

Requirements for Electrical Installations

**IET Wiring Regulations
Eighteenth Edition**



BS 7671:2018 - Corrigendum (December2018)

Please note the following corrections

TABLE OF CONTENTS (INCLUDING SUMMARY OF CORRECTIONS)

No.	Page	Location	Issue									
1.	131	Chapter 51	<p>Due to the publication of BS EN 60445 in 2017, which was between the cut-off date for new work and the publication date for BS 7671:2018, it's necessary to amend Table 51.1. In BS EN 60445:2017, the functional earthing conductor is identified by the colour pink.</p> <p style="text-align: center;">TABLE 51 – Identification of conductors</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Function</th> <th style="width: 20%;">Alphanumeric</th> <th style="width: 30%;">Colour</th> </tr> </thead> <tbody> <tr> <td>Protective conductors</td> <td></td> <td>Green-and-yellow</td> </tr> <tr> <td>Functional earthing conductor</td> <td></td> <td>Cream Pink⁽⁵⁾</td> </tr> </tbody> </table> <p>NOTE: ⁽¹⁾ Power circuits include lighting circuits. ⁽²⁾ M identifies either the mid-wire of a three-wire DC circuit, or the earthed conductor of a two-wire earthed DC circuit. ⁽³⁾ Only the middle wire of three-wire circuits may be earthed. ⁽⁴⁾ An earthed PELV conductor is blue. ⁽⁵⁾ BS EN 60445:2017 applies from 8th September 2020</p>	Function	Alphanumeric	Colour	Protective conductors		Green-and-yellow	Functional earthing conductor		Cream Pink⁽⁵⁾
Function	Alphanumeric	Colour										
Protective conductors		Green-and-yellow										
Functional earthing conductor		Cream Pink⁽⁵⁾										
2.	132	514.12.1	Label size in BS 7671:2018 is incorrect, align with BS 7671:2015+A3:2015									
3.	133	514.12.2	Label size in BS 7671:2018 is incorrect, align with BS 7671:2015+A3:2015									
4.	133	514.13.2	Label size in BS 7671:2018 is incorrect, align with BS 7671:2015+A3:2015									
5.	133	514.14.1	Label size in BS 7671:2018 is incorrect, align with BS 7671:2015+A3:2015									
6.	134	514.15.1	Label size in BS 7671:2018 is incorrect, align with BS 7671:2015+A3:2015									
7.	244	Fig 701.2 f)	Regulation 701.32.3 (ii) (b) states that Zone 1 is limited by the vertical surface “at a distance of 1.20 m from the centre point of the fixed water outlet on the wall or ceiling for showers without a basin (see Figure 701.1(e) and (f)).” Therefore, Zone 2 as shown within this figure is an error.									
8.	280	710.559	<p>710.559 Luminaires and lighting installations</p> <p>In medical locations of Group 1 and Group 2, at least two different sources of supply shall be provided. One of the sources shall be connected to the electrical supply system for safety services.</p> <p>In medical locations of group 1 and group 2, a minimum of two lighting circuits shall be provided from separate sources of supply. At least one of the circuits shall be supplied from a system for safety services.</p> <p>The luminaires of the escape routes shall be arranged on alternate circuits, one of which shall be supplied from the power supply source for safety services.</p>									
9.	351	Appendix 1	BS EN 60947-2 should be referenced as 2017 and not as A2:2013									
10.	373	Appendix 4	Last row of the table, 90°C thermoplastic insulated cables should be 'thermosetting'.									
11.	423	Table 4F3A	Glass fibre flexible cable, ambient temperature reads “35 to 50°C”, should be “35 to 150°C”,									

The corrections are shown with a red change bar on the following pages.

