341	426	389	330
120	263	235	336	299	413	379	436	398	495	453	385
150	300	270	375	328	476	436	505	461	570	524	445
185	341	306	426	370	545	500	579	530	651	600	511
240	400	358	500	433	644	590	686	630	769	711	606
300	459	410	573	493	743	681	794	730	886	824	701
400	-	-	683	584	868	793	915	849	1065	994	820
500	-	-	783	666	990	904	1044	973	1228	1150	936
630	-	-	900	764	1130	1033	1191	1115	1423	1338	1069
800	-	-	-	-	1288	1179	1358	1275	1581	1485	1214
1000	-	-	-	-	1443	1323	1520	1436	1775	1671	1349

NOTES:

- Where the conductor is to be protected by a semi-enclosed fuse to BS 3036, see item 6.2 of the preface to this appendix.
- The current-carrying capacities in columns 2 to 5 are also applicable to flexible cables to BS 7211 table 3(b) where the cables are used in fixed installations.
- For cable in rigid pvc conduit the values stated in table 4D1 are applicable (see Regulation 521-05).
- Where a conductor operates at a temperature exceeding 70°C it shall be ascertained that the equipment connected to the conductor is suitable for the conductor operating temperature (see Regulation 512-02).
- Where cables in this table are connected to equipment or accessories designed to operate at a temperature not exceeding 70°C, the current ratings given in the equivalent table for 70°C pvc insulated cables (BS 6004, BS 6346) shall be used (see also Regulation 523-01-01).

COPPER CONDUCTORS

TABLE 4E1B

VOLTAGE DROP (per ampere per metre):

Conductor operating temperature: 90°C

Conductor cross-sectional area	2 cables, single-phase a.c.					3 or 4 cables, three-phase a.c.				
	Reference Methods 3 & 4 (enclosed in conduit etc. in or on a wall)	Reference Methods 1 & 11 (clipped direct or on trays, touching)	Reference Method 12 (spaced*)	Reference Methods 3 & 4 (enclosed in conduit etc. in or on a wall)	Reference Methods 1, 11 & 12 (in trefoil)	Reference Methods 1 & 11 (flat and touching)	Reference Method 12 (flat spaced*)			
1	3	4	5	6	7	8	9			
(mm ²)	(mV/A/m)	(mV/A/m)	(mV/A/m)	(mV/A/m)	(mV/A/m)	(mV/A/m)	(mV/A/m)			
1	46	46	46	40	40	40	40			
1.5	31	31	31	27	27	27	27			
2.5	19	19	19	16	16	16	16			
4	12	12	12	10	10	10	10			
6	7.9	7.9	7.9	6.8	6.8	6.8	6.8			
10	4.7	4.7	4.7	4.0	4.0	4.0	4.0			
16	2.9	2.9	2.9	2.5	2.5	2.5	2.5			
25	1.85	1.85	1.85	1.60	1.60	1.60	1.60			
35	1.35	1.35	1.35	1.15	1.15	1.15	1.15			
50	0.99	0.99	0.99	0.87	0.87	0.87	0.87			
70	0.68	0.70	0.68	0.60	0.60	0.59	0.59			
95	0.49	0.51	0.49	0.44	0.43	0.43	0.43			
120	0.39	0.41	0.39	0.35	0.34	0.34	0.34			
150	0.32	0.33	0.32	0.29	0.28	0.28	0.28			
185	0.25	0.27	0.26	0.23	0.22	0.22	0.22			
240	0.190	0.21	0.20	0.185	0.170	0.170	0.170			
300	0.155	0.175	0.160	0.150	0.140	0.135	0.135			
400	0.120	0.140	0.130	0.125	0.110	0.110	0.110			
500	0.093	0.120	0.105	0.100	0.090	0.088	0.085			
630	0.072	0.100	0.086	0.088	0.074	0.071	0.068			
800	0.056	-	0.072	-	0.062	0.059	0.055			
1000	0.045	-	0.063	-	0.055	0.050	0.047			
	r	x	z	r	x	z	r			
	x	x	x	x	x	x	x			
	z	z	z	z	z	z	z			

NOTE: * Spacings larger than those specified in Method 12 (see table 4A) will result in larger voltage drop.

COPPER CONDUCTORS

TABLE 4E2A

Multicore cable having thermosetting insulation, non armoured
(COPPER CONDUCTORS)

BS 5467
BS 7211

Ambient temperature: 30°C
Conductor operating temperature: 90°C

CURRENT-CARRYING CAPACITY (amperes):

Conductor cross-sectional area (mm ²)	Reference Method 4 (enclosed in an insulated wall, etc.)		Reference Method 3 (enclosed in conduit on a wall or ceiling, or in trunking)		Reference Method 1 (clipped direct)		Reference Method 11 (on a perforated cable tray) or Reference Method 13 (free air)	
	1 two-core cable*, single-phase a.c. or d.c.	1 three- or four-core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three- or four-core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three- or four-core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three- or four-core cable*, three-phase a.c.
1	2	3	4	5	6	7	8	9
(mm ²)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)
1	14.5	13	17	15	19	17	21	18
1.5	18.5	16.5	22	19.5	24	22	26	23
2.5	25	22	30	26	33	30	36	32
4	33	30	40	35	45	40	49	42
6	42	38	51	44	58	52	63	54
10	57	51	69	60	80	71	86	75
16	76	68	91	80	107	96	115	100
25	99	89	119	105	138	119	149	127
35	121	109	146	128	171	147	185	158
50	145	130	175	154	209	179	225	192
70	183	164	221	194	269	229	289	246
95	220	197	265	233	328	278	352	298
120	253	227	305	268	382	322	410	346
150	290	259	334	300	441	371	473	399
185	329	295	384	340	506	424	542	456
240	386	346	459	398	599	500	641	538
300	442	396	532	455	693	576	741	621
400	-	-	625	536	803	667	865	741

NOTES:

- Where the conductor is to be protected by a semi-enclosed fuse to BS 3036, see item 6.2 of the preface to this appendix.
- Where a conductor operates at a temperature exceeding 70°C it shall be ascertained that the equipment connected to the conductor is suitable for the conductor operating temperature (see Regulation 512-02).
- * With or without a protective conductor.
- For cables in rigid pvc conduit the values stated in table 4D2 are applicable (see Regulation 521-05).
- Where cables in this table are connected to equipment or accessories designed to operate at a temperature not exceeding 70°C, the current ratings given in the equivalent table for 70°C pvc insulated cables (BS 6004, BS 6346) shall be used (see also Regulation 523-01-01).
- Circular conductors are assumed for sizes up to and including 16 mm². Values for larger sizes relate to shaped conductors and may safely be applied to circular conductors.

TABLE 4E2B

VOLTAGE DROP (per ampere per metre): Conductor operating temperature: 90°C

Conductor cross-sectional area	Two-core cable, d.c.	Two-core cable, single-phase a.c.	Three- or four-core cable, three-phase a.c.
(mm ²)	2	3	4
	(mV/A/m)	(mV/A/m)	(mV/A/m)
1	46	46	40
1.5	31	31	27
2.5	19	19	16
4	12	12	10
6	7.9	7.9	6.8
10	4.7	4.7	4.0
16	2.9	2.9	2.5
25	1.85	0.160	0.140
35	1.35	0.155	0.135
50	0.98	0.155	0.135
70	0.67	0.150	0.130
95	0.49	0.150	0.130
120	0.39	0.145	0.130
150	0.31	0.145	0.125
185	0.25	0.145	0.125
240	0.195	0.140	0.125
300	0.155	0.140	0.120
400	0.120	0.140	0.120
	r	x	x
	1.85	0.160	0.140
	1.35	0.155	0.135
	0.98	0.155	0.135
	0.67	0.150	0.130
	0.49	0.150	0.130
	0.40	0.145	0.130
	0.32	0.145	0.125
	0.26	0.145	0.125
	0.200	0.140	0.125
	0.160	0.140	0.120
	0.130	0.140	0.120
	0.130	0.190	0.165
	r	z	z
	1.60	1.90	1.65
	1.15	1.35	1.15
	0.86	1.00	0.87
	0.59	0.69	0.60
	0.43	0.52	0.45
	0.34	0.42	0.37
	0.28	0.35	0.30
	0.22	0.29	0.26
	0.175	0.24	0.21
	0.140	0.21	0.185

COPPER CONDUCTORS

TABLE 4E3A

Single-core cables having thermosetting insulation (non-magnetic armour)
(COPPER CONDUCTORS)

BS 5467
BS 6724

Ambient temperature: 30°C
Conductor operating temperature: 90°C

CURRENT-CARRYING CAPACITY (amperes):

Conductor cross-sectional area	Reference Method 11 (on perforated cable tray)						Reference Method 12 (free air)					
	Reference Method 1 (clipped direct)		2 cables, single-phase a.c. or d.c. flat and touching		3 or 4 cables, three-phase a.c. flat and touching		2 cables, single-phase a.c.		2 cables, d.c.		3 or 4 cables, three-phase a.c.	
	2	3	4	5	6	7	8	9	10	11	12	
1	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	
(mm ²)	237	220	253	232	282	266	284	270	288	266	222	
50	303	277	322	293	357	337	356	349	358	331	285	
70	367	333	389	352	436	412	446	426	425	393	346	
95	425	383	449	405	504	477	519	497	485	449	402	
120	488	437	516	462	566	539	600	575	549	510	463	
150	557	496	587	524	643	614	688	660	618	574	529	
185	656	579	689	612	749	714	815	782	715	666	625	
240	755	662	792	700	842	805	943	906	810	755	720	
300	853	717	899	767	929	889	1137	1094	848	797	815	
400	962	791	1016	851	1032	989	1314	1266	923	871	918	
500	1082	861	1146	935	1139	1092	1528	1474	992	940	1027	
630	1170	904	1246	987	1204	1155	1809	1744	1042	978	1119	
800	1261	961	1345	1055	1289	1238	2100	2026	1110	1041	1214	

NOTES:

- Where the conductor is to be protected by a semi-enclosed fuse to BS 3036, see item 6.2 of the preface to this appendix.
- Where a conductor operates at a temperature exceeding 70°C it shall be ascertained that the equipment connected to the conductor is suitable for the conductor operating temperature (see Regulation 512-02).
- Where cables in this table are connected to equipment or accessories designed to operate at a temperature not exceeding 70°C, the current ratings given in the equivalent table for 70°C pvc insulated cables (BS 6004, BS 6346) shall be used (see also Regulation 523-01-01).

TABLE 4E3B

VOLTAGE DROP (per ampere per metre): Conductor operating temperature: 90°C

Conductor cross-sectional area	2 cables, d.c.			2 cables, single-phase a.c.						3 or 4 cables, three-phase a.c.									
		Reference Methods 1 & 11 (touching)		Reference Method 12 (spaced*)		Reference Methods 1, 11 & 12 (in trefoil touching)		Reference Methods 1 & 11 flat and touching		Reference Method 12 (flat spaced*)			Reference Methods 1, 11 & 12 (in trefoil touching)		Reference Methods 1 & 11 flat and touching		Reference Method 12 (flat spaced*)		
(mm ²)	(mV/A/m)	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z
1	2																		
	(mV/A/m)																		
50	0.98	0.99	0.21	1.00	0.98	0.29	1.00	0.86	0.180	0.87	0.84	0.25	0.88	0.84	0.25	0.88	0.84	0.33	0.90
70	0.67	0.68	0.200	0.71	0.69	0.29	0.75	0.59	0.170	0.62	0.60	0.25	0.65	0.62	0.25	0.65	0.62	0.32	0.70
95	0.49	0.51	0.195	0.55	0.53	0.28	0.60	0.44	0.170	0.47	0.46	0.24	0.52	0.49	0.24	0.52	0.49	0.31	0.58
120	0.39	0.41	0.190	0.45	0.43	0.27	0.51	0.35	0.165	0.39	0.38	0.24	0.44	0.41	0.24	0.44	0.41	0.30	0.51
150	0.31	0.33	0.185	0.38	0.36	0.27	0.45	0.29	0.160	0.33	0.31	0.23	0.39	0.34	0.23	0.39	0.34	0.29	0.45
185	0.25	0.27	0.185	0.33	0.30	0.26	0.40	0.23	0.160	0.28	0.26	0.23	0.34	0.29	0.23	0.34	0.29	0.29	0.41
240	0.195	0.21	0.180	0.28	0.24	0.26	0.35	0.180	0.155	0.24	0.21	0.22	0.30	0.24	0.22	0.30	0.24	0.28	0.37
300	0.155	0.170	0.175	0.25	0.195	0.25	0.32	0.145	0.150	0.21	0.170	0.22	0.28	0.20	0.22	0.28	0.20	0.27	0.34
400	0.115	0.145	0.170	0.22	0.180	0.24	0.30	0.125	0.150	0.195	0.160	0.21	0.27	0.20	0.21	0.27	0.20	0.27	0.33
500	0.093	0.125	0.170	0.21	0.165	0.24	0.29	0.105	0.145	0.180	0.145	0.20	0.25	0.190	0.20	0.25	0.190	0.24	0.31
630	0.073	0.105	0.165	0.195	0.150	0.23	0.27	0.092	0.145	0.170	0.135	0.195	0.24	0.175	0.195	0.24	0.175	0.23	0.29
800	0.056	0.090	0.160	0.190	0.145	0.23	0.27	0.086	0.140	0.165	0.130	0.180	0.23	0.175	0.180	0.23	0.175	0.195	0.26
1000	0.045	0.092	0.155	0.180	0.140	0.21	0.25	0.080	0.135	0.155	0.125	0.170	0.21	0.165	0.170	0.21	0.165	0.180	0.24

NOTE: * Spacings larger than those specified in Method 12 (see table 4A) will result in a larger voltage drop.

COPPER CONDUCTORS

TABLE 4E4A
Multicore armoured cables having thermosetting insulation
(COPPER CONDUCTORS)

BS 5467
 BS 6724

Ambient temperature: 30°C
 Conductor operating temperature: 90°C

CURRENT-CARRYING CAPACITY (amperes):

Conductor cross-sectional area	Reference Method I (clipped direct)		Reference Method II (on a perforated horizontal or vertical cable tray) or Reference Method 13 (free air)
	1 two-core cable, single-phase a.c. or d.c.	1 three- or four-core cable, three-phase a.c.	
1	2	3	4
(mm ²)	(A)	(A)	(A)
1.5	27	23	29
2.5	36	31	39
4	49	42	52
6	62	53	66
10	85	73	90
16	110	94	115
25	146	124	152
35	180	154	188
50	219	187	228
70	279	238	291
95	338	289	354
120	392	335	410
150	451	386	472
185	515	441	539
240	607	520	636
300	698	599	732
400	787	673	847
			1 three- or four-core cable, three-phase a.c.
			5
			(A)
			25
			33
			44
			56
			78
			99
			131
			162
			197
			251
			304
			353
			406
			463
			546
			628
			728

NOTES:

1. Where the conductor is to be protected by a semi-enclosed fuse to BS 3036, see item 6.2 of the preface to this appendix.
2. Where a conductor operates at a temperature exceeding 70°C it shall be ascertained that the equipment connected to the conductor is suitable for the conductor operating temperature (see Regulation 512-02).
3. Where cables in this table are connected to equipment or accessories designed to operate at a temperature not exceeding 70°C, the current ratings given in the equivalent table for 70°C pvc insulated cables (BS 6004, BS 6346) shall be used (see also Regulation 523-01-01).

TABLE 4E4B

VOLTAGE DROP (per ampere per metre): Conductor operating temperature: 90°C

Conductor cross-sectional area	Two-core cable, d.c.		Two-core cable, single-phase a.c.		Three- or four-core cable, three-phase a.c.					
	1	2	3	4	r	x	z	r	x	z
(mm ²)	(mV/A/m)		(mV/A/m)		(mV/A/m)					
1.5	31	31	31	27						
2.5	19	19	19	16						
4	12	12	12	10						
6	7.9	7.9	7.9	6.8						
10	4.7	4.7	4.7	4.0						
16	2.9	2.9	2.9	2.5						
25	1.85	1.85	0.160	0.160	1.85	0.160	1.90	1.60	0.140	1.65
35	1.35	1.35	0.155	0.155	1.35	0.155	1.35	1.15	0.135	1.15
50	0.98	0.98	0.155	0.155	0.99	0.155	1.00	0.86	0.135	0.87
70	0.67	0.67	0.150	0.150	0.67	0.150	0.69	0.59	0.130	0.60
95	0.49	0.49	0.150	0.150	0.50	0.150	0.52	0.43	0.130	0.45
120	0.39	0.39	0.145	0.145	0.40	0.145	0.42	0.34	0.130	0.37
150	0.31	0.31	0.145	0.145	0.32	0.145	0.35	0.28	0.125	0.30
185	0.25	0.25	0.145	0.145	0.26	0.145	0.29	0.22	0.125	0.26
240	0.195	0.195	0.140	0.140	0.20	0.140	0.24	0.175	0.125	0.21
300	0.155	0.155	0.140	0.140	0.16	0.140	0.21	0.140	0.120	0.185
400	0.120	0.120	0.140	0.140	0.13	0.140	0.190	0.115	0.120	0.165

COPPER CONDUCTORS

TA 4F1

Single-core non-armoured cables having 85°C rubber insulation (COPPER CONDUCTORS)

BS 6007
BS 6883

Ambient temperature: 30°C
Conductor operating temperature: 85°C

CURRENT-CARRYING CAPACITY (amperes):

Conductor cross-sectional area	Reference Method 3 (enclosed in conduit etc. in or on a wall)		Reference Method 1 (clipped direct)		Reference Method 11 (on a perforated cable tray) Horizontal or Vertical		Reference Method 12 (free air)	
	2	3	4	5	6	7	8	9
1	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)
(mm ²)								
1	17	15	19	17.5	-	-	-	-
1.5	22	19.5	25	23	-	-	-	-
2.5	30	27	34	31	-	-	-	-
4	40	36	45	42	-	-	-	-
6	52	46	59	54	-	-	-	-
10	72	63	81	75	-	-	-	-
16	96	85	108	100	-	-	-	-
25	127	112	143	133	153	140	154	134
35	157	138	177	164	189	174	192	167
50	190	167	215	199	229	211	235	204
70	242	213	274	254	293	269	303	262
95	293	258	332	308	356	327	370	320
120	339	298	384	357	412	379	431	373
150	372	334	442	411	475	437	499	432
185	428	379	519	469	542	499	573	495
240	510	443	607	553	639	589	679	587
300	593	506	695	636	735	679	786	680
400	719	602	827	755	860	798	929	799
500	835	689	946	865	989	918	1081	919
630	975	791	1088	996	1143	1062	1263	1060

NOTES:

- Where the conductor is to be protected by a semi-enclosed fuse to BS 3036, see item 6.2 of the preface to this appendix.
- Where a conductor operates at a temperature exceeding 70°C it shall be ascertained that the equipment connected to the conductor is suitable for the conductor operating temperature (see Regulation 512-02).
- For cables in rigid pvc conduit the values stated in table 4D1 are applicable (see Regulation 521-05).
- Where cables in this table are connected to equipment or accessories designed to operate at a temperature not exceeding 70°C, the current ratings given in the equivalent table for 70°C pvc insulated cables (BS 6004, BS 6346) shall be used (see also Regulation 523-01-01).

TABLE 4F1B

VOLTAGE DROP (per ampere per metre):

Conductor cross-sectional area	2 cables, single-phase a.c.												3 or 4 cables, three-phase a.c.											
	Reference Method 3 (enclosed in conduit etc. in or on a wall)			Reference Methods 1 & 11 (clipped direct or on trays, touching)			Reference Method 12 (spaced*)			Reference Method 3 (enclosed in conduit etc. in or on a wall)			Reference Methods 1, 11 & 12 (in trefoil touching)			Reference Methods 1 & 11 (flat and touching)			Reference Method 12 (flat spaced*)					
(mm ²)	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z			
1	1.85	0.32	1.90	1.85	0.20	1.85	1.85	0.29	1.85	1.60	0.28	1.65	1.60	0.175	1.60	1.60	0.25	1.60	1.60	0.32	1.65			
1.5	1.80	0.32	1.90	1.85	0.20	1.85	1.85	0.29	1.85	1.60	0.28	1.65	1.60	0.25	1.60	1.60	0.25	1.60	1.60	0.32	1.65			
2	1.80	0.32	1.90	1.85	0.20	1.85	1.85	0.29	1.85	1.60	0.28	1.65	1.60	0.25	1.60	1.60	0.25	1.60	1.60	0.32	1.65			
2.5	1.80	0.32	1.90	1.85	0.20	1.85	1.85	0.29	1.85	1.60	0.28	1.65	1.60	0.25	1.60	1.60	0.25	1.60	1.60	0.32	1.65			
4	1.80	0.32	1.90	1.85	0.20	1.85	1.85	0.29	1.85	1.60	0.28	1.65	1.60	0.25	1.60	1.60	0.25	1.60	1.60	0.32	1.65			
6	1.80	0.32	1.90	1.85	0.20	1.85	1.85	0.29	1.85	1.60	0.28	1.65	1.60	0.25	1.60	1.60	0.25	1.60	1.60	0.32	1.65			
10	1.80	0.32	1.90	1.85	0.20	1.85	1.85	0.29	1.85	1.60	0.28	1.65	1.60	0.25	1.60	1.60	0.25	1.60	1.60	0.32	1.65			
16	1.80	0.32	1.90	1.85	0.20	1.85	1.85	0.29	1.85	1.60	0.28	1.65	1.60	0.25	1.60	1.60	0.25	1.60	1.60	0.32	1.65			
25	1.80	0.32	1.90	1.85	0.20	1.85	1.85	0.29	1.85	1.60	0.28	1.65	1.60	0.25	1.60	1.60	0.25	1.60	1.60	0.32	1.65			
35	1.30	0.31	1.40	1.30	0.195	1.35	1.30	0.28	1.35	1.15	0.27	1.20	1.15	0.170	1.15	1.15	0.24	1.15	1.15	1.15	0.32	1.20		
50	0.95	0.30	1.05	0.97	0.190	0.99	0.97	0.28	1.00	0.87	0.26	0.91	0.84	0.165	0.86	0.84	0.24	0.88	0.84	0.84	0.32	0.90		
70	0.65	0.29	0.74	0.66	0.185	0.69	0.66	0.27	0.72	0.60	0.25	0.65	0.57	0.160	0.60	0.57	0.24	0.62	0.57	0.57	0.31	0.65		
95	0.48	0.28	0.58	0.49	0.180	0.52	0.49	0.27	0.56	0.44	0.25	0.51	0.43	0.155	0.45	0.43	0.23	0.48	0.42	0.42	0.31	0.52		
120	0.38	0.27	0.49	0.39	0.175	0.43	0.39	0.26	0.47	0.35	0.24	0.43	0.34	0.155	0.37	0.34	0.23	0.41	0.34	0.34	0.30	0.45		
150	0.30	0.27	0.42	0.31	0.175	0.36	0.31	0.26	0.40	0.29	0.24	0.37	0.27	0.150	0.31	0.27	0.23	0.35	0.27	0.27	0.30	0.40		
185	0.25	0.27	0.38	0.25	0.170	0.30	0.25	0.26	0.36	0.23	0.23	0.33	0.22	0.150	0.26	0.22	0.22	0.31	0.22	0.22	0.30	0.37		
240	0.190	0.21	0.26	0.195	0.165	0.26	0.195	0.25	0.32	0.180	0.23	0.29	0.170	0.145	0.22	0.170	0.22	0.28	0.170	0.170	0.30	0.34		
300	0.150	0.170	0.26	0.155	0.165	0.23	0.155	0.25	0.29	0.150	0.23	0.27	0.135	0.140	0.195	0.135	0.22	0.26	0.135	0.135	0.29	0.32		
400	0.115	0.140	0.26	0.125	0.160	0.20	0.120	0.25	0.28	0.130	0.22	0.26	0.110	0.140	0.175	0.110	0.21	0.24	0.105	0.105	0.29	0.31		
500	0.091	0.115	0.26	0.100	0.155	0.185	0.097	0.24	0.26	0.105	0.22	0.24	0.089	0.135	0.165	0.089	0.21	0.23	0.085	0.085	0.29	0.30		
630	0.072	0.100	0.25	0.082	0.155	0.175	0.077	0.24	0.25	0.085	0.22	0.24	0.073	0.135	0.155	0.073	0.21	0.22	0.067	0.067	0.28	0.29		

NOTE: * Spacings larger than those specified in Method 12 (see table 4A) will result in larger voltage drop.

TABLE 4F2A

Multicore, sheathed and non-armoured cables having 85°C rubber insulation
(COPPER CONDUCTORS)

BS 6883

Ambient temperature: 30°C
Conductor operating temperature: 85°C

CURRENT-CARRYING CAPACITY (amperes):

Conductor cross-sectional area	Reference Method 3 (enclosed)		Reference Method 1 (clipped direct)		Reference Method 11 (on a perforated cable tray) or Reference Method 13 (free air)	
	2 1 two-core cable, single-phase a.c. or d.c.	3 1 three- or four-core cable, three-phase a.c.	4 1 two-core cable, single-phase a.c. or d.c.	5 1 three- or four-core cable, three-phase a.c.	6 1 two-core cable, single-phase a.c. or d.c.	7 1 three- or four-core cable, three-phase a.c.
1	(A)	(A)	(A)	(A)	(A)	(A)
1	16.5	14.5	18	16	19.5	17.5
1.5	21	18.5	23	20	25	22
2.5	29	25	32	28	34	30
4	38	33	43	37	46	40
6	48	43	55	48	59	52
10	66	58	76	66	81	71
16	87	77	103	88	109	94
25	114	100	136	117	144	123
35	139	122	168	144	177	151
50	167	147	201	174	213	186
70	211	185	256	222	272	237
95	254	222	310	269	329	287
120	292	256	359	312	381	333
150	320	287	413	359	438	383
185	368	326	470	409	499	437
240	439	381	553	482	587	515
300	509	436	636	555	675	593

NOTES:

1. Where the conductor is to be protected by a semi-enclosed fuse to BS 3036, see item 6.2 of the preface to this appendix.
2. Where a conductor operates at a temperature exceeding 70°C it shall be ascertained that the equipment connected to the conductor is suitable for the conductor operating temperature (see Regulation 512-02).
3. For cables in rigid pvc conduit the values stated in table 4D2 are applicable (see Regulation 521-05).
4. Where cables in this table are connected to equipment or accessories designed to operate at a temperature rating not exceeding 70°C, the current ratings given in the equivalent table for 70°C pvc insulated cables (BS 6004, BS 6346) shall be used (see also Regulation 523-01-01).

COPPER CONDUCTORS

TABLE 4F2B

VOLTAGE DROP (per ampere per metre): Conductor operating temperature: 85°C

Conductor cross-sectional area	Two-core cable, d.c.	Two-core cable, single-phase a.c.	Three- or four-core cable, three-phase a.c.		
	2	3	4		
(mm ²)	(mV/A/m)	(mV/A/m)	(mV/A/m)		
1	46	46	40		
1.5	31	31	26		
2.5	19	19	16		
4	12	12	10		
6	7.7	7.7	6.7		
10	4.6	4.6	4.0		
16	2.9	2.9	2.5		
			r	x	z
25	1.80	1.85	1.85	0.175	1.85
35	1.30	1.30	1.30	0.170	1.35
50	0.95	0.97	0.97	0.170	0.99
70	0.65	0.66	0.66	0.165	0.68
95	0.48	0.49	0.49	0.160	0.52
120	0.38	0.39	0.39	0.160	0.42
150	0.30	0.31	0.31	0.155	0.35
185	0.25	0.25	0.25	0.155	0.30
240	0.190	0.195	0.195	0.150	0.25
300	0.150	0.155	0.155	0.150	0.22
			r	x	z
			1.60	0.150	1.60
			1.15	0.150	1.15
			0.84	0.145	0.86
			0.58	0.140	0.59
			0.43	0.140	0.45
			0.34	0.135	0.36
			0.27	0.135	0.30
			0.22	0.130	0.26
			0.170	0.130	0.22
			0.135	0.130	0.185

COPPER CONDUCTORS

TABLE 4H1A
60°C rubber-insulated flexible cables
BS 6007

CURRENT-CARRYING CAPACITY (amperes):

Conductor cross-sectional area	Single-phase a.c. or d.c.		Three-phase a.c.		Single-phase a.c. or d.c.	
	1 two-core cable, with or without protective conductor	2	1 three-core, four-core or five-core cable	3	2 single-core cables	4
(mm ²)	(A)	(A)	(A)	(A)	(A)	(A)
4	30	26	26	-	140	-
6	39	34	34	-	175	-
10	51	47	47	-	216	-
16	73	63	63	-	258	-
25	97	83	83	-	302	-
35	-	102	102	-	347	-
50	-	124	124	-	394	-
70	-	158	158	-	471	-
95	-	192	192	-	541	-
120	-	222	222	-	644	-
150	-	255	255	-	738	-
185	-	291	291	-	861	-
240	-	343	343	-	-	-
300	-	394	394	-	-	-
400	-	-	-	-	-	-
500	-	-	-	-	-	-
630	-	-	-	-	-	-

NOTES:

1. The current ratings tabulated are for cables in free air but may also be used for cables resting on a surface. If the cable is to be wound on a drum on load the ratings should be reduced in accordance with NOTE 3 below and for cables which may be covered, NOTE 4 below.

2. Where the conductor is to be protected by a semi-enclosed fuse to BS 3036, see item 6.2 of the preface to this appendix.

3. Flexible cables wound on reeling drums

The current ratings of cables used on reeling drums are to be reduced by the following factors:

a) Radial type drum ventilated:	85%	b) Ventilated cylindrical type drum 1 layer of cable:	85%
unventilated:	75%	2 layers of cable:	65%
		3 layers of cable:	45%
		4 layers of cable:	35%

A radial type drum is one where spiral layers of cable are accommodated between closely spaced flanges; if fitted with solid flanges the ratings given above should be reduced and the drum is described as non-ventilated and if the flanges have suitable apertures as ventilated.

A ventilated cylindrical cable drum is one where layers of cable are accommodated between widely spaced flanges and the drum and end flanges have suitable ventilating apertures.

4. Where cable may be covered over or coiled up whilst on load, or the air movement over the cable restricted, the current rating should be reduced.

It is not possible to specify the amount of reduction but the table of rating factors for reeling drums can be used as a guide.

TABLE 4H1B

VOLTAGE DROP (per ampere per metre):

Conductor operating temperature: 60°C

Conductor cross-sectional area	Two-core cable, d.c.		Two-core cable, single-phase a.c.		1 three-core, four-core or five-core cable, three-phase a.c.		2 single-core cables, touching	
	2	3	4	5	6	d.c.	Single-phase a.c.*	
(mm ²)	(mV/A/m)	(mV/A/m)	(mV/A/m)	(mV/A/m)	(mV/A/m)	(mV/A/m)	(mV/A/m)	
1	12	10	10	-	-	-	-	
4	7.8	6.7	6.7	-	-	-	-	
6	4.6	4.0	4.0	-	-	-	-	
10	2.9	2.5	2.5	-	-	-	-	
16	-	-	-	-	-	-	-	
25	1.80	1.85	1.55	1.55	1.55	1.31	1.32	
35	-	-	1.10	1.10	1.15	0.91	0.93	
50	-	-	0.83	0.83	0.84	0.64	0.67	
70	-	-	0.57	0.57	0.58	0.49	0.53	
95	-	-	0.42	0.42	0.44	0.38	0.43	
120	-	-	0.33	0.33	0.36	0.31	0.36	
150	-	-	0.27	0.27	0.30	0.25	0.32	
185	-	-	0.22	0.22	0.26	0.195	0.27	
240	-	-	0.170	0.170	0.21	0.155	0.24	
300	-	-	0.135	0.135	0.185	0.120	0.21	
400	-	-	-	-	-	0.090	0.20	
500	-	-	-	-	-	0.068	0.185	
630	-	-	-	-	-	-	-	

NOTE: * A larger voltage drop will result if the cables are spaced.

TABLE 4H2A

85°C or 150°C rubber-insulated flexible cables

BS 6007

CURRENT-CARRYING CAPACITY (amperes):

Ambient temperature: 30°C
Conductor operating temperature: 85°C

Conductor cross-sectional area	d.c. or single-phase a.c. (1 two-core cable, with or without protective conductor)		Three-phase a.c. (1 three-core, four-core or five-core cable)		Single-phase a.c. or d.c., 2 single-core cables, touching	
	1	2	3	4	4	4
(mm ²)	(A)	(A)	(A)	(A)	(A)	(A)
1	41	36	36	36	192	192
4	53	47	47	47	240	240
6	73	64	64	64	297	297
10	99	86	86	86	354	354
16	131	114	114	114	414	414
25	-	140	140	140	476	476
35	-	170	170	170	540	540
50	-	216	216	216	645	645
70	-	262	262	262	741	741
95	-	303	303	303	885	885
120	-	348	348	348	1017	1017
150	-	397	397	397	1190	1190
185	-	467	467	467	-	-
240	-	537	537	537	-	-
300	-	-	-	-	-	-
400	-	-	-	-	-	-
500	-	-	-	-	-	-
630	-	-	-	-	-	-

CORRECTION FACTOR FOR AMBIENT TEMPERATURE

85°C rubber-insulated cables:

Ambient temperature	35°C	40°C	45°C	50°C	55°C	60°C	65°C	70°C	75°C	80°C
Correction factor	0.95	0.90	0.85	0.80	0.74	0.67	0.60	0.52	0.43	0.30

150°C rubber-insulated cables:

Ambient temperature	35 to 85°C	90°C	95°C	100°C	105°C	110°C	115°C	120°C	125°C	130°C	135°C	140°C	145°C
Correction factor	1.0	0.96	0.92	0.88	0.83	0.78	0.73	0.68	0.62	0.55	0.48	0.39	0.28

NOTES:

- The current ratings tabulated are for cables in free air but may also be used for cables resting on a surface. If the cable is to be wound on a drum on load the ratings should be reduced in accordance with NOTE 3 below and for cables which may be covered, NOTE 4 below.
- Where the conductor is to be protected by a semi-enclosed fuse to BS 3036, see item 6.2 of the preface to this appendix.
- Flexible cables wound on reeling drums

The current ratings of cables used on reeling drums are to be reduced by the following factors:

a) Radial type drum ventilated:	85%	b) Ventilated cylindrical type drum
unventilated:	75%	1 layer of cable: 85%
		2 layers of cable: 65%
		3 layers of cable: 45%
		4 layers of cable: 35%

A radial type drum is one where spiral layers of cable are accommodated between closely spaced flanges; if fitted with solid flanges the ratings given above should be reduced and the drum is described as non-ventilated and if the flanges have suitable apertures as ventilated.

A ventilated cylindrical cable drum is one where layers of cable are accommodated between widely spaced flanges and the drum and end flanges have suitable ventilating apertures.

- Where cable may be covered over or coiled up whilst on load, or the air movement over the cable restricted, the current rating should be reduced. It is not possible to specify the amount of reduction but the table of rating factors for reeling drums can be used as a guide.

- The temperature limits given in table 54C should be taken into account when it is intended to operate these cables at maximum permissible temperature.

- Where a conductor operates at a temperature exceeding 70°C it shall be ascertained that the equipment connected to the conductor is suitable for the conductor operating temperature (see Regulation 512-02).

- For 150°C cables, where the correction factors for ambient temperature are used, the conductor operating temperature may be up to 150°C.

- BS 6007 does not include rubber-insulated cables above 16 mm² nominal cross-sectional area

COPPER
CONDUCTORS

TABLE 4H2B

VOLTAGE DROP (per ampere per metre):

Conductor operating temperature: 85°C

Conductor cross-sectional area	1 two-core or 2 single-core cables d.c.		Two-core cable single-phase a.c.			1 three-core, four-core or five-core cable three-phase a.c.			2 single-core cables touching		
	(mm ²)	(mV/A/m)	r	x	z	r	x	z	r	x	z
1	2										
4	13			13			11				
6	8.4			8.4			7.3				
10	5.0			5.0			4.3				
16	3.1			3.1			2.7				
25	2.0	2.00	2.00	0.175	2.00	1.70	0.150	1.70			
35	1.42	-	-	-	-	1.20	0.150	1.20			
50	0.99	-	-	-	-	0.90	0.145	0.91	1.42	0.21	1.43
70	0.70	-	-	-	-	0.61	0.140	0.63	0.99	0.21	1.01
95	0.53	-	-	-	-	0.46	0.135	0.48	0.70	0.20	0.72
120	0.41	-	-	-	-	0.36	0.135	0.39	0.53	0.195	0.56
150	0.33	-	-	-	-	0.29	0.130	0.32	0.41	0.190	0.46
185	0.27	-	-	-	-	0.24	0.130	0.27	0.33	0.190	0.38
240	0.21	-	-	-	-	0.185	0.130	0.22	0.27	0.190	0.33
300	0.165	-	-	-	-	0.145	0.125	0.195	0.21	0.185	0.28
400	0.125	-	-	-	-	-	-	-	0.170	0.180	0.25
500	0.098	-	-	-	-	-	-	-	0.130	0.175	0.22
630	0.073	-	-	-	-	-	-	-	0.105	0.170	0.20
									0.084	0.170	0.190

NOTES:

- The voltage drop figures given above are based on a conductor operating temperature of 85°C and are therefore not accurate when the operating temperature is in excess of 85°C. In the case of the 150°C cables with a conductor temperature of 150°C the above resistive values should be increased by a factor of 1.2. (This factor is only applicable to the range of 150°C rubber-insulated cables included in BS 6007 i.e. up to 16 mm² nominal cross-sectional area).
- * A larger voltage drop will result if the cables are spaced.

COPPER CONDUCTORS

TABLE 4H3A

Flexible cords
BS 6141
BS 6500

CURRENT-CARRYING CAPACITY (amperes); and MASS SUPPORTABLE (kg):

Conductor cross-sectional area	Current-carrying capacity		Maximum mass supportable by twin flexible cord (see Regulation 522-08-06)
	Single-phase a.c.	Three-phase a.c.	
1	2	3	4
(mm ²)	(A)	(A)	(kg)
0.5	3	3	2
0.75	6	6	3
1	10	10	5
1.25	13	-	5
1.5	16	16	5
2.5	25	20	5
4	32	25	5

Where cable is on a reel see the notes to table 4H1A.

CORRECTION FACTOR FOR AMBIENT TEMPERATURE

60°C rubber and pvc cords:

Ambient temperature	35°C	40°C	45°C	50°C	55°C
Correction factor	0.91	0.82	0.71	0.58	0.41

150°C rubber cords:

Ambient temperature	35 to 120°C	125°C	130°C	135°C	140°C	145°C
Correction factor	1.0	0.96	0.85	0.74	0.60	0.42

85°C rubber cords having a h.o.f.r. sheath or a heat-resisting pvc sheath and for 85°C and 90°C heat-resisting pvc cords:

Ambient temperature	35 to 50°C	55°C	60°C	65°C	70°C
Correction factor	1.0	0.96	0.83	0.67	0.47

Glass fibre cords:

Ambient temperature	35 to 150°C	155°C	160°C	165°C	170°C	175°C
Correction factor	1.0	0.92	0.82	0.71	0.57	0.40

TABLE 4H3B

VOLTAGE DROP (per ampere per metre):

Conductor cross-sectional area	d.c. or single-phase a.c.	Three-phase a.c.
1	2	3
(mm ²)	(mV/A/m)	(mV/A/m)
0.5	93	80
0.75	62	54
1	46	40
1.25	37	-
1.5	32	27
2.5	19	16
4	12	10

NOTE: * The tabulated values above are for 60°C rubber-insulated and pvc-insulated flexible cords and for other types of flexible cords they are to be multiplied by the following factors:

For 85°C rubber or 85°C and 90°C pvc-insulated	1.09
150°C rubber-insulated	1.31
185°C glass fibre	1.43

7

TABLE 4J1A

**Mineral insulated cables bare and exposed to touch (see note 2)
or having an overall covering of pvc
(COPPER CONDUCTORS AND SHEATH)**

BS 6207

Ambient temperature: 30°C
Sheath operating temperature: 70°C

CURRENT-CARRYING CAPACITY (amperes):

REFERENCE METHOD 1 (CLIPPED DIRECT)

Conductor cross-sectional area	2 single-core cables, or 1 two-core cable, single-phase a.c. or d.c.	3 single-core cables in trefoil, or 1 three-core cable, three-phase a.c.	3 single-core cables in flat formation, three-phase a.c.	1 four-core cable, three cores loaded three-phase a.c.	1 four-core cable, all cores loaded	1 seven-core cable, all cores loaded	1 twelve-core cable, all cores loaded	1 nineteen-core cable, all cores loaded
1	2	3	4	5	6	7	8	9
(mm ²)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)
Light duty 500 V								
1	18.5	15	17	15	13	10	-	-
1.5	23	19	21	19.5	16.5	13	-	-
2.5	31	26	29	26	22	17.5	-	-
4	40	35	38	-	-	-	-	-
Heavy duty 750 V								
1	19.5	16	18	16.5	14.5	11.5	9.5	8.5
1.5	25	21	23	21	18	14.5	12.0	10.0
2.5	34	28	31	28	25	19.5	16.0	-
4	45	37	41	37	32	26	-	-
6	57	48	52	47	41	-	-	-
10	77	65	70	64	55	-	-	-
16	102	86	92	85	72	-	-	-
25	133	112	120	110	94	-	-	-
35	163	137	147	-	-	-	-	-
50	202	169	181	-	-	-	-	-
70	247	207	221	-	-	-	-	-
95	296	249	264	-	-	-	-	-
120	340	286	303	-	-	-	-	-
150	388	327	346	-	-	-	-	-
185	440	371	392	-	-	-	-	-
240	514	434	457	-	-	-	-	-

NOTES:

1. For single-core cables, the sheaths of the circuit are assumed to be connected together at both ends.
2. For bare cables exposed to touch, the tabulated values should be multiplied by 0.9.
3. Regulation 528-01-06 allows the omission of partitions under certain circumstances.

TABLE 4J1A (continued)

Mineral insulated cables bare and exposed to touch (see note 2)
or having an overall covering of pvc
(COPPER CONDUCTORS AND SHEATH)

BS 6207

Ambient temperature: 30°C
Sheath operating temperature: 70°C

CURRENT-CARRYING CAPACITY (amperes):

REFERENCE METHOD 11 (ON A PERFORATED CABLE TRAY, HORIZONTAL OR VERTICAL)

Conductor cross-sectional area	2 single-core cables, touching		1 two-core cable,	1 three-core cable, three-phase a.c.	1 four-core cable, three cores loaded	1 four-core cable, all cores loaded	1 seven-core cable, all cores loaded	1 twelve-core cable, all cores loaded	1 nineteen-core cable, all cores loaded	3 single-core cables, three-phase a.c.			
	Single-phase a.c. or d.c.		11	12	13	14	15	16	17	Vertical spaced	Horizontal spaced	Flat touching	Trefoil
	10	11								18	19	20	21
(mm ²)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)
Light duty 500 V													
1	18.5	19.5	16.5	16	14	11	-	-	19	22	17	16.5	
1.5	24	25	21	21	18	14	-	-	25	28	22	21	
2.5	31	33	28	28	24	19	-	-	32	37	29	28	
4	42	44	37	-	-	-	-	-	43	48	39	37	
Heavy duty 1000 V													
1	20	21	17.5	18	16	12	10	9	21	24	19	17.5	
1.5	25	26	22	23	20	15.5	13	11	27	30	25	22	
2.5	34	36	30	30	27	21	17	-	35	41	32	30	
4	45	47	40	40	35	28	-	-	47	53	43	40	
6	57	60	51	51	44	-	-	-	59	67	54	51	
10	78	82	69	68	59	-	-	-	80	90	73	69	
16	104	109	92	89	78	-	-	-	105	119	97	92	
25	135	142	120	116	101	-	-	-	135	154	125	120	
35	165	174	147	-	-	-	-	-	164	187	153	147	
50	204	215	182	-	-	-	-	-	202	230	188	182	
70	251	264	223	-	-	-	-	-	246	279	229	223	
95	301	317	267	-	-	-	-	-	294	333	275	267	
120	346	364	308	-	-	-	-	-	335	382	314	308	
150	395	416	352	-	-	-	-	-	380	431	358	352	
185	448	472	399	-	-	-	-	-	424	482	405	399	
240	524	552	466	-	-	-	-	-	472	537	471	466	

NOTES:

- For single-core cables, the sheaths of the circuit are assumed to be connected together at both ends.
- For bare cables exposed to touch, the tabulated values should be multiplied by 0.9.
- Regulation 528-01-06 allows the omission of partitions under certain circumstances.

COPPER CONDUCTORS

TABLE 4J1A (continued)
Mineral insulated cables bare and exposed to touch (see note 2)
or having an overall covering of pvc
(COPPER CONDUCTORS AND SHEATH)

BS 6207

Ambient temperature: 30°C
 Sheath operating temperature: 70°C

CURRENT-CARRYING CAPACITY (amperes):

REFERENCE METHODS 12 and 13 (FREE AIR)										
Conductor cross-sectional area	2 single-core cables, or 1 two-core cable, single-phase a.c. or d.c.	3 single-core cables in trefoil, or 1 three-core cable, three phase a.c.	1 four-core cable, three cores loaded three-phase a.c.	1 four-core cable, all cores loaded	1 seven-core cable, all cores loaded	1 twelve-core cable, all cores loaded	1 nineteen-core cable, all cores loaded	3 single-core cables, three-phase a.c.		
								Vertical spaced	Horizontal spaced	Touching
1	22	23	24	25	26	27	28	29	30	31
(mm ²)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)
Light duty										
500 V										
1	19.5	16.5	16	14	11	-	-	20	23	18
1.5	25	21	21	18	14	-	-	26	29	23
2.5	33	28	28	24	19	-	-	34	39	31
4	44	37	-	-	-	-	-	45	51	41
Heavy duty										
750 V										
1	21	17.5	18	16	12	10	9	22	25	20
1.5	26	22	23	20	15.5	13	11	28	32	26
2.5	36	30	30	27	21	17	-	37	43	34
4	47	40	40	35	28	-	-	49	56	45
6	60	51	51	44	-	-	-	62	71	57
10	82	69	68	59	-	-	-	84	95	77
16	109	92	89	78	-	-	-	110	125	102
25	142	120	116	101	-	-	-	142	162	132
35	174	147	-	-	-	-	-	173	197	161
50	215	182	-	-	-	-	-	213	242	198
70	264	223	-	-	-	-	-	259	294	241
95	317	267	-	-	-	-	-	309	351	289
120	364	308	-	-	-	-	-	353	402	331
150	416	352	-	-	-	-	-	400	454	377
185	472	399	-	-	-	-	-	446	507	426
240	552	466	-	-	-	-	-	497	565	496

NOTES:

1. For single-core cables, the sheaths of the circuit are assumed to be connected together at both ends.
2. For bare cables exposed to touch, the tabulated values should be multiplied by 0.9.
3. Regulation 528-01-06 allows the omission of partitions under certain circumstances.