TABLE 51 – Identification of conductors

Function	Alphanumeric	Colour
Protective conductors		Green-and-yellow
Functional earthing conductor		Cream/Pink ⁽⁵⁾
AC power circuit ⁽¹⁾		
Line of single-phase circuit	L	Brown
Neutral of single- or three-phase circuit	N	Blue
Line 1 of three-phase AC circuit	L1	Brown
Line 2 of three-phase AC circuit	L2	Black
Line 3 of three-phase AC circuit	L3	Grey
Two-wire unearthed DC power circuit		
Positive of two-wire circuit	L+	Brown
Negative of two-wire circuit	L-	Grey
Two-wire earthed DC power circuit		
Positive (of negative earthed) circuit	L+	Brown
Negative (of negative earthed) circuit ⁽²⁾	M	Blue
Positive (of positive earthed) circuit ⁽²⁾	M	Blue
Negative (of positive earthed) circuit	L-	Grey
Three-wire DC power circuit		
Outer positive of two-wire circuit derived from three-wire system	L+	Brown
Outer negative of two-wire circuit derived from three-wire system	L-	Grey
Positive of three-wire circuit	L+	Brown
Mid-wire of three-wire circuit ⁽²⁾⁽³⁾	M	Blue
Negative of three-wire circuit	L-	Grey
Control circuits, ELV and other applications		
Line conductor	L	Brown, Black, Red, Orange, Yellow, Violet, Grey, White, Pink or Turquoise
Neutral or mid-wire ⁽⁴⁾	N or M	Blue

NOTE: ⁽¹⁾ Power circuits include lighting circuits.

⁽²⁾ M identifies either the mid-wire of a three-wire DC circuit, or the earthed conductor of a two-wire earthed DC circuit.

⁽³⁾ Only the middle wire of three-wire circuits may be earthed.

⁽⁴⁾ An earthed PELV conductor is blue.

⁽⁵⁾ BS EN 60445:2017 applies from 8th September 2020

514.7 **Not used**

514.8 **Identification of a protective device**

514.8.1 A protective device shall be arranged and identified so that the circuit protected may be easily recognized.

514.9 **Diagrams and documentation**

514.9.1 A legible diagram, chart or table or equivalent form of information shall be provided indicating in particular:

- (i) the type and composition of each circuit (points of utilization served, number and size of conductors, type of wiring), and
- (ii) the method used for compliance with Regulation 410.3.2, and
- (iii) the information necessary for the identification of each device performing the functions of protection, isolation and switching, and its location, and
- (iv) any circuit or equipment vulnerable to the electrical tests as required by Part 6.

For simple installations the foregoing information may be given in a schedule. A durable copy of the schedule relating to a distribution board shall be provided within or adjacent to each distribution board.

Any symbol used shall comply with IEC 60617.

514.10 **Warning notice: voltage**

514.10.1 Every item of equipment or enclosure within which a nominal voltage exceeding 230 volts to earth exists and where the presence of such a voltage would not normally be expected, shall be so arranged that before access is gained to a live part, a warning of the maximum voltage to earth present is clearly visible.

514.11 **Warning notice: isolation**

514.11.1 A notice of such durable material as to be likely to remain easily legible throughout the life of the installation shall be fixed in each position where there are live parts which are not capable of being isolated by a single device. The location of each disconnector (isolator) shall be indicated unless there is no possibility of confusion.

514.12 **Notices: periodic inspection and testing**

514.12.1 A notice of such durable material as to be likely to remain easily legible throughout the life of the installation shall be fixed in a prominent position at or near the origin of every installation upon completion of the work carried out in accordance with Chapter 64 or 65. The notice shall be inscribed in indelible characters not smaller than those illustrated here and shall read as follows:

IMPORTANT

This installation should be periodically inspected and tested and a report on its condition obtained, as prescribed in the IET Wiring Regulations BS 7671 Requirements for Electrical Installations.

Date of last inspection

Recommended date of next inspection

514.12.2 Where an installation incorporates an RCD a notice shall be fixed in a prominent position at or near each RCD in the installation. The notice shall be inscribed in indelible characters not smaller than those illustrated here and shall read as follows:

This installation, or part of it, is protected by a device which automatically switches off the supply if an earth fault develops. Test six-monthly by pressing the button marked 'T' or 'Test'. The device should switch off the supply and should then be switched on to restore the supply. If the device does not switch off the supply when the button is pressed, seek expert advice.

NOTE: Testing frequencies of RCDs in temporary installations may need increasing.

514.13 Warning notices: earthing and bonding connections

514.13.1 A durable label to BS 951 with the words 'Safety Electrical Connection – Do Not Remove' shall be permanently fixed in a visible position at or near:

- (i) the point of connection of every earthing conductor to an earth electrode, and
- (ii) the point of connection of every bonding conductor to an extraneous-conductive-part, and
- (iii) the main earthing terminal, where separate from main switchgear.

514.13.2 Where Regulation 418.2.5 or 418.3 applies, the warning notice specified shall be durably marked in legible type not smaller than that illustrated here and shall read as follows:

The protective bonding conductors associated with the electrical installation in this location **MUST NOT BE CONNECTED TO EARTH.**

Equipment having exposed-conductive-parts connected to earth must not be brought into this location.

514.14 Warning notice: non-standard colours

514.14.1 If wiring additions or alterations are made to an installation such that some of the wiring complies with Regulation 514.4 but there is also wiring to a previous version of these Regulations, a warning notice shall be affixed at or near the appropriate distribution board with the following wording:

CAUTION

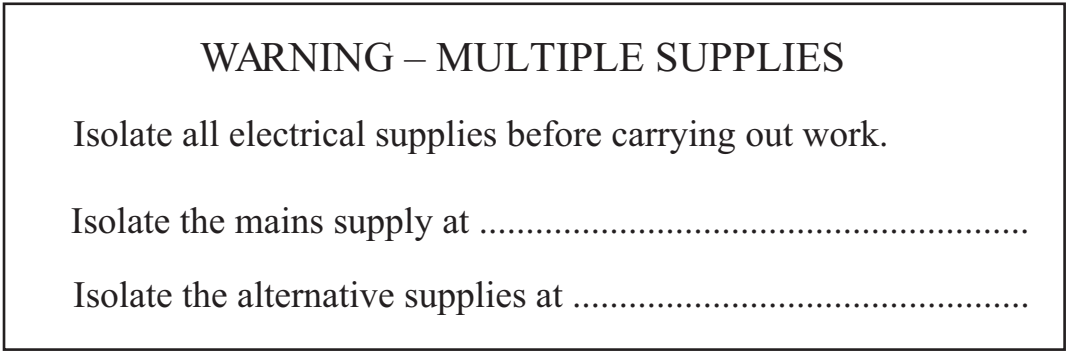
This installation has wiring colours to two versions of BS 7671. Great care should be taken before undertaking extension, alteration or repair that all conductors are correctly identified.

514.15 Warning notice: alternative supplies

514.15.1 Where an installation includes alternative or additional sources of supply, warning notices shall be affixed at the following locations in the installation:

- (i) At the origin of the installation
- (ii) At the meter position, if remote from the origin
- (iii) At the consumer unit or distribution board to which the alternative or additional sources are connected
- (iv) At all points of isolation of all sources of supply.

The warning notice shall be durably marked in legible type not smaller than that illustrated here and shall read as follows:



514.16 Notice: high protective conductor current

See Regulation 543.7.1.205.

515 PREVENTION OF MUTUAL DETRIMENTAL INFLUENCE

515.1 Prevention of mutual detrimental influence

Electrical equipment shall be selected and erected so as to avoid any harmful influence between the electrical installation and any non-electrical installations envisaged.

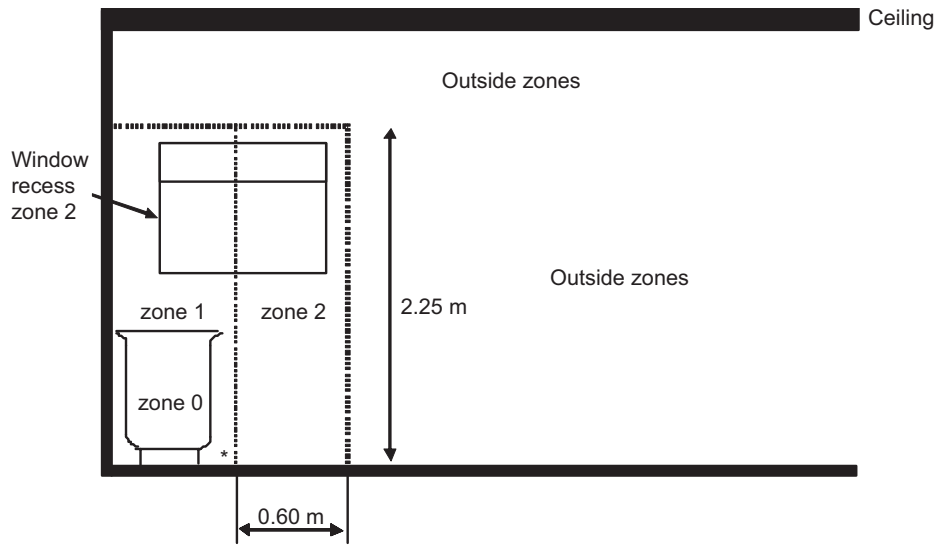
NOTE: For EMC see Sections 332 and 444.