TABLE 4J1B

**Mineral insulated cables bare and exposed to touch
or having an overall covering of pvc
(COPPER CONDUCTORS AND SHEATH)**

BS 6207

VOLTAGE DROP (per ampere per metre) for single-phase a.c. or d.c.: Sheath operating temperature: 70°C

Conductor cross-sectional area	Two single-core cables, touching			One two-core or multicore* cable		
	1	2	3	r	x	z
(mm ²)		(mV/A/m)	(mV/A/m)			
1	42	42	42			
1.5	28	28	28			
2.5	17	17	17			
4	10	10	10			
6	7	7	7			
10	4.2	4.2	4.2			
16	2.6	2.6	2.6			
25	1.65	0.200	1.65	1.65	0.145	1.65
35	1.20	0.195	1.20	-	-	-
50	0.89	0.185	0.91	-	-	-
70	0.62	0.180	0.64	-	-	-
95	0.46	0.175	0.49	-	-	-
120	0.37	0.170	0.41	-	-	-
150	0.30	0.170	0.34	-	-	-
185	0.25	0.165	0.29	-	-	-
240	0.190	0.160	0.25	-	-	-

NOTE: * Multiple single-phase a.c. or d.c. circuits in a multicore cable

TABLE 4J1B (continued)

**Mineral insulated cables bare and exposed to touch
or having an overall covering of pvc
(COPPER CONDUCTORS AND SHEATH)**

BS 6207

Sheath operating temperature: 70°C

VOLTAGE DROP (per ampere per metre) for three-phase operation:

Conductor cross-sectional area	Three single-core cables												One three-core or four-core or multicore* cable						
	Trefoil touching			Flat formation						Spaced 1 cable diameter apart									
	2	3	4	Touching		r		z		x		z							
(mm ²)	(mV/A/m)			(mV/A/m)						(mV/A/m)			(mV/A/m)						
1	36	36	36	14	9.1	6.0	3.6	2.3	14	9.1	6.0	3.6	2.3	14	9.1	6.0	3.6	2.3	5
1.5	24	24	24	14	9.1	6.0	3.6	2.3	14	9.1	6.0	3.6	2.3	14	9.1	6.0	3.6	2.3	36
2.5	14	14	14	14	9.1	6.0	3.6	2.3	14	9.1	6.0	3.6	2.3	14	9.1	6.0	3.6	2.3	24
4	9.1	9.1	9.1	14	9.1	6.0	3.6	2.3	14	9.1	6.0	3.6	2.3	14	9.1	6.0	3.6	2.3	14
6	6.0	6.0	6.0	14	9.1	6.0	3.6	2.3	14	9.1	6.0	3.6	2.3	14	9.1	6.0	3.6	2.3	14
10	3.6	3.6	3.6	14	9.1	6.0	3.6	2.3	14	9.1	6.0	3.6	2.3	14	9.1	6.0	3.6	2.3	14
16	2.3	2.3	2.3	14	9.1	6.0	3.6	2.3	14	9.1	6.0	3.6	2.3	14	9.1	6.0	3.6	2.3	14
25	1.45	0.170	1.45	1.45	0.25	1.45	1.45	1.45	1.45	0.25	1.45	1.45	1.45	1.45	0.32	1.50	1.45	1.45	1.45
35	1.05	0.165	1.05	1.05	0.24	1.10	1.05	1.05	1.05	0.24	1.10	1.05	1.05	1.05	0.31	1.10	-	-	-
50	0.78	0.160	0.80	0.79	0.24	0.83	0.79	0.79	0.79	0.24	0.83	0.79	0.79	0.31	0.87	-	-	-	-
70	0.54	0.155	0.56	0.55	0.23	0.60	0.55	0.55	0.55	0.23	0.60	0.55	0.55	0.30	0.65	-	-	-	-
95	0.40	0.150	0.43	0.41	0.22	0.47	0.41	0.41	0.41	0.22	0.47	0.41	0.41	0.29	0.53	-	-	-	-
120	0.32	0.150	0.36	0.33	0.22	0.40	0.33	0.33	0.33	0.22	0.40	0.33	0.33	0.28	0.46	-	-	-	-
150	0.26	0.145	0.30	0.29	0.21	0.36	0.29	0.29	0.29	0.21	0.36	0.29	0.29	0.27	0.42	-	-	-	-
185	0.21	0.140	0.26	0.25	0.21	0.32	0.25	0.25	0.25	0.21	0.32	0.25	0.25	0.26	0.39	-	-	-	-
240	0.165	0.140	0.22	0.21	0.20	0.29	0.21	0.21	0.21	0.20	0.29	0.21	0.21	0.25	0.36	-	-	-	-

NOTE: * Multiple three-phase circuits in a multicore cable

TABLE 4J2A

Mineral insulated cables bare and neither exposed to touch
nor in contact with combustible materials
(COPPER CONDUCTORS AND SHEATH)

BS 6207

Ambient temperature: 30°C

Sheath operating temperature: 105°C

CURRENT-CARRYING CAPACITY (amperes):

REFERENCE METHOD 1 (CLIPPED DIRECT)

Conductor cross-sectional area	2 single-core cables, or 1 two-core cable, single-phase a.c. or d.c.	3 single-core cables in trefoil, or 1 three-core cable, three-phase a.c.	3 single-core cables in flat formation, three-phase a.c.	1 four-core cable, three cores loaded three-phase a.c.	1 four-core cable, all cores loaded	1 seven-core cable, all cores loaded	1 twelve-core cable, all cores loaded	1 nineteen-core cable, all cores loaded
1	2	3	4	5	6	7	8	9
(mm ²)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)
Light duty 500 V								
1	22	19	21	18.5	16.5	13	-	-
1.5	28	24	27	24	21	16.5	-	-
2.5	38	33	36	33	28	22	-	-
4	51	44	47	-	-	-	-	-
Heavy duty 750 V								
1	24	20	24	20	17.5	14	12	10.5
1.5	31	26	30	26	22	17.5	15.5	13
2.5	42	35	41	35	30	24	20	-
4	55	47	53	46	40	32	-	-
6	70	59	67	58	50	-	-	-
10	96	81	91	78	68	-	-	-
16	127	107	119	103	90	-	-	-
25	166	140	154	134	117	-	-	-
35	203	171	187	-	-	-	-	-
50	251	212	230	-	-	-	-	-
70	307	260	280	-	-	-	-	-
95	369	312	334	-	-	-	-	-
120	424	359	383	-	-	-	-	-
150	485	410	435	-	-	-	-	-
185	550	465	492	-	-	-	-	-
240	643	544	572	-	-	-	-	-

NOTES:

1. For single-core cables, the sheaths of the circuit are assumed to be connected together at both ends.
2. No correction factor for grouping need be applied.
3. Where a conductor operates at a temperature exceeding 70°C it shall be ascertained that the equipment connected to the conductor is suitable for the conductor operating temperature (see Regulation 512-02).

TABLE 4J2A (continued)

Mineral insulated cables bare and neither exposed to touch
nor in contact with combustible materials
(COPPER CONDUCTORS AND SHEATH)

BS 6207

Ambient temperature: 30°C
Sheath operating temperature: 105°C

CURRENT-CARRYING CAPACITY (amperes):

REFERENCE METHODS 12 and 13 (FREE AIR)										
Conductor cross-sectional area	2 single-core cables, or 1 two-core cable, single-phase a.c. or d.c.	3 single-core cables in trefoil, or 1 three-core cable, three-phase a.c.	1 four-core cable, three cores loaded three-phase a.c.	1 four-core cable, all cores loaded	1 seven-core cable, all cores loaded	1 twelve-core cable, all cores loaded	1 nineteen-core cable, all cores loaded	3 single-core cables, three-phase a.c.		
								Vertical spaced	Horizontal spaced	Touching
1	10	11	12	13	14	15	16	17	18	19
(mm ²)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)
Light duty 500 V										
1	24	21	20	18	14	-	-	26	29	23
1.5	31	26	26	22	18	-	-	33	37	29
2.5	41	35	35	30	24	-	-	43	49	39
4	54	46	-	-	-	-	-	56	64	51
Heavy duty 750 V										
1	26	22	22	19	15	13	11	28	32	25
1.5	33	28	28	24	19	16.5	14	35	40	32
2.5	45	38	37	32	26	22	-	47	54	43
4	60	50	49	43	34	-	-	61	70	56
6	76	64	63	54	-	-	-	78	89	71
10	104	87	85	73	-	-	-	105	120	96
16	137	115	112	97	-	-	-	137	157	127
25	179	150	146	126	-	-	-	178	204	164
35	220	184	-	-	-	-	-	216	248	200
50	272	228	-	-	-	-	-	266	304	247
70	333	279	-	-	-	-	-	323	370	300
95	400	335	-	-	-	-	-	385	441	359
120	460	385	-	-	-	-	-	441	505	411
150	526	441	-	-	-	-	-	498	565	469
185	596	500	-	-	-	-	-	557	629	530
240	697	584	-	-	-	-	-	624	704	617

NOTES:

- For single-core cables, the sheaths of the circuit are assumed to be connected together at both ends.
- No correction factor for grouping need be applied.
- Where a conductor operates at a temperature exceeding 70°C it shall be ascertained that the equipment connected to the conductor is suitable for the conductor operating temperature (see Regulation 512-02).

TABLE 4J2B

Mineral insulated cables bare and neither exposed to touch nor in contact with combustible materials (COPPER CONDUCTORS AND SHEATH)

BS 6207

Sheath operating temperature: 105°C

VOLTAGE DROP (per ampere per metre) for single-phase a.c. or d.c.:

Conductor cross-sectional area	Two single-core cables touching			One two-core or multicore* cable		
	r	x	z	r	x	z
(mm ²)	(mV/A/m)					
1	47	31		47	31	
1.5	19	12		19	12	
2.5	7.8	4.7		7.8	4.7	
4	3.0			3.0		
6						
10						
16						
25	1.85	0.180	1.85	1.85	0.145	1.85
35	1.35	0.175	1.35	-	-	-
50	1.00	0.170	1.00	-	-	-
70	0.69	0.165	0.71	-	-	-
95	0.51	0.160	0.54	-	-	-
120	0.41	0.160	0.44	-	-	-
150	0.33	0.155	0.36	-	-	-
185	0.27	0.150	0.31	-	-	-
240	0.21	0.150	0.26	-	-	-

NOTE: * Multiple single-phase a.c. or d.c. circuits in a multicore cable

TABLE 4J2B (continued)

**Mineral insulated cables bare and neither exposed to touch
nor in contact with combustible materials
(COPPER CONDUCTORS AND SHEATH)**

BS 6207

Sheath operating temperature: 105°C

VOLTAGE DROP (per ampere per metre) for three-phase operation:

Conductor cross- sectional area	Three single-core cables											
	Trefoil touching			Flat formation						One three-core or four-core or multicore* cable		
	2			Touching			Spaced 1 cable diameter apart			5		
(mm ²)	(mV/A/m)			(mV/A/m)			(mV/A/m)			(mV/A/m)		
1	40			40			40			40		
1.5	27			27			27			27		
2.5	16			16			16			16		
4	10			10			10			10		
6	6.8			6.8			6.8			6.8		
10	4.1			4.1			4.1			4.1		
16	2.6			2.6			2.6			2.6		
25	r	x	z	r	x	z	r	x	z	r	x	z
	1.60	0.160	1.65	1.60	0.23	1.65	1.60	0.23	1.65	1.60	0.31	1.65
35	1.15	0.155	1.20	1.15	0.23	1.20	1.20	0.23	1.20	1.20	0.30	1.25
50	0.87	0.150	0.88	0.88	0.22	0.91	0.90	0.22	0.91	0.90	0.29	0.95
70	0.60	0.145	0.62	0.61	0.22	0.65	0.63	0.22	0.65	0.63	0.29	0.70
95	0.45	0.140	0.47	0.46	0.21	0.50	0.48	0.21	0.50	0.48	0.28	0.56
120	0.36	0.135	0.38	0.37	0.21	0.42	0.39	0.21	0.42	0.39	0.28	0.48
150	0.29	0.135	0.32	0.31	0.20	0.37	0.34	0.20	0.37	0.34	0.27	0.43
185	0.23	0.130	0.27	0.26	0.20	0.33	0.29	0.20	0.33	0.29	0.26	0.39
240	0.180	0.130	0.22	0.22	0.195	0.29	0.26	0.195	0.29	0.26	0.25	0.36

NOTE: * Multiple three-phase circuits in a multicore cable

ALUMINIUM CONDUCTORS

TABLE 4K1A

Single-core pvc-insulated cables, non-armoured, with or without sheath
(ALUMINIUM CONDUCTORS)

BS 6004

Ambient temperature: 30°C

CURRENT-CARRYING CAPACITY (amperes):

BS 6346

Conductor operating temperature: 70°C

Conductor cross-sectional area	Reference Method 4 (enclosed in conduit in thermally insulating wall etc.)		Reference Method 3 (enclosed in conduit on a wall or in trunking etc.)		Reference Method 1 (clipped direct)		Reference Method 11 (on a perforated cable tray horizontal or vertical)		Reference Method 12 (free air)		
	2 cables, single-phase a.c. or d.c.	3 or 4 cables, three-phase a.c.	2 cables, single-phase a.c. or d.c.	3 or 4 cables, three-phase a.c.	2 cables, single-phase a.c. or d.c. flat and touching	3 or 4 cables, three-phase a.c. flat and touching or trefoil	2 cables, single-phase a.c. or d.c. flat and touching	3 or 4 cables, three-phase a.c. flat and touching or trefoil	Horizontal flat spaced	Vertical flat spaced	Trefoil
1	2	3	4	5	6	7	8	9	10	11	12
(mm ²)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)
50	93	84	118	104	134	123	144	132	163	148	128
70	118	107	150	133	172	159	185	169	210	191	165
95	142	129	181	161	210	194	225	206	256	234	203
120	164	149	210	186	245	226	261	240	298	273	237
150	189	170	234	204	283	261	301	277	344	317	274
185	215	194	266	230	324	299	344	317	394	364	316
240	252	227	312	269	384	354	407	375	466	432	375
300	289	261	358	306	444	410	469	433	538	501	435
380	-	-	413	352	511	472	543	502	625	584	507
480	-	-	477	405	591	546	629	582	726	680	590
600	-	-	545	462	679	626	722	669	837	787	680
740	-	-	-	-	771	709	820	761	956	902	776
960	-	-	-	-	900	823	953	886	1125	1066	907
1200	-	-	-	-	1022	926	1073	999	1293	1229	1026

NOTE:

Where the conductor is to be protected by a semi-enclosed fuse to BS 3036, see item 6.2 of the preface to this appendix.

TABLE 4K1B

VOLTAGE DROP (per ampere per metre):

Conductor cross-sectional area	2 cables, single-phase a.c.												3 or 4 cables, three-phase a.c.											
	Reference Methods 3 & 4 (enclosed in conduit etc. in or on a wall)			Reference Methods 1 & 11 (clipped direct or on trays, touching)			Reference Method 12 (spaced*)			Reference Methods 3 & 4 (enclosed in conduit etc. in or on a wall)			Reference Methods 1, 11 & 12 (in trefoil touching)			Reference Methods 1 & 11 (flat touching)			Reference Method 12 (flat spaced*)					
1	3			4			5			6			7			8			9					
(mm ²)	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z
50	1.60	0.30	1.60	1.55	0.190	1.55	1.55	0.28	1.55	1.35	0.26	1.40	1.35	0.165	1.35	1.35	0.24	1.35	1.35	0.32	1.40			
70	1.10	0.30	1.15	1.05	0.185	1.05	1.05	0.27	1.10	0.94	0.26	0.97	0.91	0.160	0.92	0.91	0.24	0.94	0.91	0.31	0.96			
95	0.77	0.81	0.29	0.77	0.185	0.79	0.77	0.27	0.82	0.70	0.25	0.74	0.67	0.160	0.69	0.67	0.23	0.71	0.67	0.31	0.74			
	(mV/A/m)			(mV/A/m)			(mV/A/m)			(mV/A/m)			(mV/A/m)			(mV/A/m)			(mV/A/m)					
120	0.64	0.29	0.70	0.61	0.180	0.64	0.61	0.27	0.67	0.55	0.25	0.61	0.53	0.155	0.55	0.53	0.23	0.58	0.53	0.31	0.61			
150	0.49	0.51	0.28	0.49	0.175	0.52	0.49	0.26	0.55	0.45	0.24	0.51	0.42	0.155	0.45	0.42	0.23	0.48	0.42	0.30	0.52			
185	0.39	0.42	0.28	0.40	0.175	0.43	0.39	0.26	0.47	0.36	0.24	0.44	0.34	0.150	0.37	0.34	0.23	0.41	0.34	0.30	0.46			
240	0.30	0.32	0.27	0.30	0.170	0.35	0.30	0.26	0.40	0.28	0.24	0.37	0.26	0.150	0.30	0.26	0.22	0.35	0.26	0.30	0.40			
300	0.24	0.26	0.27	0.24	0.170	0.30	0.24	0.26	0.35	0.23	0.23	0.32	0.21	0.145	0.26	0.21	0.22	0.31	0.21	0.30	0.36			
380	0.190	0.22	0.27	0.195	0.165	0.26	0.195	0.25	0.32	0.190	0.23	0.30	0.170	0.145	0.22	0.170	0.22	0.28	0.170	0.29	0.34			
480	0.150	0.180	0.26	0.155	0.165	0.23	0.155	0.25	0.29	0.155	0.23	0.27	0.140	0.140	0.195	0.140	0.22	0.26	0.135	0.29	0.32			
600	0.120	0.150	0.26	0.130	0.160	0.21	0.125	0.25	0.28	0.125	0.22	0.26	0.110	0.140	0.180	0.110	0.22	0.24	0.110	0.29	0.31			
740	0.099	-	-	0.105	0.160	0.190	0.100	0.25	0.27	-	-	-	0.094	0.135	0.165	0.094	0.21	0.23	0.089	0.29	0.30			
960	0.075	-	-	0.086	0.155	0.180	0.082	0.24	0.26	-	-	-	0.077	0.135	0.155	0.077	0.21	0.22	0.071	0.29	0.29			
1200	0.060	-	-	0.074	0.155	0.170	0.068	0.24	0.25	-	-	-	0.066	0.135	0.150	0.066	0.21	0.22	0.059	0.28	0.29			

NOTE: * Spacings larger than those specified in Method 12 (see table 4A) will result in a larger voltage drop.

ALUMINIUM CONDUCTORS

TABLE 4K2A

Multicore pvc-insulated cables, non-armoured
(ALUMINIUM CONDUCTORS)

BS 6004
BS 6346

Ambient temperature: 30°C
Conductor operating temperature: 70°C

CURRENT-CARRYING CAPACITY (amperes):

Conductor cross-sectional area	Reference Method 4 (enclosed in an insulating wall etc.)		Reference Method 3 (enclosed in conduit on a wall or ceiling, or in trunking)		Reference Method 1 (clipped direct)		Reference Method 11 (on a perforated cable tray) or Reference Method 13 (free air)
	1 two-core cable, single-phase a.c. or d.c.	1 three- or four-core cable, three-phase a.c.	1 two-core cable, single-phase a.c. or d.c.	1 three- or four-core cable, three-phase a.c.	1 two-core cable, single-phase a.c. or d.c.	1 three- or four-core cable, three-phase a.c.	
1	2	3	4	5	6	7	9
(mm ²)	(A)	(A)	(A)	(A)	(A)	(A)	(A)
16	44	41	54	48	66	59	73
25	58	53	71	62	83	73	89
35	71	65	86	77	103	90	111
50	86	78	104	92	125	110	135
70	108	98	131	116	160	140	173
95	130	118	157	139	195	170	210
120	-	135	-	160	-	197	-
150	-	155	-	184	-	227	-
185	-	176	-	210	-	259	-
240	-	207	-	248	-	305	-
300	-	237	-	285	-	351	-
							212
							245
							280
							330
							381

NOTE:

Where the conductor is to be protected by a semi-enclosed fuse to BS 3036, see item 6.2 of the preface to this appendix.

TABLE 4K2B

VOLTAGE DROP (per ampere per metre): Conductor operating temperature: 70°C

Conductor cross-sectional area	Two-core cable, d.c.	Two-core cable, single-phase a.c.	Three- or four-core cable, three-phase a.c.
1	2	3	4
(mm ²)	(mV/A/m)	(mV/A/m)	(mV/A/m)
16	4.5	4.5	3.9
25	2.9	r x z 2.9 0.175 2.9	r x z 2.5 0.150 2.5
35	2.1	2.1 0.170 2.1	1.80 0.150 1.80
50	1.55	1.55 0.170 1.55	1.35 0.145 1.35
70	1.05	1.05 0.165 1.05	0.90 0.140 0.92
95	0.77	0.77 0.160 0.79	0.67 0.140 0.68
120	-	-	0.53 0.135 0.55
150	-	-	0.42 0.135 0.44
185	-	-	0.34 0.135 0.37
240	-	-	0.26 0.130 0.30
300	-	-	0.21 0.130 0.25

ALUMINIUM CONDUCTORS

TABLE 4K3A

Single-core armoured pvc-insulated cables (non-magnetic armour)
(ALUMINIUM CONDUCTORS)

CURRENT-CARRYING CAPACITY (amperes): BS 6346 Ambient temperature: 30°C
Conductor operating temperature: 70°C

Conductor cross-sectional area	Reference Method 1 (clipped direct)		Reference Method 11 (on a perforated cable tray)		Reference Method 12 (free air)							
	3 or 4 cables, three-phase a.c. flat and touching		2 cables, single-phase a.c. or d.c. flat and touching		2 cables, single-phase a.c.		2 cables, d.c. spaced		3 or 4 cables, three-phase a.c.			
	2	3	4	5	Horizontal flat spaced	Vertical flat spaced	Horizontal flat spaced	Vertical flat spaced	Horizontal flat spaced	Vertical flat spaced	3 cables trefoil	
1	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)
50	143	133	152	141	168	159	167	157	169	155	131	131
70	183	168	194	178	212	200	214	202	213	196	168	168
95	221	202	234	214	259	245	261	247	255	236	205	205
120	255	233	270	246	299	285	303	288	293	272	238	238
150	294	267	310	282	340	323	349	333	335	312	275	275
185	334	303	352	319	389	371	400	382	379	354	315	315
240	393	354	413	374	457	437	472	452	443	415	372	372
300	452	405	474	427	520	498	545	523	505	475	430	430
380	518	452	543	479	583	559	638	613	551	518	497	497
480	586	501	616	534	655	629	742	715	604	568	568	568
600	658	550	692	589	724	696	859	828	656	618	642	642
740	728	596	769	642	802	770	986	952	707	666	715	715
960	819	651	868	706	866	832	1171	1133	770	726	808	808
1200	893	692	952	756	938	902	1360	1317	822	774	880	880

NOTE:

Where the conductor is to be protected by a semi-enclosed fuse to BS 3036, see item 6.2 of the preface to this appendix.

TABLE 4K3B

VOLTAGE DROP (per ampere per metre):

Conductor operating temperature: 70°C

Conductor cross-sectional area	2 cables, single-phase a.c.			3 or 4 cables, three-phase a.c.								
	2 cables, d.c.	Reference Methods 1 & 11 (touching)	Reference Method 12 (spaced*)	Reference Methods 1, 11 and 12 (in trefoil touching)	Reference Methods 1 & 11 (flat and touching)	Reference Method 12 (flat spaced*)						
1	2	3	4	5	6	7						
(mm ²)	(mV/A/m)	(mV/A/m)	(mV/A/m)	(mV/A/m)	(mV/A/m)	(mV/A/m)						
50	1.55	0.23	0.31	1.35	0.195	1.35	r	x	z	r	x	z
70	1.05	0.22	0.30	0.92	0.190	0.93	1.35	0.27	1.35	1.30	0.34	1.35
95	0.77	0.21	0.29	0.68	0.185	0.70	0.93	0.26	0.96	0.95	0.33	1.00
							0.70	0.25	0.75	0.73	0.32	0.80
120	0.61	0.21	0.29	0.54	0.180	0.57	0.57	0.25	0.62	0.60	0.32	0.68
150	0.49	0.20	0.28	0.44	0.175	0.47	0.46	0.24	0.52	0.50	0.31	0.58
185	0.39	0.41	0.28	0.35	0.170	0.39	0.38	0.24	0.45	0.42	0.30	0.51
240	0.30	0.32	0.27	0.28	0.165	0.32	0.30	0.23	0.38	0.33	0.29	0.44
300	0.24	0.26	0.26	0.22	0.160	0.27	0.24	0.23	0.34	0.28	0.29	0.40
380	0.190	0.22	0.25	0.185	0.155	0.24	0.22	0.22	0.32	0.27	0.26	0.38
480	0.150	0.180	0.25	0.155	0.155	0.22	0.195	0.22	0.29	0.24	0.25	0.35
600	0.120	0.150	0.23	0.130	0.150	0.200	0.170	0.21	0.27	0.21	0.24	0.32
740	0.097	0.135	0.170	0.115	0.145	0.185	0.160	0.20	0.26	0.200	0.22	0.30
960	0.075	0.115	0.160	0.100	0.140	0.175	0.150	0.185	0.24	0.190	0.195	0.27
1200	0.060	0.110	0.155	0.094	0.140	0.170	0.145	0.160	0.22	0.185	0.165	0.25

NOTE: * Spacings larger than those specified in Method 12 (see table 4A) will result in larger voltage drop.

ALUMINIUM CONDUCTORS

TABLE 4K4A

Multicore armoured pvc-insulated cables
(ALUMINIUM CONDUCTORS)

BS 6346

Ambient temperature: 30°C

Conductor operating temperature: 70°C

CURRENT-CARRYING CAPACITY (amperes):

Conductor cross-sectional area	Reference Method 1 (clipped direct)		Reference Method 11 (on a perforated cable tray) or Reference Method 13 (free air)
	1 two-core cable, single-phase a.c. or d.c.	2 3 three- or four-core cable, three-phase a.c.	
1	2	3	5
(mm ²)	(A)	(A)	(A)
16	68	58	61
25	89	76	80
35	109	94	99
50	131	113	119
70	165	143	151
95	199	174	186
120	-	202	216
150	-	232	250
185	-	265	287
240	-	312	342
300	-	360	399

NOTE:

Where the conductor is to be protected by a semi-enclosed fuse to BS 3036, see item 6.2 of the preface to this appendix.

TABLE 4K4B

VOLTAGE DROP (per ampere per metre): Conductor operating temperature: 70°C

Conductor cross-sectional area	Two-core cable, d.c.	Two-core cable, single-phase a.c.	Three- or four-core cable, three-phase a.c.		
	2	3	r	x	z
1					
(mm ²)	(mV/A/m)	(mV/A/m)			(mV/A/m)
16	4.5	4.5			3.9
25	2.9	0.175	2.9	0.175	2.5
35	2.1	0.170	2.1	0.170	1.80
50	1.55	0.170	1.55	0.170	1.35
70	1.05	0.165	1.05	0.165	0.90
95	0.77	0.160	0.77	0.160	0.67
120	-	-	-	-	0.53
150	-	-	-	-	0.42
185	-	-	-	-	0.34
240	-	-	-	-	0.26
300	-	-	-	-	0.21

ALUMINIUM CONDUCTORS

TABLE 4L1A

Single-core cables having thermosetting insulation, non-armoured, with or without sheath (ALUMINIUM CONDUCTORS)

BS 5467

Ambient temperature: 30°C
Conductor operating temperature: 90°C

CURRENT-CARRYING CAPACITY (amperes):

Conductor cross-sectional area	Reference Method 4 (enclosed in conduit in thermally insulating wall etc.)		Reference Method 3 (enclosed in conduit on a wall or in trunking etc.)		Reference Method 1 (clipped direct)		Reference Method 11 (on a perforated cable tray horizontal or vertical)		Reference Method 12 (free air)			
	2	3	4	5	6	7	8	9	10	11	12	
1	2 cables, single-phase a.c. or d.c.	3 or 4 cables, three-phase a.c.	2 cables, single-phase a.c. or d.c.	3 or 4 cables, three-phase a.c.	2 cables, single-phase a.c. or d.c. flat and touching	3 or 4 cables, three-phase a.c. flat and touching or trefoil	2 cables, single-phase a.c. or d.c. flat and touching	3 or 4 cables, three-phase a.c. flat and touching or trefoil	2 cables, single-phase a.c. or d.c. or 3 cables, three-phase a.c.	Horizontal flat spaced	Vertical flat spaced	Trefoil
(mm ²)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)
50	125	113	157	140	169	149	180	165	210	188	159	(A)
70	158	142	200	179	215	189	231	211	271	244	206	159
95	191	171	242	217	265	234	281	258	332	300	253	206
120	220	197	281	251	308	273	326	300	387	351	296	253
150	253	226	-	-	353	314	376	346	448	408	343	296
185	288	256	-	-	410	366	430	396	515	470	395	343
240	338	300	-	-	489	438	509	469	611	561	471	395
300	387	344	-	-	564	507	586	541	708	652	544	471
380	-	-	-	-	658	594	679	628	798	742	638	544
480	-	-	-	-	765	692	786	728	927	865	743	638
600	-	-	-	-	871	791	903	836	1058	990	849	743
740	-	-	-	-	1001	911	1025	951	1218	1143	979	849
960	-	-	-	-	1176	1072	1191	1108	1440	1355	1151	979
1200	-	-	-	-	1333	1217	1341	1249	1643	1550	1307	1151

NOTES:

- Where the conductor is to be protected by a semi-enclosed fuse to BS 3036, see item 6.2 of the preface to this appendix.
- Where a conductor operates at a temperature exceeding 70°C it shall be ascertained that the equipment connected to the conductor is suitable for the conductor operating temperature (see Regulation 512-02).
- Where cables in this table are connected to equipment or accessories designed to operate at a temperature not exceeding 70°C, the current ratings given in the equivalent table for 70°C pvc insulated cables (BS 6004, BS 6346) shall be used (see also Regulation 523-01-01).