515.2 Where equipment carrying current of different types or at different voltages is grouped in a common assembly (such as a switchboard, a cubicle or a control desk or box), all the equipment belonging to any one type of current or any one voltage shall be effectively segregated wherever necessary to avoid mutual detrimental influence.

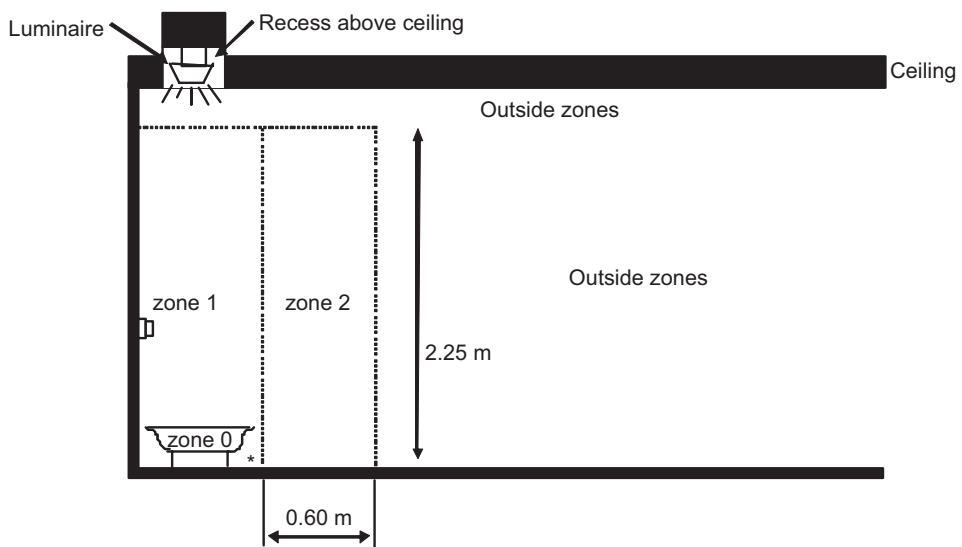
The immunity levels of equipment shall be chosen taking into account the electromagnetic disturbances that can occur when connected and erected as for normal use, and taking into account the intended level of continuity of service necessary for the application. See the specific equipment standard or the relevant part of BS EN 61000 series.

Fig 701.2 – Examples of zone dimensions (elevation)
 NOT TO SCALE (See Regulation 701.32 for definitions of zones)

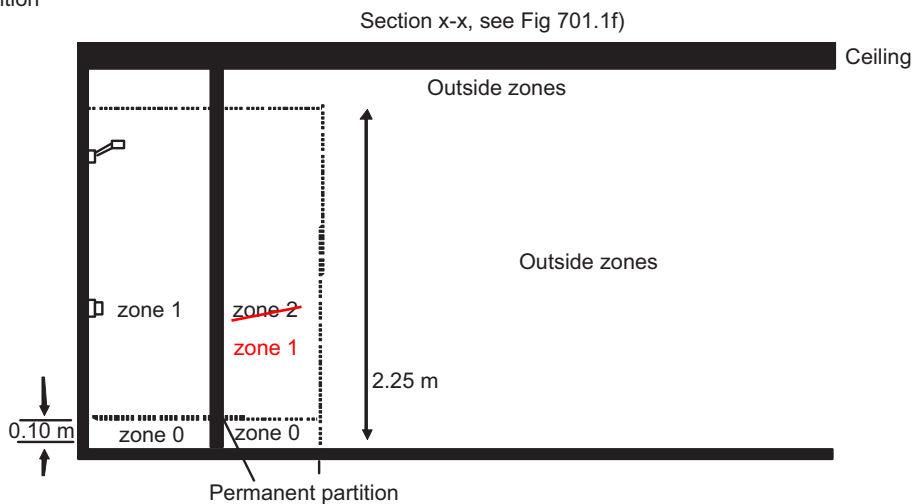
a) Bath tub



c) Shower basin



f) Shower without basin, but with permanent fixed partition



* Zone 1 if the space is accessible without the use of a tool.
 Spaces under the bath accessible only with the use of a tool are outside the zones.