ALUMINIUM CONDUCTORS

TABLE 4L2A

Multicore cables having thermosetting insulation, non-armoured
(ALUMINIUM CONDUCTORS)

BS 5467

Ambient temperature: 30°C
Conductor operating temperature: 90°C

CURRENT-CARRYING CAPACITY (amperes):

Conductor cross-sectional area	Reference Method 4 (enclosed in an insulated wall etc.)		Reference Method 3 (enclosed in conduit on a wall or ceiling, or in trunking)		Reference Method 1 (clipped direct)		Reference Method 11 (on a perforated cable tray) or Reference Method 13 (free air)	
	1 two-core cable, single-phase a.c. or d.c.	1 three- or four-core cable, three-phase a.c.	1 two-core cable, single-phase a.c. or d.c.	1 three- or four-core cable, three-phase a.c.	1 two-core cable, single-phase a.c. or d.c.	1 three- or four-core cable, three-phase a.c.	1 two-core cable, single-phase a.c. or d.c.	1 three- or four-core cable, three-phase a.c.
1	2	3	4	5	6	7	8	9
(mm ²)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)
16	60	55	72	64	84	76	91	77
25	78	71	94	84	101	90	108	97
35	96	87	115	103	126	112	135	120
50	115	104	138	124	154	136	164	146
70	145	131	175	156	198	174	211	187
95	175	157	210	188	241	211	257	227
120	-	180	-	216	-	245	-	263
150	-	206	-	240	-	283	-	304
185	-	233	-	272	-	323	-	347
240	-	273	-	318	-	382	-	409
300	-	313	-	364	-	440	-	471

NOTES:

1. Where the conductor is to be protected by a semi-enclosed fuse to BS 3036, see item 6.2 of the preface to this appendix.
2. Where a conductor operates at a temperature exceeding 70°C it shall be ascertained that the equipment connected to the conductor is suitable for the conductor operating temperature (see Regulation 512-02).
3. Where cables in this table are connected to equipment or accessories designed to operate at a temperature not exceeding 70°C, the current ratings given in the equivalent table for 70°C pvc insulated cables (BS 6004, BS 6346) shall be used (see also Regulation 523-01-01).

TABLE 4L2B

VOLTAGE DROP (per ampere per metre): Conductor operating temperature: 90°C

Conductor cross-sectional area	Two-core cable, d.c.		Two-core cable, single-phase a.c.			Three- or four-core cable, three-phase a.c.			
	1	2	3	x	r	z	r	x	z
(mm ²)		(mVA/m)	(mVA/m)	(mVA/m)				(mV/A/m)	
16		4.8	4.8					4.2	
25		3.1		0.165	3.1	3.1	2.7	0.140	2.7
35		2.2		0.160	2.2	2.2	1.90	0.140	1.95
50		1.60		0.160	1.65	1.65	1.40	0.135	1.45
70		1.10		0.155	1.15	1.15	0.96	0.135	0.97
95		0.82		0.150	0.84	0.84	0.71	0.130	0.72
120	-	-	-	-	-	-	0.56	0.130	0.58
150	-	-	-	-	-	-	0.45	0.130	0.47
185	-	-	-	-	-	-	0.37	0.130	0.39
240	-	-	-	-	-	-	0.28	0.125	0.31
300	-	-	-	-	-	-	0.23	0.125	0.26

ALUMINIUM CONDUCTORS

TABLE 4L3A

Single-core cables having thermosetting insulation (non-magnetic armour)
(ALUMINIUM CONDUCTORS)

BS 5467
BS 6724

Ambient temperature: 30°C
Conductor operating temperature: 90°C

CURRENT-CARRYING CAPACITY (amperes):

Conductor cross-sectional area	Reference Method 11 (on a perforated cable tray)					Reference Method 12 (free air)					
	Reference Method 1 (clipped direct)		Reference Method 11 (on a perforated cable tray)		Reference Method 12 (free air)						
	2 cables, single-phase a.c. or d.c., flat and touching		2 cables, single-phase a.c. or d.c., flat and touching		2 cables, d.c.		3 or 4 cables, three-phase a.c.				
	2	3	4	5	6	7	8	9	10	11	12
1	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)
(mm ²)	179	165	192	176	212	199	216	197	215	192	162
50	228	209	244	222	269	254	275	253	270	244	207
70	276	252	294	267	328	310	332	307	324	296	252
120	320	291	340	308	378	358	384	357	372	343	292
150	368	333	390	352	429	409	441	411	424	394	337
185	419	378	444	400	490	467	511	480	477	447	391
240	494	443	521	468	576	549	605	572	554	523	465
300	568	508	597	536	654	624	701	666	626	595	540
380	655	573	688	608	735	704	812	780	639	649	625
480	747	642	786	685	825	790	942	906	765	717	714
600	836	706	880	757	909	872	1076	1036	832	780	801
740	934	764	988	824	989	950	1250	1205	890	835	897
960	1056	838	1121	911	1094	1052	1488	1435	970	911	1014
1200	1163	903	1236	990	1187	1141	1715	1658	1043	980	1118

NOTES:

1. Where the conductor is to be protected by a semi-enclosed fuse to BS 3036, see item 6.2 of the preface to this appendix.
2. Where a conductor operates at a temperature exceeding 70°C it shall be ascertained that the equipment connected to the conductor is suitable for the conductor operating temperature (see Regulation 512-02).
3. Where cables in this table are connected to equipment or accessories designed to operate at a temperature not exceeding 70°C, the current ratings given in the equivalent table for 70°C pvc insulated cables (BS 6004, BS 6346) shall be used (see also Regulation 523-01-01).

TABLE 4L3B

VOLTAGE DROP (per ampere per metre):

Conductor operating temperature: 90°C

Conductor cross-sectional area (mm ²)	2 cables, d.c.			2 cables, single-phase a.c.						3 or 4 cables, three-phase a.c.					
		Reference Methods 1 & 11 (touching)	Reference Method 12 (spaced*)		Reference Methods 1, 11 & 12 (in trefoil touching)	Reference Methods 1 & 11 (flat and touching)	Reference Method 12 (flat spaced*)		Reference Methods 1, 11 & 12 (in trefoil touching)	Reference Methods 1 & 11 (flat and touching)	Reference Method 12 (flat spaced*)		Reference Methods 1, 11 & 12 (in trefoil touching)	Reference Methods 1 & 11 (flat and touching)	Reference Method 12 (flat spaced*)
	2	3	4	5	6	7		5	6	7		5	6	7	
	(mV/A)	(mV/A/m)	(mV/A/m)	(mV/A/m)	(mV/A/m)	(mV/A/m)	(mV/A/m)	(mV/A/m)	(mV/A/m)	(mV/A/m)	(mV/A/m)	(mV/A/m)	(mV/A/m)	(mV/A/m)	(mV/A/m)
50	1.60	0.22	0.30	0.185	1.40	1.40	1.60	0.185	0.26	1.40	1.35	0.185	0.26	0.34	1.40
70	1.10	0.21	0.29	0.180	0.96	0.96	1.15	0.180	0.25	0.98	0.99	0.180	0.25	0.33	1.00
95	0.82	0.20	0.29	0.175	0.71	0.71	0.90	0.175	0.25	0.74	0.76	0.175	0.25	0.32	0.78
120	0.66	0.20	0.28	0.170	0.57	0.57	0.74	0.170	0.24	0.60	0.63	0.170	0.24	0.31	0.64
150	0.52	0.195	0.28	0.170	0.46	0.46	0.62	0.170	0.24	0.49	0.52	0.170	0.24	0.30	0.54
185	0.42	0.190	0.27	0.165	0.38	0.38	0.54	0.165	0.24	0.40	0.44	0.165	0.24	0.30	0.47
240	0.32	0.185	0.27	0.160	0.29	0.29	0.45	0.160	0.23	0.32	0.35	0.160	0.23	0.29	0.39
300	0.26	0.185	0.26	0.160	0.24	0.24	0.40	0.160	0.23	0.26	0.29	0.160	0.23	0.29	0.34
380	0.21	0.180	0.25	0.155	0.195	0.195	0.36	0.155	0.22	0.23	0.27	0.155	0.22	0.27	0.32
480	0.160	0.175	0.25	0.155	0.160	0.160	0.34	0.155	0.21	0.20	0.24	0.155	0.21	0.26	0.29
600	0.130	0.175	0.24	0.150	0.135	0.135	0.31	0.150	0.21	0.175	0.22	0.150	0.21	0.25	0.27
740	0.105	0.170	0.22	0.145	0.120	0.120	0.29	0.145	0.195	0.165	0.21	0.145	0.195	0.22	0.26
960	0.080	0.160	0.21	0.140	0.105	0.105	0.27	0.140	0.180	0.150	0.195	0.140	0.180	0.22	0.24
1200	0.064	0.160	0.20	0.135	0.093	0.093	0.25	0.135	0.175	0.140	0.180	0.135	0.175	0.22	0.22

NOTE: * Spacings larger than those specified in Method 12 (see table 4A) will result in larger voltage drop.

ALUMINIUM CONDUCTORS

TABLE 4L4A

**Multicore armoured cables having thermosetting insulation
(ALUMINIUM CONDUCTORS)**

BS 5467
BS 6724

CURRENT-CARRYING CAPACITY (amperes): Ambient temperature: 30°C
Conductor operating temperature: 90°C

Conductor cross-sectional area	Reference Method 1 (clipped direct)		Reference Method 11 (on a perforated cable tray) or Reference Method 13 (free air)
	1 two-core cable, single-phase a.c. or d.c.	2 1 three- or four-core cable, three-phase a.c.	
1	2	3	5
(mm ²)	(A)	(A)	(A)
16	82	71	74
25	108	92	98
35	132	113	120
50	159	137	145
70	201	174	185
95	242	214	224
120	-	249	264
150	-	284	305
185	-	328	350
240	-	386	418
300	-	441	488

NOTES:

1. Where the conductor is to be protected by a semi-enclosed fuse to BS 3036, see item 6.2 of the preface to this appendix.
2. Where a conductor operates at a temperature exceeding 70°C it shall be ascertained that the equipment connected to the conductor is suitable for the conductor operating temperature (see Regulation 512-02).
3. Where cables in this table are connected to equipment or accessories designed to operate at a temperature not exceeding 70°C, the current ratings given in the equivalent table for 70°C pvc insulated cables (BS 6004, BS 6346) shall be used (see also Regulation 523-01-01).

TABLE 4L4B

VOLTAGE DROP (per ampere per metre): Conductor operating temperature: 90°C

Conductor cross-sectional area	Two-core cable, d.c.		Two-core cable, single-phase a.c.			Three- or four-core cable, three-phase a.c.		
	1	2	3	x	z	r	x	z
(mm ²)	(mV/A/m)		(mV/A/m)			(mV/A/m)		
16	4.8	4.8	4.8				4.2	
25	3.1	3.1	0.165	3.1	3.1	2.7	0.140	2.7
35	2.2	2.2	0.160	2.2	2.2	1.90	0.140	1.95
50	1.60	1.65	0.160	1.65	1.65	1.40	0.135	1.45
70	1.10	1.10	0.155	1.15	1.15	0.96	0.135	0.97
95	0.82	0.82	0.150	0.84	0.84	0.71	0.130	0.72
120	-	-	-	-	-	0.56	0.130	0.58
150	-	-	-	-	-	0.45	0.130	0.47
185	-	-	-	-	-	0.37	0.130	0.39
240	-	-	-	-	-	0.28	0.125	0.31
300	-	-	-	-	-	0.23	0.125	0.26

APPENDIX 5

CLASSIFICATION OF EXTERNAL INFLUENCES (Chapters 32 and 52)

This Appendix gives the classification and codification of external influences developed for IEC Publication 364-3, Second Edition 1993.

Each condition of external influence is designated by a code comprising a group of two capital letters and a number, as follows:

The first letter relates to the general category of external influence:

- A** Environment
- B** Utilisation
- C** Construction of buildings

The second letter relates to the nature of the external influence:

- ... **A**
- ... **B**
- ... **C**

The number relates to the class within each external influence:

- **1**
- **2**
- **3**

For example the code **AA4** signifies:

- A** = Environment
- AA** = Environment - Ambient temperature
- AA4** = Environment - Ambient temperature in the range of -5°C to +40°C.

NOTE: The codification given in this Appendix is not intended to be used for marking equipment.

APPENDIX 5

CONCISE LIST OF EXTERNAL INFLUENCES

ENVIRONMENT	A	AA	Ambient (°C)	AF	Corrosion	AM	Radiation
		AA1	-60°C +5°C	AF1	Negligible	AM1	Negligible
		AA2	-40°C +5°C	AF2	Atmospheric	AM2	Stray currents
		AA3	-25°C +5°C	AF3	Intermittent	AM3	Electromagnetic
		AA4	-5°C +40°C	AF4	Continuous	AM4	Ionization
		AA5	+5°C +40°C			AM5	Electrostatics
		AA6	+5°C +60°C	AG	Impact	AM6	Induction
		AA7	-25°C +55°C	AG1	Low	AN	Solar
		AA8	-50°C +40°C	AG2	Medium	AN1	Low
				AG3	High	AN2	Medium
		AB	Temperature and humidity			AN3	High
		AC	Altitude (metres)	AH	Vibration		
		AC1	≤ 2000 metres	AH1	Low	AP	Seismic
		AC2	> 2000 metres	AH2	Medium	AP1	Negligible
				AH3	High	AP2	Low
		AD	Water	AJ	Other mechanical stresses	AP3	Medium
		AD1	Negligible			AP4	High
		AD2	Drops	AK	Flora		
		AD3	Sprays	AK1	No hazard	AQ	Lightning
		AD4	Splashes	AK2	Hazard	AQ1	Negligible
		AD5	Jets			AQ2	Indirect
		AD6	Waves	AL	Fauna	AQ3	Direct
		AD7	Immersion	AL1	No hazard		
		AD8	Submersion	AL2	Hazard	AR	Movement of air
						AR1	Low
		AE	Foreign bodies			AR2	Medium
		AE1	Negligible			AR3	High
		AE2	Small				
	AE3	Very Small			AS	Wind	
	AE4	Light dust			AS1	Low	
	AE5	Moderate dust			AS2	Medium	
	AE6	Heavy dust			AS3	High	
UTILIZATION	B	BA	Capability	BD	Evacuation	BE	Materials
		BA1	Ordinary	BD1	Normal	BE1	No risk
		BA2	Children	BD2	Difficult	BE2	Fire risk
		BA3	Handicapped	BD3	Crowded	BE3	Explosion risk
		BA4	Instructed	BD4	Difficult and crowded	BE4	Contamination risk
		BA5	Skilled				
		BB	Resistance				
		BC	Contact with earth				
		BC1	None				
		BC2	Low				
		BC3	Frequent				
		BC4	Continuous				
	BUILDING	C	CA	Materials	CB	Structure	
		CA1	Non-combustible	CB1	Negligible		
		CA2	Combustible	CB2	Fire propagation		
				CB3	Structure movement		
				CB4	Flexible		

Environment:

Code	Class designation	Characteristics	Applications and examples																
	<i>Ambient temperature</i>																		
AA1 AA2 AA3 AA4 AA5 AA6 AA7 AA8		<p>The ambient temperature is that of the ambient air where the equipment is to be installed.</p> <p>It is assumed that the ambient temperature includes the effects of all other equipment installed in the same location.</p> <p>The ambient temperature to be considered for the equipment is the temperature at the place where the equipment is to be installed resulting from the influence of all other equipment in the same location, when operating, not taking into account the thermal contribution of the equipment to be installed.</p> <p>Lower and upper limits of the ranges of ambient temperature:</p> <table border="0"> <tr> <td>-60°C</td> <td>+ 5°C</td> </tr> <tr> <td>-40°C</td> <td>+ 5°C</td> </tr> <tr> <td>-25°C</td> <td>+ 5°C</td> </tr> <tr> <td>- 5°C</td> <td>+40°C</td> </tr> <tr> <td>+ 5°C</td> <td>+40°C</td> </tr> <tr> <td>+ 5°C</td> <td>+60°C</td> </tr> <tr> <td>-25°C</td> <td>+55°C</td> </tr> <tr> <td>-50°C</td> <td>+40°C</td> </tr> </table> <p>Ambient temperature classes are applicable only where humidity has no influence.</p> <p>The average temperature over a 24-hour period must not exceed 5°C below the upper limits.</p> <p>Combination of two ranges to define some environments may be necessary. Installations subject to temperatures outside the ranges require special consideration</p>	-60°C	+ 5°C	-40°C	+ 5°C	-25°C	+ 5°C	- 5°C	+40°C	+ 5°C	+40°C	+ 5°C	+60°C	-25°C	+55°C	-50°C	+40°C	
-60°C	+ 5°C																		
-40°C	+ 5°C																		
-25°C	+ 5°C																		
- 5°C	+40°C																		
+ 5°C	+40°C																		
+ 5°C	+60°C																		
-25°C	+55°C																		
-50°C	+40°C																		

Environment continued:

Code	Class designation	Characteristics						Applications and examples
<i>Ambient climatic conditions (combined influence of temperature and humidity)</i>								
		Low air temperature	High air temperature	Low relative humidity	High relative humidity	Low absolute humidity	High absolute humidity	
		°C	°C	%	%	g/m ³	g/m ³	
AB1		-60	+5	3	100	0.003	7	Indoor and outdoor locations with extremely low ambient temperatures
AB2		-40	+5	10	100	0.1	7	Indoor and outdoor locations with low ambient temperatures
AB3		-25	+5	10	100	0.5	7	Indoor and outdoor locations with low ambient temperatures
AB4		-5	+40	5	95	1	29	Weather protected locations having neither temperature nor humidity control. Heating may be used to raise low ambient temperatures
AB5		+5	+40	5	85	1	25	Weather protected locations with temperature control
AB6		+5	+60	10	100	1	35	Indoor and outdoor locations with extremely high ambient temperature influence of cold ambient temperature is prevented. Occurrence of solar and heat radiation
AB7		-25	+55	10	100	0.5	29	Indoor weather protected locations having neither temperature nor humidity control, the locations may have opening directly to the open air or be subjected to solar radiation
AB8		-50	+40	15	100	0.04	36	Outdoor and non-weather protected locations, with low and high temperatures

NOTES:

1. All specified values are maximum or limit values which will have a low probability of being exceeded.
2. The low and high relative humidities are limited by the low and high absolute humidities, so that e.g. for environmental parameters a and c, or b and d, the limit values given do not occur simultaneously

Environment continued:

Code	Class designation	Characteristics	Applications and examples
<i>Altitude</i>			
AC1 AC2		≤ 2000 m > 2000 m	
<i>Presence of water</i>			
AD1	Negligible	Probability of presence of water is negligible	Location in which the walls do not generally show traces of water but may do so for short periods, for example in the form of vapour which good ventilation dries rapidly
AD2	Free-falling drops	Possibility of vertically falling drops	Location in which water vapour occasionally condenses as drops or where steam may occasionally be present
AD3	Sprays	Possibility of water falling as a spray at an angle up to 60°C from the vertical	Locations in which sprayed water forms a continuous film on floors and/or walls
AD4	Splashes	Possibility of splashes from any direction	Locations where equipment may be subjected to splashed water; this applies, for example, to certain external luminaires, construction site equipment
AD5	Jets	Possibility of jets of water from any direction	Locations where hosewater is used regularly (yards, car-washing bays)
AD6	Waves	Possibility of water waves	Seashore locations such as piers, beaches, quays, etc.
AD7	Immersion	Possibility of intermittent partial or total covering by water	Locations which may be flooded and/or where water may be at maximum 150 mm above the highest point of equipment, the lowest part of equipment being not more than 1 m below the water surface
AD8	Submersion	Possibility of permanent and total covering by water	Locations such as swimming pools where electrical equipment is permanently and totally covered with water under a pressure greater than 0.1 bar
<i>Presence of foreign solid bodies</i>			
AE1	Negligible	The quantity or nature of dust or foreign solid bodies is not significant	
AE2	Small objects	Presence of foreign solid bodies where the smallest dimension is not less than 2.5 mm	Tools and small objects are examples of foreign bodies of which the smallest dimension is at least 2.5 mm
AE3	Very small objects	Presence of foreign solid bodies where the smallest dimension is not less than 1 mm	Wires are examples of foreign solid bodies of which the smallest dimension is not less than 1 mm
AE4	Light dust	Presence of light deposits of dust 10 < deposit of dust ≤ 35mg/m ² a day	

Environment continued:

Code	Class designation	Characteristics	Applications and examples
AE5	Moderate	Presence of medium deposits of dust $35 < \text{deposit of dust} \leq 350 \text{mg/m}^2 \text{ a day}$	
AE6	Heavy dust	Presence of large deposits of dust $350 < \text{deposit of dust} \leq 1000 \text{mg/m}^2 \text{ a day}$	
Presence of corrosive or polluting substances			
AF1	Negligible	The quantity or nature of corrosive or polluting substances is not significant	
AF2	Atmospheric	The presence of corrosive or polluting substances of atmospheric origin is significant	Installations situated by the sea or near industrial zones producing serious atmospheric pollution, such as chemical works, cement works; this type of pollution arises especially in the production of abrasive, insulating or conductive dusts
AF3	Intermittent or accidental	Intermittent or accidental subjection to corrosive or polluting chemical substances being used or produced	Locations where some chemical products are handled in small quantities and where these products may come only accidentally into contact with electrical equipment; such conditions are found in factory laboratories, other laboratories or in locations where hydrocarbons are used (boiler-rooms, garages, etc.)
AF4	Continuous	Continuously subject to corrosive or polluting chemical substances in substantial quantity	For example, chemical works
Mechanical stress			
Impact			
AG1	Low severity		Household and similar conditions
AG2	Medium severity		Usual industrial conditions
AG3	High severity		Severe industrial conditions
Vibration			
AH1	Low severity		Household and similar conditions where the effects of vibration are generally negligible
AH2	Medium severity		Usual industrial conditions
AH3	High severity		Industrial installations subject to severe conditions

Environment continued:

Code	Class designation	Characteristics	Applications and examples
	<i>Other mechanical stresses</i>		
AJ	(Classification under consideration)		
	<i>Presence of flora and/or mould growth</i>		
AK1	No hazard	No harmful hazard or flora and/or mould growth	The hazard depends on local conditions and the nature of flora. Distinction should be made between harmful growth of vegetation or conditions for promotion of mould growth
AK2	Hazard	Harmful hazard or flora and/or mould growth	
	<i>Presence of fauna</i>		
AL1	No hazard	No harmful hazard from fauna	The hazard depends on the nature of the fauna. Distinction should be made between: - presence of insects in harmful quantity or of an aggressive nature - presence of small animals or birds in harmful quantity or of an aggressive nature
AL2	Hazard	Harmful hazard from fauna (insects, birds, small animals)	
	<i>Electromagnetic, electrostatic or ionizing influence</i>		
AM1	Negligible	No harmful effects from stray currents, electromagnetic radiation, electrostatic fields, ionizing radiation or induction	
AM2	Stray currents	Harmful hazards of stray currents	
AM3	Electromagnetics	Harmful presence of electromagnetic radiation	
AM4	Ionization	Harmful presence of ionizing radiation	
AM5	Electrostatics	Harmful presence of electrostatic fields	
AM6	Induction	Harmful presence of induced currents	

Environment continued:

Code	Class designation	Characteristics	Applications and examples
<i>Solar radiation</i>			
AN1	Low	Intensity $\leq 500 \text{ W/m}^2$	
AN2	Medium	$500 < \text{intensity} < 700 \text{ W/m}^2$	
AN3	High	$700 < \text{intensity} < 1120 \text{ W/m}^2$	
<i>Seismic radiation</i>			
AP1	Negligible	Acceleration $\leq 30 \text{ Gal}$	$1 \text{ Gal} = 1 \text{ cm/s}^2$
AP2	Low severity	$30 < \text{acceleration} < 300 \text{ Gal}$	
AP3	Medium severity	$300 < \text{acceleration} < 600 \text{ Gal}$	
AP4	High severity	$600 < \text{acceleration}$	Vibration which may cause the destruction of the building is outside the classification Frequency is not taken into account in the classification however, if the seismic wave resonates with the building, seismic effects must be specially considered. In general, the frequency of seismic acceleration is between 0 Hz and 10 Hz
<i>Lightning, ceraunic level</i>			
AQ1	Negligible	≤ 25 days per year	
AQ2	Indirect exposure	> 25 days per year Hazard from supply arrangement	Installations supplied by overhead lines
AQ3	Direct	Hazard from exposure of equipment	Parts of installations located outside buildings. The risks AQ2 and AQ3 relate to regions with a particularly high level of thunderstorm activity.
<i>Movement of air</i>			
AR1	Low	Speed $\leq 1 \text{ m/s}$	
AR2	Medium	$1 \text{ m/s} < \text{speed} \leq 5 \text{ m/s}$	
AR3	High	$5 \text{ m/s} < \text{speed} \leq 10 \text{ m/s}$	
<i>Wind</i>			
AS1	Low	Speed $\leq 20 \text{ m/s}$	
AS2	Medium	$20 \text{ m/s} < \text{speed} \leq 30 \text{ m/s}$	
AS3	High	$30 \text{ m/s} < \text{speed} \leq 50 \text{ m/s}$	

Utilisation:

Code	Class designation	Characteristics	Applications and examples
<i>Capability of person</i>			
BA1	Ordinary	Uninstructed persons	Nurseries Requirement for inaccessibility of electrical equipment. Limitation of temperature of accessible surfaces
BA2	Children	Children in locations intended for their occupation NOTE - This class does not necessarily apply to family dwellings	
BA3	Handicapped	Persons not in command of all their physical and intellectual abilities (sick person, old persons)	Hospitals Requirement for inaccessibility of electrical equipment. Limitation of temperature of accessible surfaces
BA4	Instructed	Persons adequately advised or supervised by skilled person to enable them to avoid dangers which electricity may create (operating and maintenance staff)	Electrical operating areas
BA5	Skilled	Persons with technical knowledge or sufficient experience to enable them to avoid dangers which electricity may create (engineers and technicians)	Closed electrical operating areas
<i>Electrical resistance of the human body</i>			
BB	(Classification under consideration)		
<i>Contact of persons with earth potential</i>			
BC1	None	Persons in non-conducting situation	Non-conducting locations
BC2	Low	Persons who do not in usual conditions make contact with extraneous-conductive-parts or stand on conducting surfaces	
BC3	Frequent	Persons who are frequently in touch with extraneous-conductive-parts or stand on conducting surfaces	Locations with extraneous-conductive-parts, either numerous or of large area
BC4	Continuous	Persons who are in permanent contact with metallic surrounding and for whom the possibility of interrupting contact is limited.	Metallic surroundings such as boilers and tanks

Utilisation continued:

Code	Class designation	Characteristics	Applications and examples
<i>Conditions of evacuation in an emergency</i>			
BD1	Normal	Low density occupation, easy conditions of evacuation	Buildings of normal or low height used for habitation
BD2	Difficult	Low density occupation, difficult conditions of evacuation	High-rise buildings
BD3	Crowded	High density occupation, easy conditions of evacuation	Locations open to the public (theatres, cinemas, department stores, etc.)
BD4	Difficult and crowded	High density occupation, difficult conditions of evacuation	High-rise buildings open to the public (hotels, hospitals, etc.)
<i>Nature of processed or stored materials</i>			
BE1	No significant risk		
BE2	Fire risks	Manufacture, processing or storage of flammable materials including presence of dust	Barns, wood-working shops, paper factories
BE3	Explosion risks	Processing or storage of explosive or low-flash point materials including presence of explosive dusts	Oil refineries, hydrocarbon stores
BE4	Contamination risks	Presence of unprotected foodstuffs, pharmaceuticals, and similar products without protection	Foodstuff industries, kitchens. Certain precautions may be necessary, in the event of fault, to prevent processed materials being contaminated by electrical equipment, e.g. by broken lamps

Construction of buildings:

Code	Class designation	Characteristics	Applications and examples
	<i>Construction of buildings</i>		
CA1	Non-combustible		
CA2	Combustible	Buildings mainly constructed of combustible materials	Wooden buildings
	<i>Building design</i>		
CB1	Negligible risks		
CB2	Propagation of fire	Buildings of which the shape and dimensions facilitate the spread of fire (e.g. chimney effects)	High-rise buildings. Forced ventilation systems
CB3	Movement	Risks due to structural movement (e.g. displacement between different parts of a building or between a building and the ground, or settlement of ground of building foundations)	Buildings of considerable length or erected on unstable ground
CB4	Flexible or unstable	Structures which are weak or subject to movement (e.g. oscillation)	Tents, air-support structures, false ceilings, removable partitions. Installations to be structurally self-supporting

APPENDIX 6

COMPLETION CERTIFICATE AND PERIODIC INSPECTION REPORT FORMS

Introduction

- (i) The Completion Certificate required by Part 7 shall be made out and signed by competent persons in respect of the design, construction, inspection and testing of the work.
- (ii) The Periodic Inspection Report required by Part 7 shall be made out and signed by competent persons in respect of the inspection and testing of an installation.
- (iii) Competent persons will, as appropriate to their function under i) and ii) above, have a sound knowledge and experience relevant to the nature of the work undertaken and to the technical standards set down in this British Standard, be fully versed in the inspection and testing procedures contained in this Standard and employ adequate testing equipment.
- (iv) Completion Certificates will indicate the responsibility for design, construction, inspection and testing, whether in relation to new work or further work on an existing installation. For large or complex installations those responsible may provide an equivalent to this form, as identified in Regulation 741-01-01.
- (v) Periodic Inspection Reports will indicate the responsibility for the inspection and testing of an installation within the extent and limitations specified on the form.
- (vi) A schedule of test results as required by Part 7 shall be issued with the associated Completion Certificate or Periodic Inspection Report.
- (vii) When making out and signing a form on behalf of a company or other business entity, individuals shall state for whom they are acting.
- (viii) Additional forms may be required as clarification, if needed by non-technical persons, or in expansion, for larger or more complex installations.
- (ix) The IEE Guidance Note 3 provides further information on inspection and testing on completion and for periodic inspections, and gives a model schedule of test results and additional forms for other purposes.

ELECTRICAL INSTALLATION COMPLETION CERTIFICATE (BS 7671 : 1992) (Notes 1 and 2)

Client's name/title:

DETAILS OF THE INSTALLATION

Tick boxes as appropriate

Installation Address:

New installation <input type="checkbox"/>	Extent of installation covered by this certificate (Use continuation sheet if necessary)
Addition to existing installation <input type="checkbox"/>	
Alteration to existing installation <input type="checkbox"/>	

PARTICULARS OF THE INSTALLATION

Type of Earthing: TN-C-S TN-S TT TN-C IT

Details of Earth Electrode:

Type.....Location.....Method of Measurement.....Resistance..... Ω

Characteristics of the supply at the origin of the installation:

Nominal voltage.....V Frequency.....Hz No of Phases.....Maximum demand (load).....A per phase

	Measured	Calculated	Other
Maximum prospective fault current (note 7) kA			
External earth fault loop impedance, Z_e Ω			

Overcurrent protective device at origin: Type: BS..... Rating.....A

Main switch or circuit-breaker: Number of poles..... Type: BS..... Rating.....A

(If a residual current device, rated residual operating current.....mA)

Method of protection against indirect contact:

1. Earthed equipotential bonding and automatic disconnection of supply

2. Other (describe)

Main equipotential bonding conductors: Conductor material csamm²

COMMENTS ON EXISTING INSTALLATION, IN THE CASE OF AN ALTERATION OR ADDITION

DESIGN

I/We being the person(s) responsible (as indicated by my/our signatures below) for the design of the electrical installation, particulars of which are described on page 1 of this form CERTIFY that the said work for which I/we have been responsible is to the best of my/our knowledge and belief in accordance with BS 7671: 1992 - Requirements for Electrical Installations (16th Edition IEE Wiring Regulations), amended to.....(Note 3) except for the departures, if any, stated in this Certificate.

Details of departures (if any) from BS 7671: 1992 (120-02)

The extent of liability of the signatory is limited to the work described on page 1 of this form as the subject of this Certificate.

For the DESIGN of the installation

Name (IN BLOCK LETTERS): Position:.....

Signature (Note 4): Date (Note 3):.....

For and behalf of:

Address:

..... Postcode:

CONSTRUCTION

I/We being the person(s) responsible (as indicated by my/our signatures below) for the design of the electrical installation, particulars of which are described on page 1 of this form CERTIFY that the said work for which I/we have been responsible is to the best of my/our knowledge and belief in accordance with BS 7671: 1992 - Requirements for Electrical Installations (16th Edition IEE Wiring Regulations), amended to.....(Note 3) except for the departures, if any, stated in this Certificate.

Details of departures (if any) from BS 7671: 1992

The extent of liability of the signatory is limited to the work described on page 1 of this form as the subject of this Certificate.

For the CONSTRUCTION of the installation

Name (IN BLOCK LETTERS): Position:.....

Signature (Note 4): Date (Note 3):.....

For and behalf of:

Address:

..... Postcode:

INSPECTION AND TEST

I/We being the person(s) responsible (as indicated by my/our signatures below) for the design of the electrical installation, particulars of which are described on page 1 of this form CERTIFY that the said work for which I/we have been responsible is to the best of my/our knowledge and belief in accordance with BS 7671: 1992 - Requirements for Electrical Installations (16th Edition IEE Wiring Regulations), amended to.....(Note 3) except for the departures, if any, stated in this Certificate.

The extent of liability of the signatory is limited to the work described on page 1 of this form as the subject of this Certificate.

For the INSPECTION AND TEST of the installation

Name (IN BLOCK LETTERS): Position:.....

Signature (Note 4): Date (Note 3):.....

For and behalf of:

Address:

..... Postcode:

I/We RECOMMEND that the installation be further inspected and tested after an interval of not more thanmonths/years (Note 5)

NOTES:

1. The Electrical Installation Completion Certificate is to be used only for the initial certification of a new installation or for an alteration or addition to an existing installation carried out in accordance with BS 7671: 1992. **It is not to be used for a Periodic Inspection** for which a Periodic Inspection Report form should be used. The **original** Certificate is to be given to the person ordering the work (Regulation 741-01-01). A **duplicate** should be retained by the contractor.
2. This Certificate is only valid if accompanied by the Schedule(s) of Test Results (see Note 6).
3. Dates to be inserted.
4. The signatures appended are those of the persons authorised by the companies executing the work of design, construction and inspection and testing respectively. A signatory authorised to certify more than one category of work should sign in each of the appropriate places.
5. The time interval recommended before the next periodic inspection must be inserted (see IEE Guidance Note 3 for guidance).
6. The page numbers for each of the Schedules of Test Results should be indicated, together with the total number of sheets involved.
7. The maximum prospective fault current recorded should be the greater of either the short-circuit current (between the live conductors) or the earth fault current (between phase conductor(s) and an exposed-conductive-part).

PERIODIC INSPECTION REPORT FOR AN ELECTRICAL INSTALLATION (BS 7671 : 1992) (Note 1)

DETAILS OF THE CLIENT

Client:

Address:

Purpose for which this Report is required:(Note 3)

DETAILS OF THE INSTALLATION

Occupier:

Address:

Description of Premises:

Domestic		Commercial	
Other			

Estimated age of the Electrical Installation: years

Evidence of Alterations or Additions:

Yes		No	
Not apparent			

If "Yes", Estimate Age: years

Date of last inspection: Records available

Yes		No	
-----	--	----	--

Records held by:

Type of Earthing: TN-C-S TN-S TT TN-C IT

Details of Earth Electrode:

Type.....Location.....Method of Measurement.....Resistance..... Ω

Characteristics of the supply at the origin of the installation:

Nominal voltage.....V Frequency.....Hz No of Phases.....Maximum demand (load).....A per phase

	Measured	Calculated	Other
Maximum prospective fault current (Note 4) kA			
External earth fault loop impedance, Z_e Ω			

Overcurrent protective device at origin: Type: BS..... Rating.....A

Main switch or circuit-breaker: Number of poles..... Type: BS..... Rating.....A

(If a residual current device, rated residual operating current.....mA)

Method of protection against indirect contact:

1. Earthed equipotential bonding and automatic disconnection of supply

2. Other (describe)

Main equipotential bonding conductors: Conductor material csamm²

EXTENT AND LIMITATIONS OF THE INSPECTION

Extent of Electrical Installation Covered by this Report (Note 5):
.....
Limitations:
.....

RECOMMENDATIONS (Note 9)

Referring to the "Schedule(s) of Inspection and Test Results", and subject to the limitations specified above	Recommendations as detailed below
<input style="width: 40px; height: 20px; border: 1px solid black;" type="checkbox"/> No remedial work required, or The following items:	
.....	
.....	
.....	
One of the following numbers shall be placed alongside each of the items detailed above (Note 6).	
<input style="width: 40px; height: 20px; border: 1px solid black; text-align: center; font-weight: bold; font-size: 1.2em;" type="checkbox"/> 1 requires urgent attention <input style="width: 40px; height: 20px; border: 1px solid black; text-align: center; font-weight: bold; font-size: 1.2em;" type="checkbox"/> 2 requires improvements <input style="width: 40px; height: 20px; border: 1px solid black; text-align: center; font-weight: bold; font-size: 1.2em;" type="checkbox"/> 3 requires further investigation	
<input style="width: 40px; height: 20px; border: 1px solid black; text-align: center; font-weight: bold; font-size: 1.2em;" type="checkbox"/> 4 does not comply with BS 7671: 1992 (as amended) (This does not necessarily imply that the electrical installation is unsafe).	

SUMMARY OF THE INSPECTION

Date(s) of the inspection:
General condition of the installation (Note 7):
.....
.....
..... Overall assessment: Satisfactory/Unsatisfactory
(Note 2)
SCHEDULE OF THE INSPECTION: See Sheet(s)..... attached
SCHEDULE OF TESTS: See Sheet(s)..... attached
SCHEDULE OF THE INSPECTION AND TEST RESULTS: See Sheet(s)..... attached

NEXT INSPECTION

We recommend that the installation should be re-inspected after an interval of not more than months/years (Note 8)
--

DECLARATION

To the best of our knowledge and belief I/We confirm that the details recorded above and in the attached Schedule(s) of Inspection and Test Results and the Recommendations are an accurate assessment, within the limits specified, of the condition of the electrical installation as above.	
INSPECTED BY:	REVIEWED BY:
Signature:	Signature:
Name (BLOCK CAPITALS):	Name (BLOCK CAPITALS):
Date of signing:	Date of signing:
For and behalf of:	
Address:	

NOTES:

1. This Periodic Inspection Report form shall only be used for the reporting on the condition of an existing installation.
2. The Report, normally comprising at least four pages, shall include schedules of both the inspection and the test results. Additional sheets of test results may be necessary for other than a simple installation. The page numbers of each sheet shall be indicated, together with the total number of sheets involved.
3. The intended purpose of the Periodic Inspection Report shall be identified, together with the recipient's details in the appropriate boxes.
4. The maximum prospective fault current recorded should be the greater of either the short-circuit current (between the live conductors) or the earth fault current (between phase conductor(s) and an exposed-conductive-part).
5. The 'Extent and Limitations' box shall fully identify the elements of the installation that are covered by the report and those that are not; this aspect having been agreed with the client and other interested parties before the inspection and testing is carried out.
6. The recommendation(s), if any, shall be categorised using the numbered coding 1-4 as appropriate.
7. The 'Summary of the Inspection' box shall clearly identify the condition of the installation in terms of safety.
8. Where the periodic inspection and testing has resulted in a satisfactory overall assessment, the time interval for the next periodic inspection and testing shall be given. The IEE Guidance Note 3 provides guidance on the maximum interval between inspections for various types of buildings. If the inspection and test reveals that parts of the installation require urgent attention, it would be appropriate to state an earlier re-inspection date having due regard to the degree of urgency and extent of the necessary remedial work.
9. If the space available on the model form for information on recommendations is insufficient, additional pages shall be provided as necessary.

INDEX

A			
A.C., types of cables suitable for	521-02		
Accessibility-			
- connections and joints	526-04		
- emergency switching	537-04-04		
- equipment	130-07, Sec. 513		
- protective conductor connections	543-03-03		
Accessories-			
- concealed cables to	522-06-06		
- selection and erection of	Sec. 553		
Accessory, definition	Part 2		
Additions to installations	130-09, Chap. 72		
Adverse conditions, precautions in	Sec. 522, Chap. 32		
Aerial cables	521-01, Table 4A (No. 14) Sec. 605		
Agricultural premises-			
- disconnection times for			
TN systems	605-05		
- dwellings excluded from			
requirements	605-01-01		
- electric fence controllers	605-14		
- electric fences	605-14-06		
- emergency switching, siting			
of devices for	605-13		
- equipment protection	605-11-01		
- heating appliances, fixing of	605-10-02		
- indirect contact protection	605-04		
- metallic grids in floors,			
bonding of	605-08-03		
- protection against fire	605-10		
- protection by SELV	605-02		
- residual current devices in	605-03, 605-10-01		
- socket-outlet circuits (except			
SELV) to be protected by			
residual current device	605-03		
- statutory regulations	Appx. 2, Item 1(v)		
- supplementary bonding for			
protection of livestock	605-08-02		
Air conditioning systems,			
main bonding of	413-02-02		
Air heating systems, forced	424-01		
Aircraft, electrical equipment			
of, the Regulations not			
applicable to	110-02-01(vi)		
Alarm-			
- devices, safety services	563-01		
- fire (<i>See Fire alarm</i>)			
Alterations to installations	130-09, Chap. 72		
Aluminium conductors-			
- as PEN conductor	546-02-02		
- in contact with brass etc.	522-05		
- minimum cross-sectional area	524-01		
Ambient temperature-			
- cables and conductors	522-01		
- cables, correction factors	Appx. 4, Para. 2.1		
- definition	Part 2		
Amendments to the Regulations	Preface		
Appliance, definition	Part 2		
Appliances-			
- fire hazard from	Sec. 422		
- flexible cables for	521-01-01		
- hot water or steam	424-02		
- in bathrooms	601-10-02		
- portable (<i>See Portable</i>			
<i>equipment</i>)			
- portable, connection of	553-01-07		
- switches mounted on	476-03-04		
- switching for	476-03-04		
Application of protective			
measures for safety	Chap. 47		
		Arcades, discharge lighting in	476-03-05
		Arcing of switchgear	130-03 422-01-03
		Arm's reach-	
		- application	412-05-02, 03
		- definition	Part 2
		Automatic disconnection of	
		supply, protection by (<i>See</i>	
		<i>Earthed equipotential bonding</i>	
		<i>and automatic disconnection</i>)	
		Automatic sources,	
		safety services supplies	313-02
		Autotransformers-	
		- SELV source, not for	411-02-03
		- use of	551-01
		Auxiliary supply for residual	
		current device	531-02-06
		B	
		Bare conductors-	
		- as overhead lines	412-05-01
		- cables connected to	523-03
		- electromechanical stresses	521-03
		- identification	514-06-03
		- switchboards, on	523-03, 514-06-03
		Bare live parts-	
		- PELV circuits	471-14-02
		- placing out of reach	412-05
		- SELV circuits	411-02-09
		Barrier, definition	Part 2
		Barriers-	
		- fire	527-02
		- protection by-	412-03
		- application of	471-05
		- degrees of protection	412-03
		- intermediate, in enclosures	412-03-04 413-03-08 611-02-02 412-03-01 471-05-02
		- openings in	
		- provided during erection,	
		testing	713-07
		- removal or opening of	412-03-04 611-02-02 412-03-03
		- securing of	Part 2
		Basic insulation, definition	Sec. 601
		Bathrooms, installations in-	
		- automatic disconnection	
		within 0.4 s	601-04-01
		- controls	601-08
		- floor heating	601-12-02
		- heating appliances	601-12-01
		- lampholders	601-11
		- luminaires	601-11
		- portable equipment not	
		permitted	601-10-02
		- SELV used in, source	601-03
		- SELV socket-outlets	601-10-01
		- shaver supply unit	601-09
		- socket-outlets not permitted	
		(except SELV)	601-10-02
		- supplementary bonding	
		required	601-04-02
		- surface wiring not to employ	
		exposed metalwork	601-07
		- switches	601-08
		Batteries-	
		- for safety services	562-01-01
		Bedrooms containing shower	
		cubicle	601-10-03
		Bends in wiring systems	522-08-03

Body resistance-	
- conventional normal	471-01
- in relation to nominal voltage of SELV circuits	471-02
- in relation to protection by automatic disconnection	471-08-01
- reduced	471-01, 601-01 602-01
Bonding (See also Equipotential bonding)-	
- agricultural premises	605-08
- bathrooms	601-04-02
- caravans	608-03-04
- conductor, definition	Part 2
- conductors-	
- main	413-02-02, 547-02
- selection and erection of	Sec. 547
- supplementary, sizing	547-03
- connections, warning notice at	514-13-01(ii)
- earth-free local	413-05
- equipment in electrically separated circuits	413-06-05(i)
- highway and street installations, metallic structures not to be bonded	611-02-05
- instantaneous water heaters	554-05-02
- lightning protection systems	413-02-02(vi) 542-04-01(iv)
- local supplementary	413-02-15
- main, to extraneous-conductive-parts	471-08-01
- other services at points of contact	413-02-02
- other services, fundamental requirement	528-02-05
- single-core metal-sheathed cables	130-04-04
- supplementary (See <i>Supplementary equipotential bonding</i>)	523-05
- swimming pools	602-03-02 602-08-04
- telecommunication cable, metallic sheath	413-02-02
Boxes-	
- joints and terminations in	526-03
- segregation of circuits in	528-01-07, 08
Breaking capacity-	
- fundamental requirement	130-03-01
- overload protective devices	432-02, 432-03
- fault current protective devices	432-02, 432-04 434-03
British Standards-	
- additional requirements of	110-01
- compliance with	Sec. 511
- exclusions from Scope	110-02
- reference in the Regulations, list	Appx. 1
Building materials, fire hazard from equipment	Secs. 421, 422
Building site (See <i>Construction sites</i>)	
Bunched, definition	Part 2
Buried cables (See <i>Cables, buried, Underground cables</i>)	
Busbars and busbar connections-	
- cables connected to busbars	523-03
- colour identification of	514-06-04
- selection of	521-01-02, 526-02
- trunking systems, as protective conductors	543-02-04
Burns, protection against	Sec. 423 462-01-01

C

Cable-	
- bracket, definition	Part 2
- channel, definition	Part 2
- cleat, definition	Part 2
- coupler, definition	Part 2
- couplers-	553-02
- reduced low voltage circuits	471-15-07
- selection	553-02
- covers	522-06-03
- ducting-	
- bends	522-08-03
- definition	Part 2
- erection of	522-08-02
- fire barriers in	527-02-02
- protective conductors formed by	543-02-07
- sealing at fire barriers	527-02
- selection of	521-05
- ducts-	
- bends	522-08-03
- fire barriers in	527-02-02
- ingress of water	522-03-01
- underground	522-06-03
- enclosures-	
- a.c. circuits in steel	521-02
- erection	522-08
- flexible, definition	Part 2
- ladder, definition	Part 2
- supports	522-08-04, 05
- tray, definition	Part 2
- trunking (See <i>Trunking systems</i>)	
- tunnel, definition	Part 2
Cables-	
- a.c., types for	521-02
- ambient temperature	522-01
	Appx. 4, Para. 2.1
- armour as protective conductor	543-02-05
- attack by fauna	522-10
- bends	522-08-03
- buried direct in ground	522-06-03
- caravan parks	608-12-01, 02
- colour identification	Sec. 514
- concealed in walls or partitions	522-06-06
- connected to bare conductors or busbars	523-03
- connections	Sec. 526
- core identification	514-06
- corrosive or polluting substances in contact with	522-05
- current-carrying capacity	130-02-03, Sec. 523, Appx. 4
- damage by-	
- fauna	522-10
- flora	522-09
- impact	522-06
- mechanical stresses	522-08
- solar radiation	522-11
- vibration	522-07
- electromagnetic effects	521-02
- electromechanical stresses	521-03
- emergency lighting	528-01
- enclosures, in onerous dust conditions	522-04
- external influences	Sec. 522
- extra-low voltage systems	411-02-06, 471-14
- fire alarm	528-01
- fire barriers	527-02
- fixings (See <i>Supports</i>)	
- flexible (including flexible cords)-	
- appliances, for	521-01-01 553-01-07
- cords, mass supportable	Appx. 4
- current-carrying capacity	Table 4H3A Appx. 4 Tables 4H1A 4H2A

<i>Cables- flexible (including flexible cords)- (cont'd)</i>			
- equipment, connections to	Sec. 526	- couplers	608-08-08
- fixed wiring, use for	521-01-04	- extra-low voltage	608-08-09
- identification of cores	514-07	- inlets	608-07
- segregation of circuits in	528-01-08	- luminaires	608-08-06, 07
- selection of	521-01, Appx. 4	- wiring	608-06-07
- separated circuits	413-06-03(ii)	Caravan park, definition	Part 2
- floor-warming	554-06-04	Caravan park installations-	Sec. 608, Div. Two
- grouping	Appx. 4, Para. 2.2	- plugs and socket-outlets for	608-13
- heating	554-06	Caravan pitch, definition	Part 2
- highway power supplies	611-04	Caravan pitch electrical supply	
- HV discharge lighting		equipment, definition	Part 2
(See <i>High Voltage</i>)		Cartridge fuse link, definition	Part 2
- identification of cores	Sec. 514	Categories of circuit (See	
- in conduit and trunking	522-08	definition of <i>Circuit</i>)	Part 2
- in saunas	603-07	Catenary wires	521-01-01
- installed under floors or			Table 4A (No. 14)
above ceilings	522-06-05	Ceiling roses-	522-08-04, 05
- joints, accessibility	526-03, 04	- application of	553-04-01(i)
- joints, general	Sec. 526	- exemption from requirements	
- lift shafts	528-02-06	for enclosures	412-03-04
- low temperatures, in	522-01	- multiple pendants	553-04-03
- mechanical stresses	522-06 to 522-08	- pendant luminaires, suitability	
- metal coverings as		for mass of	554-01-01
protective conductors	543-02-02, 05	- voltage limitation	553-04-02
- metal-sheathed, single-core,		Ceilings, thermally insulated,	
bonding	523-05	cables above	523-04
- metal coverings as earth		Ceilings, cables above,	
electrodes	542-02-01(vi), 05	mechanical damage	522-06-05
- methods of installation	521-07	Central heating systems, main	
- neutrals	524-02	bonding to	413-02-02(iv)
- non-flexible, LV, selection		Certificate-	
of types	521-01-01	- completion	741-01-01
- non-metal-enclosed, as		- provision of	Appx. 6
protection against direct			741-01-01
and indirect contact	471-09-04		742-02-01
- non-sheathed, to be enclosed	521-07-03		743-01-01
- on construction sites	604-10-02	Certification and Reporting	Chap. 74
- overhead between buildings etc.	412-05-01	Characteristics, general, of	
- parallel	433-03, 434-04	installation	300-01
	523-02	Charts (See <i>Diagrams</i>)	
- reduced neutral	524-02-02	Cinematograph installations	Appx. 2, Item 1(iv)
- road-warming	554-06-02, 03	Circuit arrangements,	
- sealing at fire barriers	527-02-01	division of installation	314-01-01
- segregation from other electrical		Circuit-breaker-	
and non-electrical services	528-01, 528-02	- definition	Part 2
- selection and erection	Chap. 52, Appx. 4	- linked, definition	Part 2
- single-core metal-sheathed,		- main, precautions for maintenance	476-02-01
bonding	523-05	Circuit-breakers-	
- soil-warming	554-06-02, 03	- breaking capacity	130-03-01
- sunlight, exposed to	522-02-01, 522-11		Sec. 432
- supports, general	522-08-04, 05	- electrode water heaters	434-03-01, 02
- telecommunication, (Cat.2),		and boilers, for	554-03-02
segregation	528-01	- emergency switching	537-04-03
- temperatures for (See		- fault current protection by	432-02, 432-04
<i>Temperature</i>)			434-03
- terminations	Sec. 526	- location of, fundamental	
- thermal insulation, in	523-04	requirements	130-03-01
- trenches, correction factors	Appx. 4	- miniature, as protection	
	Table 4B3	against shock	413-02-11, 14
- trenches, rating	Table 4A		604-04-04
	(Nos. 17-20)		605-05-04
- underground	522-06-03, 608-12	- nominal current to be indicated	533-01-01
	611-04	- overcurrent settings-	
- vibration	522-07, 608-06-07	- discrimination	533-01-06
- voltage drop	525-01	- precautions against	
	Appx. 4, Para. 7	interference with	533-01-05
- water or moisture in		- overload protection by	432-02, 432-03
contact with	522-03	Circuit, definition	Part 2
Capacitive electrical energy,		Circuit disconnection times	
discharge of	461-01-04	(See <i>Disconnection times</i>)	
Caravan, definition	Part 2	Circuit impedances, for	
Caravan installations-	Sec. 608, Div. One	automatic disconnection	413-02-04
- accessories	608-08	Circuit protective conductor,	
- bonding	Sec. 608	definition	Part 2
- cable supports	Appx. 4	Circuit protective conductor,	
	608-06-05	of ring circuit	543-02-09
- connectors	608-08-08		607-02-06

Circuits-			
- 'Class II', protective conductors in	413-03-09		Concealed cables in walls or partitions 522-06-06, 07
- control	471-09-02, 03		Concrete, steel reinforcement
- division of installation into	464-02		(<i>See Steel</i>)
- electrically separated,	314-01-01		Conductive parts (<i>See also</i>
arrangement of			<i>Exposed-conductive-parts.</i>
- final (<i>See Final circuits</i>)	413-06		<i>Extraneous-conductive-parts</i>)
- isolation	Sec. 461		Conductive parts in 'Class II'
- number of	Sec. 314		enclosures 413-03-09
- protective conductor			Conductors-
impedances for	Table 41C		- aluminium (<i>See Aluminium</i>
- ring (<i>See Final circuits, ring</i>)			<i>conductors</i>)
- safety services	Sec. 563		- ambient temperature 522-01
- segregation between	515-01-02, 528-01		- bare, cables connected to 523-03
- SELV, arrangement of	411-02		- bonding (<i>See Bonding conductors</i>)
- separation of	Sec. 314, 411-02		- connections Sec. 526
	Sec. 563		- copperclad (<i>See Aluminium</i>
- switching of	476-01-02		<i>conductors</i>)
Classification, safety services sources	313-02		- corrosive or polluting substances,
Class I equipment, definition	Part 2		exposure to 522-05
Class II equipment, definition	Part 2		- colour identification of Sec. 514
Class II equipment or			- current-carrying capacity Sec. 523
equivalent insulation,			- electromechanical stresses 521-03
protection by-	413-03		- erection of, fundamental
agricultural premises	605-11		requirement 130-02-04
- application of	471-09		- external influences Sec. 522
- application to complete			- heating 554-06
installation or circuit	471-09-03		- identification Sec. 514
- cables, non-metallic sheathed not			- insulating of, fundamental
to be described as	471-09-04		requirement 130-02-04
- conductive parts, connection to			Sec. 526
protective conductor prohibited	413-03-09		- mechanical stresses 522-06, 07, 08
- enclosures of equipment	413-03		- neutral, cross-sectional area 524-02
- exposed metalwork of			- overhead (<i>See Overhead lines</i>)
equipment, mounting to			- parallel 433-03, 434-04
prevent electrical contact	471-09-02		523-02
- insulating screws not to			- protective (<i>See Protective</i>
be relied upon	413-03-07		<i>conductors</i>)
- lids or doors in enclosures	413-03-08		- resistance under fault conditions 413-02-05
- preferred, for agricultural			- selection and erection Chap. 52
installations	605-11		- soldered 526-02
- protective conductors in relation to	413-03-09		- support, general 522-08
	471-09-02		Conduit and conduit systems-
- reinforced insulation during erection	413-03-01(iii)		- bends 522-08-03
- supplementary insulation			- cables in 522-08
during erection	413-03-01(ii)		- colour identification of 514-02
- testing	413-03-06		- drainage of 522-03
- type-tested equipment	413-03-01		- erection to be completed
Class III equipment-			before drawing in 522-08-02
definition	Part 2		- fixing (<i>See Supports</i>)
- earthing of	607-05-01		- flexible, prohibited as
Clean earth (<i>See Low noise earth</i>)			protective conductor 543-02-01
Clocks, plugs and socket- outlets for	553-01-05		- joints 543-03
CNE conductor (<i>See PEN conductor</i>)			- materials, British Standards 521-04
Codes of Practice-			- metallic-
- approved 120-02			- pin-grip and plain slip
- British Standard Appx. 1			formed by 543-03-06
Colour-			- socket-outlets in 543-02-07
- emergency switching devices	537-04-04		- non-metallic 521-04, 522-01
- fireman's switch	537-04-06		Conduit and conduit systems- (cont.)
- identification of non-flexible			- passing through floors and walls 527-02
cables and conductors	Sec. 514		- protective conductor formed by 543-02, 03
- identification of flexible			- sealing 527-02, 03
cables and cords	514-07		- short inaccessible lengths 471-13-04(v)
- identification of conduits	514-02		- underground 522-06-03
Combined protective and			- water in 522-03
functional purposes-			Connections, electrical 130-02-05
- earthing arrangements for,	542-01-06		Sec. 526
	Sec. 546		Connector, definition Part 2
Compatibility of equipment	331-01, 512-05		Connectors, caravan 608-08-08(iii)
Compliance with-			Connectors, clock 553-01-05(i)
- Electricity at Work Regulations			Construction of equipment, applicability
1989, Note by HSE	Preface (opp.)		of the Regulations to 110-04
- Standards	Sec. 511		Construction site installations-
Completion Certificate-			Sec. 604
- form of	Appx. 6		- cable couplers 604-13
- provision of	741-01-01		- cables to be protected against
			mechanical damage 604-10-02
			- disconnection times for TN systems 604-04
			- earth fault monitoring, IT system 604-03-01

<i>Construction site installations- (cont'd)</i>			
- emergency switching	604-11-03	Definitions	Part 2
- equipment protection	604-09-02	Demand, maximum, assessment of	Sec. 311
- exempt locations	604-01-01	Demand, maximum,	
- indirect contact protection	604-03-02	suitability of supply for	313-01
- IT system not to be used		Departures from the Regulations	120-05, Chap. 74
where an alternative	604-03-01	Design current, definition	Part 2
- luminaire supporting couplers		Diagrams, provision of	514-09
not to be used	604-12-03	Diagrams, availability for	
- main distribution assembly for	604-09, 604-11	inspection and testing	711-01
- main isolator to be lockable 'off	604-11-04	Dielectric, flammable liquid	422-01-05
- plugs and socket-outlets	604-12	Direct and indirect contact,	
- reduced low voltage systems	604-02-02	protection against both-	
	604-04-06	- application of	410-01, Sec. 411
	604-04-07	- cables as	471-02, 03
- residual current devices	604-08-03(ii)	Direct contact, definition	471-09-04
	604-11-06	Direct contact, protection against-	Part 2
- safety supplies	604-08-03	- application of	Secs. 412, 471
- socket-outlet circuits	604-02-02	- in areas accessible only to skilled	471-04 to 471-07
- voltages not to be exceeded	604-02-02	or instructed persons	
Consumer unit, definition	Part 2	- supplementary, by residual	471-13-01
Contactors, emergency switching by	537-04-03	current device	
Continuity tests	713-02, 03	- testing of	412-06, 471-16
Contracts, citation of the		Discharge lighting-	Sec. 713
Regulations in	120-01-02	- circuits, reduced neutral prohibited	
Control circuits	464-02	- fireman's switch	524-02-03
Controlgear, identification	514-01-01	- high voltage	476-03, 537-04-06
Controls in bathrooms	601-08	- isolation	554-02
Cord, flexible, definition	Part 2	Discharge of energy, for isolation	476-02-04
Cord-operated switches in		Discharge of energy, protection	461-01-06
bathrooms	601-08-01	by limitation of	
Correction factors (<i>See Cables</i>)		Disconnection times-	411-04, 471-03
Corrosion-		- agricultural and horticultural	
- cables, general	522-05	premises	Sec. 605
- earth electrodes	542-02	- bathrooms	601-04-01
- earthing conductors	542-03	- construction site installations	Sec. 604
- equipment	130-08-01	- fault clearance	434-03-03
- heating cables	554-06-02	- highway supplies and equipment	611-02-04
- wiring systems	522-05	- reduced low voltage systems	471-15-06
Coupler, cable (<i>See Cable coupler</i>)		- room containing a shower cubicle	601-04-01
Coupler (<i>See also Luminaire</i>		- shock protection, fixed equipment	
<i>supporting coupler</i>)-		outside main equipotential zone	471-08-03
- caravan	608-08-08	- shock protection, general	413-02
Current-		Disconnecter-	
- circulation, precautions to limit	566-01-02	- definition	Part 2
- maximum demand	Sec. 311	- functional switching, not for	537-05-03
- nature of	313-01	Discrimination-	
- nominal, of fuses and		- overcurrent protective devices	533-01-06
circuit-breakers	Sec. 533	- residual current devices	531-02-09
- suitability of equipment for	512-02	Disputes with electricity suppliers	Appx. 2
Current-carrying capacity-		Distribution board, definition	Part 2
- cables and conductors	130-02-03	Distribution circuit-	
	Sec. 523	- definition	Part 2
- definition	Part 2	- disconnection time for	413-02-13
- parallel conductors	433-03, 523-02	Diversity, may take account of	311-01-01
Currents, harmonic (<i>See Harmonic</i>		Doors-	
<i>currents</i>)		- in Class II enclosures	413-03-08
Current transformers, omission		- in street furniture	611-02-02
of overload protection	473-01-03(iii)	Double insulation-	
Current-using equipment-		- definition	Part 2
- definition	Part 2	- of equipment	413-03
- power demand	130-02, 512-04	Drainage of conduit systems	522-03
- selection and erection of	Sec. 554	Duct, definition	Part 2
Cyclic loads, overload protection for	533-02-01	Duct (<i>See also Cable ducts</i>)	
		Ducting (<i>See Cable ducting</i>)	
D		Dust, presence of	522-04
Danger, definition	Part 2		
Danger notices (<i>See Warning notices</i>)		E	
Data processing equipment-		Earth-	
- definition	Part 2	- connections to	130-04, Sec. 542
- earthing	607-01	- definition	Part 2
Data transmission circuits, applicability		- protection of persons in contact	
of the Regulations to	110-01-01(xiii)	with general mass of	471-08-03
D.C. plugs and socket-outlets,		Earth electrode-	
prohibited for switching	537-05-05	- caravan sites	608-13
Defects or omissions, on		- definition	Part 2
inspection and test	Chap. 74		

<i>Electrical separation, protection by- (cont'd)</i>		
- protective conductors for	413-06-05	
- separation of circuit	413-06-03	
- socket-outlets for	413-06-05(ii)	
- supplies for	413-06-02	
- testing of	713-06-02	
- voltage limitation	413-06-02(iv)	
Electricity at Work Regulations 1989-		
- applicable to places of work activity	Appx. 2, Item 1(iii)	
- compliance of installations with, Note by HSE	Preface (opp.)	
- further guidance on	Appx. 2, Para. 4	
- relationship of the Regulations to Electricity Supply Regulations 1988 (amended)-	120-02	
- relationship of the Regulations to - failure of consumer's installation to comply with	Appx. 2, Item 1(i) 120-02	
- failure of consumer's installation to comply with	Appx. 2, Para. 2	
Electrode boilers (and electrode water heaters)-		
- definition	Part 2	
- selection and erection of	554-03	
Electrodynamic effects (<i>See also Electromechanical, Electromagnetic</i>)		
Electrodynamic effects on protective conductors	543-03-01	
Electrolysis, precautions against-		
- earthing arrangements	542-01-08	
- wiring system metalwork	522-05-02	
Electromagnetic effects in cables	521-02	
Electromechanical stresses-		
- conductors and cables	521-03	
- earthing arrangements	542-01-07(ii)	
Electronic devices (<i>See also Semiconductors</i>)-		
- as safety source for SELV circuit	411-02-02(iv)	
Emergency lighting systems (<i>See also Circuit, definition</i>)-		
- segregation from fire alarm circuits	110-01-01(x) Part 2	
- segregation from other circuits	528-01-04	
- supplies for	528-01	
Emergency stopping-	313-02, Chap. 56	
- definition	Part 2	
- where to be provided	463-01-05	
- including electric braking	537-04-02	
Emergency switching-		
- application of	Part 2	
- definition	476-03	
- provision of	Part 2	
- restricted operation	Sec. 463	
- selection of devices for	476-03-03	
Enclosure, definition	537-01, 537-04	
Enclosures-	Part 2	
- accessibility to equipment within	Sec. 513	
- joints and terminations for	422-01-04, 526-03	
- protective conductors formed by	543-02	
- provided during erection, testing of	713-07	
Enclosures, protection by-		
- arc-resistant, for fixed equipment	422-01-03(i)	
- Class II or equivalent	413-03	
- degrees of protection	412-03	
- fire-resistant, for fixed equipment	422-01-02	
- lids or doors in	413-03-08	
- openings in	611-02-02	
- provided during erection, testing of	412-03-01	
- removal or opening of	713-07	
- securing of	412-03-04	
Energy, limitation of discharge of-	412-03-03	
- application	411-04	
Engineer, suitably qualified electrical	471-03	
	120-01-02, 471-12	
	Appx. 4, Item 8	
Environmental conditions (<i>See External influences</i>)		
Equipment-		
- accessibility	130-07, Sec. 513	
- adverse conditions, exposed to	130-08	
- agricultural premises	605-11 to 14	
- applicability of the Regulations to	110-04	
- Class II	413-03, 471-09	
- compatibility of	512-05	
- construction of	130-02	
- containing flammable liquid	422-01-05	
- current-using, definition	Part 2	
- current-using, requirements	Sec. 554	
- data processing	607-05	
- definition	Part 2	
- erection of	Part 5	
- established, use of	120-04	
- fixed-		
- definition	Part 2	
- disconnection times for	413-02-13	
- earth fault loop impedances for	413-02	
- for safety services supplies	562-01-02	
- functional testing of	713-12	
- fundamental requirements	130-02	
- guarding, against burns	Sec. 423	
- having exposed live parts	471-13-02	
- heat dissipation	422-01-02(iii)	
- incorporating motors	552-01-02	
- isolation and switching of	Chap. 46	
- maintenance of	130-02-01	
- mechanical maintenance switching for	Sec. 462, 537-03	
- mobile, in non-conducting location	413-04-05	
- oil-filled	422-01-05	
- operational conditions	Sec. 512	
- outdoors, circuits supplying	471-08-03	
- portable-		
- connection of	553-01-07	
- definition	Part 2	
- in non-conducting location	413-04-05	
- outdoors, supplies for	471-16	
- prohibited in bathrooms	601-10-02	
- selection of	Sec. 510	
- stationary, definition	Part 2	
- suitability for maximum power demand	130-02-02, 512-04	
- surface temperature of	422-01-02	
	Sec. 423	
- swimming pools	Sec. 602	
- testing of	130-02-01, Part 7	
- type-tested	413-03-01	
- used outside main equipotential zone	471-08-03	
Equipotential bonding (<i>See also Bonding</i>)-		
- agricultural premises	605-08	
- bathrooms	601-04-02	
- caravans	608-03-04	
- conductors-		
- main	413-02	
- selection and erection of	Sec. 547	
- supplementary	413-02	
- supplementary, sizing of	547-03	
- definition	Part 2	
- earth-free local	413-05	
- highway and street installations. metallic structures not to be bonded	611-02-05	
- local supplementary, general	413-02-15	
- main	413-02-02	
- safety separated circuits, in	413-06-05	
- swimming pools	602-03-02	
	602-08-04	
- testing of	713-02	
- zone, equipment used outside	471-08-03 to 05	
Equipotential zone, definition	Part 2	
Erection of equipment	Part 5	
Established materials, equipment and methods, use of	120-04	

European Committee for Electrotechnical Standardization (CENELEC)	Preface	- devices for	432-01, 432-02 432-04, Sec. 435
Exciter circuits of machines, omission of overload protection	473-01-03	- omission of devices for	473-02-04
Exclusions from Regulations	110-02	- position of devices for	473-02-01 to 03
Exhibitions, temporary discharge lighting installations for	476-03-05	Fauna, hazard to wiring system	522-10
Explosive atmospheres (<i>See Potentially explosive atmospheres</i>)		FELV (<i>See Functional extra-low voltage</i>)	
Exposed-conductive-part, definition	Part 2	Fence controllers, electric (<i>See also Electric fences</i>), selection and erection of	605-14
Exposed-conductive-parts-		Final circuit, definition	Part 2
- agricultural and horticultural premises	605-08-02, 605-09-01	Final circuits-	
- bathrooms and shower rooms	601-04	- arrangement of, general	314-01
- caravans	608-03-02	- to be connected to separate ways	314-01-04
- connection, for earthing and automatic disconnection-		- control of	314-01-02
- IT systems	413-02-21 to 26	- disconnection times, for earthing and automatic disconnection (<i>See Disconnection times</i>)	
- TN systems	413-02-06, 17	- earth fault loop impedances (<i>See Earth fault loop impedances</i>)	
- TT systems	413-02-18, 20	- number of points supplied	314-01-03
- data processing equipment, of	607-05-01	- number required	314-01-03
- earth-free local bonded location	413-05	- ring-	433-02-04
- electrical separation	413-06	- continuity test	713-03
- exemptions from protection against indirect contact	471-13-04(iii)	- definition	Part 2
- functional extra-low voltage systems	471-14-04, 05	- overload protection of	433-02-04
- high earth leakage current equipment	607-02-07(vi)	- protective conductor of	543-02-09
- local bonding of	413-02-27, 28	- to supply equipment producing high earth leakage current	607-02-06
- non-conducting location	413-04-02	- separate control of	314-01-02
- protective conductors formed by	543-02	- separation of	314-01-04
- restrictive conductive locations	606-04	Fire alarm systems, (<i>See also Circuit, definition</i>)-	110-01-01(xii) Part 2
- SELV circuits	411-02-07, 08	- segregation from emergency lighting circuits	528-01-04
- swimming pools	602-03-02	- segregation from other circuits	528-01
Extensions to installations	130-09, Chap. 72	- supplies for	313-02, Chap. 56
External influence, definition	Part 2	Fire authority, local, siting of fireman's switch	476-03-07
External influences-		Fire barriers	527-02
- classification of	Appx. 5	Fire conditions, safety services for	561-01-02
- earthing arrangements to be suitable for	542-01-07(iii)	Fire extinguishing devices, omission of overload protection in circuits supplying	473-01-03(iv)
- equipment to be suitable for	512-06	Fire, protection against-	
- selection and erection of equipment in relation to	Sec. 522	- applicability of Regulations to	120-01(v)
Extra-low voltage- (<i>See also Voltage, extra-low; Functional extra-low, Protective extra-low and Separated extra-low voltage</i>)-		- circuits for safety services	563-01-02
- application	471-02, 471-14	- equipment containing flammable liquid	422-01-05
- definition	Part 2	- equipment enclosure constructed during erection	422-01-07
- range covered by Regulations	110-03	- equipment, fixed	Secs. 421, 422
Extraneous-conductive-part, definition	Part 2	- fire hazard to adjacent materials	422-01-01, 02
Extraneous-conductive-parts-		- fire hazard to fixed object or building element	422-01-06
- agricultural premises	605-08-02	- fire-resistant screening or enclosure	422-01-02, 03
- bathrooms	601-04	- fundamental requirement	130-08-02
- bonding of	413-02-02	- heat dissipation of equipment	422-01-02(iii)
- caravans	413-02-27	- heating conductors and cables	554-06-01
- earth-free local bonded location	608-03-04	- risk of spread of fire	527-01
- propagating potential outside non-conducting location	413-05-02	- surface temperature of equipment	422-01-02
- protective conductors formed by	413-04-06	- thermal radiation	421-01-01
- SELV equipment connected to	543-02-02(vii)	Fireman's switch-	
- swimming pools	713-02	- provision of	476-03-05 to 07
	411-02-07(iv)	- selection of	537-04-06
	602-03-02	Fire-resistant-	
F		- screens or enclosures for equipment	422-01-02, 03
Fault, definition	Part 2	- structural elements, cables passing through	527-02
Fault current (<i>See also Short-circuit current</i>)-		Fixed equipment (<i>See also Equipment, fixed</i>)-	
- definition	Part 2	- definition	Part 2
- prospective (<i>See Prospective fault current</i>)		- heat dissipation	422-01-02(iii)
- protection against-	Secs. 431, 434 473-02		

Flammable dielectric liquid, in equipment	422-01-05	- prohibited in earthed neutral	130-05-02
Flexible cable, definition	Part 2	- selection of	533-01 to 533-03
Flexible cables and cords (<i>See Cables, flexible</i>)		- semi-enclosed-	
Flexible conduits, prohibited as protective conductors	543-02-01	- elements for	533-01-04
Flexible cord, definition	Part 2	- overload protection by	433-02-03
Floor-warming systems-		- shock protection by-	413-02-10, 14
- cables and conductors for	554-06	- fault current protection by	432-04
Floors-		- single-pole, in phase only	130-05-01
- cables buried in	522-06-04	Fusing factor	533-01-02(ii)
- cables passing through	527-02-01		
- cables under	522-06-05	G	
- conductive, in earth-free bonded location	413-05-04	Gas installation pipe, definition	Part 2
- insulating, resistance of	413-04-04	Gas meters	547-02-02
Flora, hazard to wiring system	522-09	Gas pipes-	
Fluctuating loads, (<i>See Cyclic loads</i>)		- bonding at points of contact with	528-02-05
Fluorescent lighting (<i>See Discharge lighting</i>)		- main bonding of	413-02-02(ii)
Foreign Standards	Preface	- prohibited as protective conductor	543-02-01
Foundations used for earthing	542-02-01(iv)	- public, prohibited as earth electrodes	542-02-04
Frequency-		- segregation from	528-02-05
- effect on current-carrying capacity of conductors	Appx. 4	General characteristics of installation, assessment of	300-01
- suitability of equipment for	512-03	Glossary (<i>See Definitions</i>)	Part 2
- supply, assessment of	313-01-01(ii)	Guarding of equipment, against burns	Sec. 423
Functional earthing-		H	
- clean (low-noise)	Sec. 545	Harmonic currents-	
- definition	Part 2	- compatibility of equipment	Chap. 33, 512-05
- equipment producing high leakage currents	Sec. 607	- neutral conductors, size of	524-02
- protective earthing in relation to	542-01-06	- precautions to limit	460-01-05
	Sec. 546		566-01-02
Functional extra-low voltage (FELV), definition	Part 2	Harmonized standard, definition	Part 2
Functional extra-low voltage systems-		Harmonization Documents	Preface
- application of	471-14-01	Health and Safety at Work etc. Act 1974	120-02, Appx. 2
	471-14-03 to 06	Heat dissipation of equipment	422-01-02(iii)
- enclosure and insulation of	471-14-03	Heaters for water, etc.	554-03 to 05
- exposed-conductive-parts of	471-14-04, 05	Heating appliances-	
- general	411-03	- agricultural premises	605-10-02
- not to be used alone as protective measure	411-01-02	- bathrooms	601-12-01
- plugs and socket-outlets of	471-14-06	Heating conductors and cables	554-06
- primary circuit of	471-14-04, 05	High earth leakage currents, earthing requirements	Sec. 607
Functional switching-		High voltage discharge lighting-	554-02
- definition	Part 2	- fireman's switch	476-03, 537-04-06
- provision of	Sec. 464	High voltage electrode water heaters and boilers	554-03
- selection of devices for	537-05	High voltage luminous tube signs, licensing conditions	Appx. 2 Item 1(vii)
Fundamental requirements for safety	Chap. 13	Highly Flammable Liquids and Liquefied Petroleum Gases Regulations 1972	Appx. 2, Para. 5(ii)
Fuse, definition	Part 2	Highway, definition	Part 2
Fuse carrier, definition	Part 2	Highway distribution board, definition	Part 2
Fuse element, definition	Part 2	Highway distribution circuit, definition	Part 2
Fuse elements, for semi-enclosed fuses	533-01-04	Highway power supply, definition	Part 2
Fuse link, definition	Part 2	Highway power supplies (<i>See also Street furniture, Street located equipment</i>)-	Sec. 611
Fuse links-		- disconnection time	611-02-04
- marking of intended type	533-01-02(i)	- identification of cables	611-04
- non-interchangeability of	533-01-02(ii)	- isolation and switching, devices for	611-03
- removable whilst energised	533-01-03	- isolation by supplier's cut-out, approval needed	611-03-02
- replaceable by unskilled persons	533-01-01, 02	- protection against electric shock	611-02
Fused plugs	553-01	- temporary supplies	611-06
Fuses- (<i>See also Overcurrent protective devices</i>)-		Hoist shaft, cables in	528-02-06
- accessible to unskilled persons	533-01-01	Horticultural premises (<i>See Agricultural premises</i>)	
- cartridge type, preferred	533-01-04	Hot air sauna (<i>See Saunas</i>), definition	Part 2
- fault protection by	432-04, 533-03	Household or similar installations-	
- functional switching, not to be used for	537-05-03	- main switch for	476-01-03
- in plugs	553-01-03	- socket-outlets for, selection	553-01-04
- marking of	533-01-02(i)		
- nominal current to be indicated	533-01-01		
- non-interchangeability of links	533-01-02(ii)		
- overload and fault protection by	432-02		
- overload protection by	432-03, 533-02		

I

Identification (<i>See also Notices</i>)-			
- colour (<i>See Colour</i>)			
- highway cables	611-04		
- protective devices	514-08		
IEC (<i>See International Electrotechnical Commission</i>)			
Immersion heaters (<i>See Water heaters</i>)			
Impedance-			
- circuit, for automatic disconnection	413-02-04		
- earth fault loop (<i>See Earth fault loop impedance</i>)			
- earthing (<i>See Earthing impedance</i>)			
- 'protective' (<i>See Limitation of discharge of energy</i>)			
Indicators-			
- circuit-breaker overcurrent settings	533-01-05		
- fireman's switch	537-04-06		
- fuse link, type of	533-01-02(i)		
- isolation devices, operation of	514-11, 537-02-03		
- mechanical maintenance switching	537-03-02		
- restricted areas, warning signs	471-13-03		
- switchgear, operation of remote	514-01-01		
Indirect contact, definition	Part 2		
Indirect contact, protection against-	410-01, Secs. 413 471		
- application of	Sec. 471, Part 6		
- automatic disconnection of supply	413-02, 471-08		
- Class II equipment or equivalent	413-03, 471-09		
- earth-free local equipotential bonding	413-05, 471-11		
- earthed equipotential bonding and automatic disconnection	413-02, 471-08		
- electrical separation	413-06, 471-12		
- exemptions, special	471-13-04		
- non-conducting location	413-04, 471-10		
- provision of	Secs. 413, 471		
- testing (<i>See also Testing</i>)	Sec. 713		
Inductance, effect on cable voltage drop	Appx. 4, Sec. 7		
Inductive electrical energy, discharge of	461-01-04		
Industrial plugs and socket-outlets	553-01-03		
Inlet, caravan	608-07		
Inspection-			
- accessibility for	Sec. 513		
- equipment to be capable of, fundamental requirement	130-02-01		
- initial, check list	712-01-03		
- initial, requirement for	711-01-01		
- installation, fundamental requirement	130-10		
- periodic-	Chap. 73		
- assessment of need for	341-01, 732-01-01		
- caravans	608-07-05		
- frequency of	732-01-01		
- notice on	514-12		
- recommendations for, fundamental requirement	130-10		
- report	744-01-01		
- requirement for	Appx. 6		
- safety services equipment	731-01-01		
Installation, electrical, definition	561-01-04		
Instantaneous water heaters	Part 2		
Instantaneous water heaters in bathrooms	601-08-01(iii)		
Instantaneous water heaters (<i>See also Water heaters</i>)			
Instructed person, definition	Part 2		
Instructed persons-			
- areas reserved for, to be indicated by signs	471-13-03		
- emergency switching of safety services reserved for	476-03-03		
- obstacles permissible for protection of	471-06, 471-13-01		
- placing out of reach permissible for protection of	471-07, 471-13-01		
- safety services	562-01-03, 05 563-01-05		
Insulation-			
- applied during erection	412-02, 413-03 713-05		
- basic, definition	Part 2		
- cable, at connection to bare conductor or busbar	523-03		
- definition	Part 2		
- double, definition	Part 2		
- double, of equipment	413-03		
- equivalent to Class II (<i>See Class II equipment</i>)			
- functional extra-low voltage circuits	471-14-03		
- joints, fundamental requirement	130-02-05		
- live parts	412-01-01(i)		
- monitoring, in IT systems	413-02-24, 531-06 561-01-03		
- non-conducting locations	413-04, 713-08		
- PELV circuits	471-14-02		
- PEN conductors	546-02-07		
- protection by insulation of live parts	412-01-01(i)		
- protective conductors	543-03-02 413-03-09		
- reinforced-			
- applied during erection	413-03-01(iii)		
- definition	Part 2		
- of equipment	413-03		
- resistance, testing	713-04		
- SELV circuits	411-02-06 411-02-09(ii)		
- site-built assemblies	412-02, 413-03 471-09, 713-05		
- supplementary, applied during erection	413-03-01(ii) 471-09-01 713-05-02		
- supplementary, definition	Part 2		
- thermal, cables in	523-04		
Interlocking-			
- enclosure openings	412-03-04(ii)		
- isolation, where equipment supplied by more than one circuit	461-01-03		
- main switches, where more than one source	460-01-02		
- main switchgear, for maintenance of	476-02-01		
- sources, to prevent paralleling of	565-01-01		
International Electro- technical Commission	Preface Chap. 32 511-01-01		
Intruder alarm systems, applicability of the Regulations to (<i>See Circuit, definition</i>)	Part 2		
Isolation-	Sec. 460		
- at origin of installation	460-01-02 476-01-01		
- definition	Part 2		
- devices for, contact distances	537-02-02		
- devices for, selection and erection	537-01, 537-02		
- discharge lighting	476-02-04		
- fundamental requirement	130-06-01		
- group of circuits	461-01-01		
- identification of devices for	461-01-03 514-01, 537-02-09		
- indication of	537-02-04		
- main, at origin of installation	460-01-02 476-01-01		
- motor circuits	476-02-03		
- multipole devices	537-02-08		
- neutral conductor	460-01-04 461-01-01		
- off-load, securing against inadvertent operation	537-02-07		

<i>Isolation- (cont'd)</i>		- main earth terminal (where separate)	514-13-01(iii)
- PEN conductor not to be isolated	460-01-04	- switchgear and controlgear	514-01-01
	546-02-06	Lampholder (<i>See Luminaire, definition</i>)	Part 2
- plugs and socket-outlets for	537-02-10	Lampholders-	
- prevention of unintentional reclosure	537-02-06	- bathrooms	601-11
- remote devices for	476-02	- batten, application	553-04-01(iii)
- semiconductor devices not to be used for	537-02-03	- bayonet	553-03-03
- single-pole devices for	537-02-08	- caravans	608-08-06, 07
Isolator-		- centre contact	553-03-04
- construction sites, securing of	604-11-04	- Edison screw	553-03-04
- contact distances	537-02-02	- exemption from requirements for enclosures	412-03-05
- definition	Part 2		471-05-02
- for maintenance of main switchgear	476-02-01	- filament lamp, voltage limit	553-03-02
- identification of purpose	514-01, 537-02-09	- overcurrent protection of	553-03-01
- off-load, securing against inadvertent operation	537-02-07	- pendant, suitability for mass suspended	554-01-01
- semiconductor devices not to be used for	537-02-03	- selection and erection of	553-03
- supplier's switchgear used as	476-01-01	- temperature rating	553-03-03
IT system-		Leakage currents and residual current devices	531-02-04
- autotransformers, step-up prohibited	551-01-02		607-02-03
- connection of installation to earth	542-01-04	Leakage currents (<i>See also Earth leakage</i>)	
- construction sites, not where alternative	604-03-01	Licensing, premises subject to	120-03
- definition	Part 2	Lids in 'Class II' enclosures	413-03-08
- distribution of neutral in	413-02-26	Life of installation, assessment of maintenance during	341-01
	473-03-05	Lift shafts, cables in	528-02-06
- earthing of live parts in	413-02-21	Lifting magnets, omission of overload protection	473-01-03(ii)
- earthing impedance	413-02-21	Lighting points	553-04
	542-01-07(i)	Lighting track systems, compliance with BS (<i>See also definition of Socket-outlet</i>)	521-06, Part 2
- equipment producing high earth leakage current not permitted in	607-04	Lightning protection, the Regulations not applicable to	110-02-01(ix)
- exposed-conductive-parts in	413-02-21 to 25	Lightning protection system-	
- first fault in	413-02-21 to 25	- account to be taken of	541-01-03
	531-05	- bonding of	413-02-02(vi)
- insulation of equipment in	512-01		542-04-01(iv)
- insulation monitoring devices for	413-02-24	Limitation of discharge of energy, protection by	411-04, 471-03
- neutral distribution in	413-02-26	Links, not to be used for functional switching	537-05-03
	473-03-05	Live conductors, determination of number and type	312-02
- overload protection	473-01-05	Live conductors, earthing of, prohibited in IT systems	413-02-21
- overvoltage in	413-02-21	Live part, definition	Part 2
- shock protective devices in	413-02-22	Live parts-	
	531-01-02	- bare, in PELV circuits	471-14-02
- voltage oscillations in	413-02-21	- bare, in SELV circuits	411-02-09
		- bare, placing out of reach	412-05
		- of PELV or SELV circuits, separation of	411-02-05(i)
J		Livestock-	
Joints-		- equipment in locations for	605-11
- cable, accessibility of	526-04	- protective measures in situations for	Sec. 605
- cable and conductor	422-01-04	- wiring systems in locations for	605-12
	Sec. 526	Local supplementary bonding (<i>See Bonding, Equipotential bonding</i>)	
- conduit system	543-03-03, 06	Locations exposed to fire risk, safety services in	563-01-02
- earthing arrangements	542-04-02	Low noise earth-	
- enclosure of	422-01-04	- definition	Part 2
- fundamental requirement	130-02-05	- requirements	Secs. 545, 546
- protective conductor	543-03-03, 04		607-02-01
Joists, cables passing	522-06-05	Low voltage (<i>See also Voltage, low</i>)-	
		- range covered by Regulations	110-03
		- reduced	471-15
			604-02-02(iii)
K		Low Voltage Electrical Equipment (Safety) Regulations 1989	Appx. 2, Para. 7
k values-		Luminaire, definition	Part 2
- in relation to protective conductors	Tables 54B, 54C, 54D, 54E, 54F		
- in relation to live conductors	Table 43A		
Keys-			
- adjustment of over-current settings by	533-01-05		
- Class II or equivalent enclosures	413-03-08		
- opening enclosures by	412-03-04(i)		
L			
Labels- (<i>See also Marking, Warning notices</i>)-			
- bonding conductor connections	514-13-01(ii)		
- earth electrode connections	542-03-02		

Luminaire supporting coupler, definition	Part 2	- mechanical maintenance switching devices	462-01-02
Luminaire supporting couplers-		Mass, maximum supportable by flexible cords	Appx. 4 Table 4H3A
- construction site installations, not to be used for	604-12-03	Materials-	
- functional extra-low voltage systems, different type required	471-14-06	- established, use of	120-04
- in non-conducting locations	413-04-03	- new, use of	120-05
- in SELV systems	411-02-11	- proper, use of	130-01
- purpose of	553-04-04	Maximum demand, assessment of	311-01-01
Luminaire track system (See definition of <i>Socket-outlet, and Lighting track systems</i>)	Part 2	Maximum demand, suitability of supply for	313-01-01(v)
Luminaires-		Mechanical damage (See <i>Mechanical stresses</i>)	
- agricultural premises	605-11	Mechanical maintenance, definition	Part 2
- bathrooms	601-11	Mechanical maintenance switching-	
- caravans	608-08-06, 07	- devices for	537-03
- ceiling rose for	553-04-01 to 03 554-01-01	- plug and socket-outlet for	537-03-05
- parts of wiring system within	522-02-02	- requirements	Sec. 462
- pendant, mass suspended	554-01-01	Mechanical protection-	
- portable, connection of	553-01-07	- cables buried in ground	522-06-03
- prevention of fire risk from	422-01-01, 02	- earthing conductors	542-03
- supported by flexible cords, maximum mass of	Appx. 4 Table 4H3A	- protective conductors	543-02, 543-03 547-03 522-06
- saunas	603-06-02, 603-09	- wiring systems	
- swimming pools	602-04-01(i)	Mechanical stresses-	
- switching for	553-04-01	- cables and conductors	434-01-01, 521-03 522-06 to 08
- temperature of flexible cord	522-02-02	- earthing arrangements	542-01-07
- wiring to	553-04	- earthing conductors	542-03
LV switchgear and controlgear assembly-		- fault current	434-01-01
- definition	Part 2	- heating cables and conductors	554-06
- enclosure used as protective conductor	543-02-04	- plugs and socket-outlets	553-01-06
- functional testing	713-12-02	- protective conductors	543-02, 543-03-01
- having total insulation	413-03-01(i)(b)	- wiring systems	522-06 to 08
M		Metals, prevention of electrolytic action	522-05-06
Machines (See also <i>Motors</i>)-		Metalwork- (See also <i>Exposed-conductive-parts, Extraneous-conductive-parts</i>)-	
- emergency stopping for	463-01-05 476-03-02	- bonding of	413-02-02
- rotating, exciter circuits of, omission of overload	473-01-03(i)	- of other services, prohibited as earth electrode	542-02-04
- rotating, selection and erection of	Sec. 552	- wiring system, as protective conductor	543-02
Magnetic-		- wiring system, protection against corrosion	522-05
- circuit of residual current device	531-02-02	Mines and quarries, installations at, the Regulations not applicable to	110-02-01(vii)
- fields, effect on residual current devices	531-02-07	Miniature circuit-breakers (See <i>Circuit-breaker and Circuit-breakers</i>)	
Magnets, lifting, omission of overload protection	473-01-03(ii)	Mobile equipment in non-conducting location	413-04-05
Main earthing terminal-		Mobile home, definition	Part 2
- connection to earth	542-01	Mobile source-	
- definition	Part 2	- electrically separated circuits supplied by	413-06-02(ii)
- selection and erection of	542-04	- SELV circuits supplied by	411-02-04
Main equipotential bonding-		Monitoring, earth fault, IT system on construction site	604-03-01
- conductors, selection and erection	547-02	Monitoring systems, earthing	543-03-05 607-02-05(ii), 07
- provision of	413-02-02	Monitoring systems, insulation, IT systems	413-02-24, 531-06 561-01-03
- zone, fixed equipment used outside	471-08-03	Motor caravan, definition	Part 2
Main switch for installation	460-01-02 476-01-03 341-01	Motor caravan installations	Sec. 608, Div. One
Maintainability, assessment of		Motor vehicles, applicability of Regulations to	110-02-01(iii)
Maintenance of equipment-		Motors-	
- accessibility for	Sec. 513	- automatic restarting	552-01-03
- fundamental requirement	130-02-01	- control equipment	552-01-02
Management of Health and Safety at Work Regulations 1992	Appx. 2, Para. 11	- direction of rotation	552-01-05
Markets, covered, discharge lighting in	476-03-05	- frequent start	552-01-01
Marking (See also <i>Labels, Warning notices</i>)-		- functional testing	713-12-02
- buried cables	522-06-03	- isolation of	476-02-03
- emergency switching devices	463-01-04		
- fuses and circuit-breakers	533-01-01, 02		
- isolating devices	461-01-05 537-02-09		

<i>Motors- (cont'd)</i>			
- mechanical maintenance, switching for	462-01-01	- mobile and portable equipment in	413-04-05
- overload protection	552-01-02	- protective conductors prohibited	413-04-03
- reverse-current braking	552-01-04	- resistance of floors and walls	413-04-04
- stalled, capability of emergency switching for	537-04-01	- socket-outlets in	413-04-03
- starters, co-ordination of overload and fault protection	435-01-01	- testing	713-08
- starting currents	552-01-01	Non-sheathed cables, to be enclosed	521-07-03
- starting, voltage drop	525-01-02	Notices-	
- switching off, fundamental requirement	130-06-01	- caravans	608-07-03, 05
Moulded case circuit-breakers (See <i>Circuit-breaker and Circuit-breakers</i>)		- fireman's switch	476-03-07
Mutual detrimental influence-			537-04-06
- electrical and non-electrical equipment	515-01-01	- periodic inspection and testing	514-12-01
- materials, between	522-05-03	- residual current devices, periodic testing	514-12-02
- protective measures	470-01-02	- Warning-	
- segregation between circuits	528-01	- areas reserved for skilled or instructed persons	471-13-03
- segregation of different currents and voltages, where grouped	515-01-02	- earth-free locations	471-11
- wiring systems and non-electrical services	528-02	- earthing and bonding connections	514-13
		- isolation of equipment	514-11
		- protection by electrical separation	471-12
		- switchgear and controlgear	514-01
		- voltages exceeding 250 V	514-10
		Numbering system of Regulations, Notes on plan	Preface (opp.)
		O	
N		Object and effects of the Regulations	Chap. 12
Neutral-		Obstacle, definition	Part 2
- conductor-		Obstacles, protection by-	
- combined with protective conductor (See <i>PEN conductors</i>)	546-02	- application of	471-06
- connection to, TN-C-S system	542-01-03	- basic requirements	412-04
- definition	Part 2	- limited to areas accessible to skilled or instructed persons only	471-06, 471-13-01
- discharge lighting circuits	524-02-03	Offshore installations, Regulations not applicable to	110-02-01(v)
- electrode water heaters and boilers	554-03	Oil-	
- fuse prohibited in	130-05-01	- filled equipment	422-01-05
	530-01-02	- pipes-	
- harmonic currents	524-02-01	- main bonding of service	413-02-02(iii)
- isolation of	460-01-04, 06	- not as protective conductor	543-02-01
	461-01-01	- services, bonding at points of contact	528-02-05
- cross-sectional area of	524-02	- services, proximity to	528-02
- overcurrent detection in	473-03	Operational conditions, equipment	Sec. 512
- reduced, prohibited in discharge lighting circuits	524-02-03	Origin of an installation-	
- single-pole devices prohibited in	130-05-01	- definition	Part 2
	530-01-02	- isolation at	460-01-02
- switching of	130-05, 460-01-04		476-01-01
	476-01-03	Oscillations, voltage in IT systems	413-02-21
	Sec. 530	Other services, bonding of	130-04-04
- distribution of, in IT systems	413-02-26		413-02-02
	473-03-05		528-02-05
- earthing of-		Overcurrent, definition	Part 2
- reduced low voltage source	471-15-04	Overcurrent detection-	
- safety sources, parallel	566-01-02	- definition	Part 2
- links	460-01-06	- neutral conductor, IT systems	473-03-05
	537-02-05	- neutral conductor, TN or TT systems	473-03-03, 04
New materials and inventions, use of	120-05	- phase conductors	473-03-01, 02
Nominal current of fuses and circuit-breakers	533-01-01	Overcurrent, limitation by supply characteristics	Sec. 436
Nominal voltage (See also <i>Voltage, nominal</i>)-		Overcurrent, protection against-	Chap. 43, Sec. 473
- caravans	608-01-01	- basic requirement	130-03, Sec. 431
	608-07-03	- discrimination in	533-01-06
- caravan parks	608-09	- electrode water heaters and boilers	554-03-02, 07
- definition	Part 2	- fundamental requirement	130-03
- of supply	313-01	- lampholders	553-03-01
- reduced low voltage circuits	471-15-02	- limitation by supply characteristics	Sec. 436
- SELV circuits	411-02-01(i)	- motors	552-01-02
- swimming pools	602-03, 602-04	- neutral conductor, IT systems	473-03-05
Non-conducting location, protection by-	413-04, 471-10	- neutral conductor, TN or TT systems	473-03-03, 04
- application of	413-04-01	- parallel conductors	433-03, 434-03-02
- basic requirements	413-04-02 to 07		434-04
- limited to special situations	471-10	- phase conductors	473-03-01, 02

<i>Overcurrent, protection against- (cont'd)</i>			
- settings of adjustable circuit-breakers	533-01-05	- selection and erection of Pendant luminaire-	Sec. 546
Overcurrent protective devices-		- bathrooms	601-11
- at origin, assessment of	313-01-01(vi)	- caravans	608-08-06
- at origin, use of supplier's device	473-01-04(iv) 473-02-04(iv)	- ceiling rose for	553-04-01 to 03 554-01-01
- co-ordination of characteristics, for overload and fault current protection	435-01-01	- flexible cord for, maximum mass supportable by	Appx. 4 Table 4H3A 554-01-01
- discrimination	533-01-06	- mass suspended	
- fundamental requirements	130-03	Periodic inspection and testing (See also <i>Inspection, periodic</i>)-	
- omission of	473-01-03, 04 473-02-04 563-01-03	- assessment of need for	314-01, 732-01-01
- overload and fault current protection	432-02	- caravans	608-08-05
- overload protection only	432-03	- notice on	514-12
- safety services	563-01-03, 04	- requirements	Chap. 73
- selection and erection of	Sec. 533	Periodic Inspection Report-	
- shock protection, as	413-02-07(i) 413-02-19(ii) 413-02-22(i) 531-01	- form of	Appx. 6
- short-circuit protection only	432-04	- requirement for	744-01-01
- supplier's, use of	473-01-04(iv) 473-02-04(iv)	Persons-	
Overcurrent settings of circuit-breakers	533-01-05, 06	- instructed, definition	Part 2
Overhead lines-		- skilled, definition	Part 2
- insulator wall brackets, exemption from protection against indirect contact	471-13-04(i)	- skilled or instructed, obstacles permissible for protection of	471-06, 471-13-01
- placing out of reach	412-05-01	- skilled or instructed, placing out of reach permissible for protection of	471-07, 471-13-01
- types of conductor	521-01-03	- untrained, the Regulations not intended for	120-01-02
Overheating, protection against	424-01	Petroleum (Consolidation) Act 1928	Appx. 2 Para 5(iii)
Overload-		Phase conductor-	
- current, definition	Part 2	- cross-sectional area of	524-01
- protection against-		- definition	Part 2
- application of	473-01	- identification of	514-06, 514-07
- co-ordination with fault current protection	435-01-01	- overcurrent detection in	473-03
- omission of	473-01-03, 04	Phase, loss of	473-03-01 552-01-05
- omission, for safety services	563-01-03	Pipes-	
- parallel conductors	433-03	- earth electrodes formed by	542-02-01(i) 542-02-04
- position of devices for protective devices-	473-01-01, 02	- gas (See <i>Gas pipes</i>)	
- requirements for	Secs. 431, 432 433, 473-01 533-01, 533-02	- oil (See <i>Oil pipes</i>)	
- selection of	413-02-21	- water (See <i>Water pipes</i>)	
Overvoltages, in IT systems		Placing out of reach, protection by-	412-05, 471-07
P		- application of	471-07
Paint, as insulation	413-03-05	- bare live parts	412-05-02 to 04
Parallel cables, selection and erection requirements	523-02	- limited to areas accessible to skilled or instructed persons only	471-07, 471-13-01
Parallel conductors, overload protection	433-03	- overhead lines	412-05-01
Parallel conductors, fault current protection	434-04	- with obstacles	412-05-03 471-13-01
Parallel operation, safety services supplies	Sec. 566	Plan of the 16th Edition, Notes on Platforms, working, for open type switchboards	Preface (opp.) 471-13-02
Partitions, cables in,	522-06-06, 07	Plug, definition	Part 2
Partitions for segregation of circuits	528-01-05 to 08	Plugs-	
Passageways for open type switchboards	471-13-02	- caravans	608-08-08(i)
PELV (See <i>Protective extra-low voltage</i>), definition	Part 2	- clock	553-01-05(i)
PEN conductor, definition	Part 2	- construction sites	604-12-02
PEN conductors-		- emergency switching by, prohibited	537-04-02
- cable enclosure prohibited as	543-02-10	- functional extra-low voltage systems	471-14-06
- isolation or switching of, prohibited	460-01-03 460-01-04 546-02-06	- functional switching by	537-05-04, 05
- residual current device with, prohibited	413-02-07 546-02-02	- fused, selection of	553-01-03
		- high earth leakage current equipment	607-02-04, 05
		- instantaneous water heaters not to be supplied by	554-05-03
		- isolators	537-02-10
		- mechanical maintenance, for switching off for	537-03-05
		- reduced low voltage circuits	471-15-07
		- selection and erection of	553-01 608-08-08(i) 411-02-10
		- SELV circuits	553-01-05(ii)
		- shavers	553-01-05(iii)
		- special circuits	
		Plugs and Sockets etc. (Safety) Regulations 1994	Appx. 2, Para. 8

PME (<i>See Protective multiple earthing</i>)-		- separate	543-02-07
Point (in wiring), definition	Part 2	- switching prohibited in	543-03-04
Polarity, test of	713-10	- 10 mm ² or less to be copper	543-02-03
Poles, concrete, exemption from protection against indirect contact	471-13-04(ii)	- testing of	713-02, 713-03
Polluting substances, wiring systems exposed to	522-05-01	- types of, description	543-02
Portable equipment-		Protective devices and switches, position of	130-05
- connection of	553-01-07	Protective devices and switches, identification of	514-01, 514-08
- definition	Part 2	Protective devices (<i>See also Overcurrent protective devices, Residual current devices, Monitoring systems. Undervoltage protective devices</i>)	
- in non-conducting location	413-04-05	Protective extra-low voltage (PELV)-	
- outdoors, supplies for	471-08-05	- definition	Part 2
- prohibited in bathrooms	601-10-02	- application of	471-14-01, 02
Potentially explosive atmospheres, installations in-		'Protective impedance' (<i>See Limitation of discharge of energy</i>)	
- applicability of the Regulations to	110-01-01(xi)	Protective multiple earthing (PME)-	
- statutory regulations, etc.	Appx. 2, Para. 5	- compliance with statutory regulations	Appx. 2, Para. 3
Power demand, suitability of equipment for	130-03, 512-04	- definition	Part 2
Prefabricated equipment, Regulations not applicable to construction of	110-04	- on caravan parks	608-13-05
Premises subject to licensing	120-03	- main bonding connections for	547-02
Proper materials, use of	130-01	Provision and Use of Work Equipment Regulations 1992	Appx. 2, Para. 12
Prospective fault current-		Public supply-	
- definition	Part 2	- compatibility with	512-05
- determination of	434-02	- switching arrangements for safety and standby supplies	313-02
- for residual current devices	531-02-08	- the Regulations not applicable to	110-02-01(i)
- suitability of protective devices	130-03, 432-02, 432-03, 432-04, 434-03		
Prospective short-circuit current at origin, determination of	313-01-01(iii)	Q	
Protection against electric shock-		Quarry installations, exclusion	110-02-01(vii)
- application of measures	Sec. 471		
- protective measures	Chap. 41	R	
- safety services	Secs. 564, 566	Radio interference suppression equipment, applicability of the Regulations to	110-02-01(viii)
Protection against overcurrent	Chap. 43, Sec. 473	Railway traction equipment, the Regulations not applicable to	110-02-01(ii)
Protection against overheating	Sec. 424	Reduced low voltage system-	
Protection against thermal effects	Chap. 42	- application	471-15
Protection against undervoltage	Chap. 45	- definition	604-02-02(iii)
Protection for safety	Part 4	Reference Method for cable sizing Regulations, Statutory-	Part 2
Protection, supplementary, by residual current device	412-06	- list of	Appx. 2
Protective conductor, definition	Part 2	- relationship of the Regulations with Regulations. The-	120-02
Protective conductors-		- citation in contracts	120-01-02
- accessibility of connections	543-03-03	- departures from	120-05
- between separate installations	542-01-09	- effects of	Chap. 12
- bonding, selection and erection of	Sec. 547	- exclusions from scope of	110-02
- caravan parks	608-13-05	- not intended to instruct untrained persons	120-01-02
- 'Class II' equipment in relation to	413-03-09	- not to be regarded as specification	120-01-02
	471-09-02, 03	- object of	Chap. 12
	514-03, 514-06	- Parts 3 to 7, relationship to Chapter 13	120-02
	514-07	- relationship with statutory regulations	120-02
- colour identification of		- scope of	Chap. 11
		- voltage ranges dealt with	110-03
- combined with neutral conductors (<i>See PEN</i>)		Reinforced concrete (<i>See Steel</i>)	
- continuity of	543-02-04(i)	Reinforced insulation, definition	Part 2
	543-02-05 to 09	Reinforced insulation, of equipment	413-03-01(iii)
	543-03	Reliability of equipment for intended life	341-01
- cross-sectional areas	543-01, 546-02-02	Remote devices for isolation	476-02-02
	547-02-01, 547-03	Remote switching for mechanical maintenance	462-01-03
- electrically separated circuits	413-06-04, 05	Residual current, definition	Part 2
- high earth leakage currents	Sec. 607	Residual current device, definition	Part 2
- identification of	514-03, 514-06		
	514-07		
- installation of	544-01-01		
- insulation of	543-03-02		
- non-conducting location, prohibited in	413-04-03		
- preservation of continuity	543-03		
- residual current device, to be outside magnetic circuit of	531-02-02		
- ring final circuit	543-02-09		
	607-02-06		
- selection and erection of	Secs. 543 to 547		
	Sec. 607		

Residual current devices-			
- agricultural premises	605-10-01	- hand lamps, supplies for	606-04-02
- application of, as supplementary protection against direct contact	412-06	- indirect contact, protection against	606-04
- auxiliary supply for	531-02-06	- protection by extra-low voltage	606-02
- caravan parks	608-13-05	- sources to be outside location	606-04-06
- conductors to be disconnected by	531-02-01	- supplementary bonding	606-04-01(ii)
- construction sites	604-04-07	Ring final circuit-	
	604-08-03(ii)	- circuit protective conductor of	543-02-09
- earth fault loop impedance for	413-02-16	- definition	Part 2
- fault current withstand capability of	531-02-08	- for high earth leakage current equipment	607-02-06
- fundamental requirement for	130-04-03	- overload protection of	433-02-04
- HV electrode water heaters and boilers	554-03-04	- test of continuity	713-03
- high earth leakage current circuits	607-02-03	Road-warming, cables for	554-06-02, 03
- in situations of increased shock risk	471-08-01(i)	Rotating machines (<i>See also Motors</i>)-	
- magnetic circuit of	531-02-02	- emergency switching for	476-03-02
- magnetic fields of other equipment	531-02-07	- exciter circuits of	473-01-03(i)
- operating current (<i>See Residual operating current</i>)		- selection and erection of	Sec. 552
- PEN conductor circuits, prohibited in	413-02-07		
	471-08-07	S	
	546-02-02	Safety, fundamental requirements for	Chap. 13
- preferred, for shock protection in TT systems	413-02-19	Safety, object of the Regulations	Chap. 12
- protection against direct contact by, not recognised as sole method	412-06-01	Safety service, definition	Part 2
- protection against indirect contact, in series	531-02-09	Safety services-	
- protective conductor still required	531-02-05	- characteristics of sources of supply	313-02
- reduced low voltage circuits with	471-15-06	- circuits-	Sec. 563
- required, for caravan parks	608-13-05	- fire resistance	563-01-02
- required, for socket-outlet circuits in TT systems	471-08-06	- independence of	563-01-01
- required, for circuit supplying portable equipment outdoors	471-08-04, 05	- segregation	528-01-04
- selection and erection of	531-02 to 05	- controlgear, location of	563-01-05
- shock protection by-		- emergency switching of	476-03-03
- earth fault loop impedance	413-02-16	- equipment-	
- in IT systems	413-02-22, 25	- fire protection	561-01-02
- in TN systems	413-02-07	- independence of	564-01-01
	413-02-15(ii), 17	- omission of overload protection	473-03-01(iv)
- in TT systems	413-02-19, 20		563-01-03
- special locations	Part 6	- preferred protective measures for	561-01-03
- supplementary protection against direct contact by	412-06-02(ii)	- required to operate in fire conditions	561-01-02
- swimming pools	602-04-01(ii)	- selection and erection-	
	602-07-01	- alarm devices	563-01-06
- testing	607-07-02(iii)	- utilisation equipment	Sec. 564
Residual operating current-	514-12-02, 713-12	- sources-	Sec. 562
- agricultural premises, for protection against fire	605-10-01	- accessible to skilled persons only	562-01-03
- caravan parks	608-13-05	- as fixed equipment	562-01-02
- definition	Part 2	- batteries	562-01-01
- earth fault loop impedance in relation to	413-02-16	- characteristics	313-02
- for supplementary protection against direct contact	412-06-02(ii)	- classification of	313-02
- IT system overcurrent protection, for	473-03-05(ii)	- equipment supplied by self-contained batteries	562-01-05
- selection of	531-02-03	- independent	562-01-01
- where increased shock risk	471-08-01(i)	- not capable of operation in parallel	Sec. 565
Resistance area (of an earth electrode), definition	Part 2	- operation in parallel	313-02, Sec. 566
Resistance-		- single, use prohibited for other purposes	562-01-04
- of circuit conductors, increase due to overcurrents	413-02-05	- supplier to be consulted	313-02
- of insulating floors and walls	413-04-04	- ventilation	562-01-06
Restrictive conductive location, definition	Part 2	- with time delay	313-02
Restrictive conductive locations-		- switchgear, location of	563-01-05
- fixed equipment, supply to	Sec. 606	Safety signs (<i>See Notices, Warning</i>)	
- functional earthing of equipment, bonding to be provided	606-04-03	Safety Signs Regulations 1980	Appx. 2, Para. 9
- hand-held tools, supplies for	606-04-04	Safety sources for SELV	411-02-02
		Saunas (<i>See also Hot air sauna</i>)-	Sec. 603
		- equipment, selection and erection	603-06
		- luminaires	603-06-02, 603-09
		- shock protection in	603-03, 04, 05
		- switchgear to be outside	603-08
		- temperature classification	603-02
		- wiring systems for	603-07
		Schedule (<i>See Diagrams</i>)	
		Scope of the Regulations	Chap. 11
		Screening materials, for fixed equipment	422-01-02, 03
		Screws, fixing, for non-metallic accessories	471-13-04(iv)
		Screws, insulating, in Class II enclosures	413-03-07

Segregation (<i>See also Mutual detrimental influence</i>)-			
- circuits	528-01		
- different currents and voltages	515-01-02		
- non-electrical services	528-02		
Selection and erection of equipment	Part 5		
SELV (<i>See Separated extra-low voltage</i>), definition	Part 2		
Semi-enclosed fuses (<i>See Fuses</i>)			
Separated extra-low voltage (SELV), definition	Part 2		
Separated extra-low voltage systems-			
- agricultural premises	605-02		
- application as protective measure	471-02		
- arrangement of	411-02		
- bathrooms	601-03, 601-08		
	601-10		
- construction sites	604-02-02(i)		
	604-08-03		
- exposed-conductive-parts of	411-02-07, 08		
- extraneous-conductive-parts, connection of equipment to	411-02-07(iv)		
- live parts of	411-02-05, 06		
- mobile sources for	411-02-04		
- nominal voltage	411-02-01(i), 09		
- plugs and socket-outlets for	411-02-10		
	553-01-01(ii)		
- protection by use of	411-01, 411-02		
- restrictive conductive locations	606-02, 606-04		
- saunas	603-03		
- separation from other circuits	411-02-05, 06		
- sources for	411-02-01		
- swimming pools	602-03, 602-04-01		
	602-07-02		
	602-08-03		
Separation, electrical, as protection against shock (<i>See Electrical separation</i>)			
Services, Safety (<i>See Safety Services</i>)			
Shaver supply units in bathrooms	601-09		
Shavers, plugs and socket-outlets for	553-01-05(ii)		
Shield, lampholder, in bathroom	601-11		
Ships, electrical equipment on board, the Regulations not applicable to	110-02-01(iv)		
Shock current, definition	Part 2		
Shock, electric, definition	Part 2		
Shock, electric, protection against (<i>See Direct contact, Indirect contact, Protection against electric shock</i>)			
Short-circuit current (<i>See also Fault current</i>), definition	Part 2		
Short-circuit current, prospective, determination at origin of installation	313-01-01(iii)		
Shower in room other than bathroom or shower room	601-10-03		
Shower rooms (<i>See Bathrooms</i>)			
Signs, electric (<i>See Discharge lighting</i>)			
Signs warning (<i>See Notices, Warning</i>)			
Simultaneously accessible parts-			
- bathrooms	601-04-01, 02		
- definition	Part 2		
- earth-free local bonding locations	413-05-02		
- electrical separation	413-06-05		
- fundamental requirement	130-04-04		
- non-conducting locations	413-04-02		
- supplementary bonding between, resistance of	413-02-28		
- with automatic disconnection	413-02-03, 04		
	471-08-01		
Single fault in IT system (<i>See IT system, first fault in</i>)			
Single insulated cables (<i>See Non-sheathed cables</i>)			
Site-built assemblies, insulation of-			
- as protection against direct contact	412-02		
- as protection against indirect contact	413-03-01		
	471-09-01		
- testing	713-05		
Skilled person, definition	Part 2		
Skilled persons-			
- and safety services sources	562-01-03		
- areas reserved for, to be indicated by signs	471-13-03		
- emergency switching of safety services by	476-03-03		
- exemption from requirements for shock protection, in areas for	471-13-01		
- maintenance of highway equipment	611-02-01(iii)		
- obstacles permissible for protection of	471-06, 471-13-01		
- placing out of reach permissible for protection of	471-07, 471-13-01		
Socket-outlet, definition	Part 2		
Socket-outlets-	553-01		
- agricultural and horticultural premises	605-03		
- bathrooms, prohibited in	601-10-02		
- bonding to boxes etc.	543-02-07		
- caravan park installations	608-13		
- caravans, in	608-08-02, 03		
- circuits for-			
- disconnection times	413-02-09, 12		
- earth fault loop impedances for	413-02-10, 11, 16		
- in TT systems	471-08-06		
- supplying outdoor equipment	471-08-04		
- clocks, for	553-01-05		
- construction sites	604-12		
- emergency switching by, prohibited	537-04-02		
- functional extra-low voltage systems	471-14-06		
- functional switching by	537-05		
- height of	553-01-06		
- high earth leakage current equipment	607-02-04 to 06		
- household installations, selection	553-01-04		
- isolation at	537-02-10		
- lighting points, at fixed	553-04-01(v)		
- mechanical maintenance, switching off for	537-03-05		
- non-conducting location, in	413-04-03		
- outdoor equipment, for	471-08-04		
- prohibited-			
- bathrooms	601-10-02		
- 'Class II' circuits or installations	471-09-03		
- emergency switching	537-04-02		
- instantaneous water heaters	554-05-03		
- provision of	553-01-07		
- reduced low voltage circuits	471-15-07		
- selection and erection of	553-01		
- SELV systems	411-02-10		
	553-01-01, 02		
- separated circuits	413-06-05(ii)		
- shavers, for	553-01-05(ii)		
- supplying equipment outside main equipotential zone	471-08-04		
- swimming pools	602-07, 602-08-01		
- voltage drop	525-01-02		
Soil warming, cables and conductors for	554-06-02, 03		
Solar gain (<i>See Solar radiation</i>)			
Solar radiation, wiring system to be suitable for or protected against	522-02-01, 522-11		
Soldered connections	526-02-01(vi)		
Special installations needing advice of qualified person	120-01-02		
Special situations-			
- protection by non-conducting location	471-10		
- protection by earth-free local equipotential bonding	471-11		
- protection by electrical separation	471-12		
Specification, the Regulations not intended as	120-01-02		
Specifications (<i>See Standards</i>)			
Spur, definition	Part 2		

<i>Switching- (cont'd)</i>			
- functional	Sec. 464, 537-05	- resistance	713-04
- fundamental requirements for	130-06	- periodic-	Chap. 73
- instantaneous water heaters	554-05-03, 04	- assessment of need for	341-01
- main switch for installation	460-01-02	- caravans	608-07-05
	476-01-03	- frequency of	732-01-01
		- notice on	514-12-01
- mechanical maintenance	Sec. 462, 537-03	- recommendations for,	
- of circuits	476-01-02	fundamental requirement	130-10
- prohibited, in PEN conductor	460-01-03	- requirement for	731-01-01
	460-01-04	- safety services equipment	561-01-04
	546-02-06	- polarity	713-10
- prohibited, in protective conductors	543-03-04	- protection against direct contact	713-07
- remote, for mechanical		- protective conductors, continuity	713-02
maintenance	462-01-03	- repeat, after rectification of fault	713-01
- single-pole, prohibited in		- residual current devices	713-12-01
neutral	130-05, 530-01-02	- ring final circuit continuity	713-03
- step-up transformers	551-01-03	- test certificates	Chap. 74, Appx. 6
Symbols-		Thermal effects, protection against	Chap. 42
- for diagrams	514-09-01	Thermal insulation, cables in	523-04
- used in Regulations	Part 2 (end of)	Thermal stresses of fault current	434-01, 434-03-03
System, definition	Part 2	Thermal stresses on	
		earthing arrangements	542-01-07
T		Time delay-	
Telecommunication cables, bonding		- electrode water heater or boiler	
of metallic sheath of	413-02-02	protection	554-03-04
Telecommunication circuits-		- for safety services supplies	313-02
- applicability of the Regulations to	110-01-01(xiii)	- for undervoltage protective devices	451-01-03
- segregation from LV circuits	528-01-03	Times, disconnection (<i>See</i>	
Temperature-		<i>Disconnection times</i>)	
- ambient, cables and conductors	522-01	TN system-	
	Appx. 4, Para. 2.1	- connection of exposed-	
		conductive-parts in	413-02-06
- limiting devices for-		- definition	Part 2
- appliances producing hot		- devices for shock protection	413-02-07
water or steam	424-02-01	- switching of neutral	Sec. 530
- forced air heating systems	424-01-01	TN-C system-	
- heaters for liquids	554-04-01	- connection of PEN conductors	542-01-05
- limits-		- definition	Part 2
- conductor operating	523-01	- explanatory notes on	Fig. 3
- connections between		- isolation and switching of neutral	460-01-04
conductors and equipment	512-02-01	TN-C-S system-	
	526-02-01(v)	- connection of installation earthing	
- current-carrying capacity	Sec. 523	terminal to supply neutral	542-01-03
- enclosures constructed during		- definition	Part 2
erection	422-01-07	- explanatory notes on	Fig. 5
- floor-warming cables	554-06-04	- isolation and switching of neutral	460-01-04
- overload protection	433-01	- on caravan site, earthing of	608-13-05
- protection against burns	423-01-01	TN-S system-	
- protective conductors	543-01-03	- connection of installation to earth	542-01-02
- fault current protection	434-03-03	- definition	Part 2
- wiring systems	522-01-01	- explanatory notes on	Fig. 4
- rating of lampholders	553-03	- isolation and switching of neutral	460-01-04
- rise in circuit conductors, due		Tools, for-	
to overcurrents	413-02-05	- adjustment of overcurrent settings	533-01-05
- saunas	603-02, 603-06-02	- disconnection of main	
- surface, of equipment	422-01-01	earthing conductor	542-04-02
	423-01-01	- opening enclosures	412-03-04
			413-03-08
Terminations of cables,		- street furniture, access to live	
conductors, etc.	Sec. 526	parts in	611-02-02
Testing-	Part 7	Total insulation of equipment	413-03-01(i)(b)
- alterations to installations	Chap. 72		471-09-01
- assemblies	713-12-02	Traction equipment, the Regulations	
- barriers provided during erection	713-07	not applicable to	110-02-01(ii)
- 'Class II' enclosures	413-03-06	Transformers-	
- continuity of protective conductors	713-02	- current, omission of	
- continuity of ring final circuit		overload protection	473-01-03(iii)
conductors	713-03	- for electrical separation	413-06-02(i)
- earth electrode resistance	713-11	- of residual current devices	531-02-02
- earth fault loop impedance	713-09	- reduced low voltage circuits	471-15-03(i)
- electrical separation of circuits	713-06	- safety isolating, for SELV circuits	411-02-02(i)
- electronic devices present	713-04-04	- selection and erection of	Sec. 551
- enclosures provided during erection	713-07	- shaver supply unit	601-09
- equipment, fundamental requirement	130-02-01	Trunking (for cables), definition	Part 2
- functional	713-12	Trunking systems-	
- initial, fundamental requirement	130-10	- cables and conductors in	522-08
- insulation-		- exposed to water or high humidity	522-03
- applied on site	713-05	- fire barriers in	527-02-02
- non-conducting floors and walls	713-08		

Trunking systems- (cont'd)

- fire sealing at floors, etc. 527-02-01
- joints in 543-03-03
- partitions in 528-01-05 to 07
- protective conductors formed by 543-02-05, 07
- selection of 521-05
- socket-outlets in 543-02-07

TT system-

- connection of exposed-conductive-parts in 413-02-18
 - connection of installation to Earth 542-01-04
 - definition Part 2
 - devices for shock protection 413-02-19
 - earthing resistance requirements 413-02-20
 - earthing resistance variations 542-01-07
 - explanatory notes on 542-02-02, 03
 - socket-outlet circuits in Fig. 6
 - switching of neutral 471-08-06
- Type-tested equipment, Class II Sec. 530
413-03-01(i)
413-03-05

U

Underground cables-

- caravan pitch supplies-
 - installation 608-12-02
 - to be used where practicable 608-12-01
 - highway power supplies 611-04
 - type, protection and identification 522-06-03
- Undervoltage, protection against Chap. 45
- Unskilled persons, main switch for 476-01-03
- Untrained persons, the Regulations not intended to instruct 120-01-02

V

- Values of k Tables 43A, 54B
54C, 54D, 54E
54F

Varnish, as insulation

- Vehicles, electrical equipment of, Regulations applicable only to caravans and motor caravans 110-02-01(iii)

Ventilation, fixed equipment

- 422-01-01
422-01-06
608-08-06
522-10

Ventilation of luminaires in caravans

Vermin, cables exposed to

Vibration-

- caravan wiring 608-06-07
- wiring systems subject to 522-07

Voltage-

- drop-
 - limit Sec. 525
 - tabulated values, for cables 525-01-02
- exceeding low voltage, applicability of the Regulations to Appx. 4
- exceeding 250V, warning notices 110-03
- extra-low, definition 514-10
- for testing Part 2
- high (See High voltage) Sec. 713
- limit-
 - ceiling roses 553-04-02
 - filament lampholders 553-03-02
 - separated circuits 413-06-02(iv)

- low-

- definition Part 2
- reduced 471-15
- marking, of different voltages within equipment 514-10-01
- nominal-
 - assessment of 313-01-01(i)
 - definition Part 2
 - ranges covered by the Regulations 110-03
 - reduced low voltage circuits 471-15-02
 - SELV circuits 411-02-01(i)
- suitability of equipment for 512-01
- oscillation, in IT systems 413-02
- reduced, definition Part 2
- tolerances (See definition of Voltage) Part 2

W

Walls-

- cables concealed in 522-06-06
- fire-resistant, cables passing through 527-02
- insulating, resistance of 413-04-04
- socket-outlets on, mounting height 553-01-06
- thermally insulating, cables in 523-04

Warning notices (See Notices, Warning)

Water-

heaters-

- and boilers, electrode type 554-03
- having immersed heating elements 554-04, 554-05
- in bathrooms 601-08-01(iii)
- protection against overheating 424-02
- swimming pools, instantaneous 602-08-03

pipes-

- as bonding conductors 543-02-06
- bonded metal, for instantaneous water heaters 554-05-02

- bonding to, at points of contact 528-02-05
- main bonding of 528-02

- public, prohibited as earth electrodes 542-02-04

- segregation from 528-02-05

- wiring system in proximity to 528-02

- wiring systems exposed to 522-03

- wiring systems exposed to 522-03

- wiring systems exposed to 522-03

- wiring systems exposed to 522-03

- wiring systems exposed to 522-03

- wiring systems exposed to 522-03

- wiring systems exposed to 522-03

- wiring systems exposed to 522-03

- wiring systems exposed to 522-03

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