710.559 Luminaires and lighting installations

~~In medical locations of Group 1 and Group 2, at least two different sources of supply shall be provided. One of the sources shall be connected to the electrical supply system for safety services.~~

In medical locations of group 1 and group 2, a minimum of two lighting circuits shall be provided from separate sources of supply. At least one of the circuits shall be supplied from a system for safety services.

The luminaires of the escape routes shall be arranged on alternate circuits, one of which shall be supplied from the power supply source for safety services.

710.56 Safety services

A power supply for safety services is required which will maintain the supply for continuous operation for a defined period within a pre-set changeover time.

The safety power supply system shall automatically take over if the voltage of one or more incoming live conductors, at the main distribution board of the building, has dropped for more than 0.5 s and by more than 10 % in regard to the nominal voltage.

NOTE: A list of examples with suggested reinstatement times is given in Table A710 of Annex A710.

710.560.4 Classification

Classification of safety services is given in Regulation 560.4.1.

NOTE: Safety services provided for locations having differing classifications should meet that classification which gives the highest security of supply.

710.560.5.5 General requirements for safety power supply sources of Group 1 and Group 2

Primary cells are not allowed as safety power sources.

An additional main incoming power supply, from the general power supply, is not regarded as a source of the safety power supply.

The availability (readiness for service) of safety power sources shall be monitored and indicated at a suitable location.

710.560.5.6 In case of a failure of the general power supply source, the power supply for safety services shall be energized to feed the equipment stated in Regulations 710.560.6.1.1 to 3 with electrical energy for a defined period of time and within a predetermined changeover period.

710.560.5.7 Where socket-outlets are supplied from the safety power supply source they shall be readily identifiable according to their safety services classification.

710.560.6 Electrical sources for safety services

710.560.6.1 Detailed requirements for safety power supply services

NOTE: Also refer to Regulation 710.560.5.5.

710.560.6.1.1 Power supply sources with a changeover period less than or equal to 0.5 s

In the event of a voltage failure on one or more line conductors at the distribution board, a safety power supply source shall be used and be capable of providing power for a period of at least 3 h for the following:

- (i) Luminaires of operating theatre tables
- (ii) ME equipment containing light sources being essential for the application of the equipment, e.g. endoscopes, including associated essential equipment, e.g. monitors
- (iii) Life-supporting ME equipment.

The duration of 3 h may be reduced to 1 h for items (ii) and (iii) if a power source meeting the requirements of Regulation 710.560.6.1.2 is installed.

The normal power supply shall be restored within a changeover period not exceeding 0.5 s.

NOTE: Supporting information relating to the autonomy of battery inverter units for theatre luminaires is given in HTM 06-01.

710.560.6.1.2 Power supply sources with a changeover period less than or equal to 15 s

Equipment meeting the requirements of Regulations 710.560.9.1 and 710.560.11 shall be connected within 15 s to a safety power supply source capable of maintaining it for a minimum period of 24 h, when the voltage of one or more live conductors at the main distribution board for the safety services has decreased by more than 10 % of the nominal value of supply voltage and for a duration greater than 3 s.

BS or EN Number	Title	References
BS EN 60947-2:2006 +A2:2013 BS EN 60947-2:2017	Circuit-breakers	411.4.4 note 2 432.4 433.1.201 433.1.204 531.1.1 531.3.2(iv) 531.3.4.2 533.1.1 533.1.3 536.4.1.4 note 3 536.4.2.1 536.4.3.1 Table 537.4 Table A53.1 711.410.3.4 721.415.1 722.531.2.101 722.533.101 740.410.3 740.411 note Appx 4 sec 4 Appx 8 sec 4
BS EN 60947-3:2009 +A2:2015	Switches, disconnectors, switch-disconnectors and fuse-combination units	536.4.2.3 536.4.2.3 note 536.4.3.2 Table 537.4 537.4.1 Table A53.1
BS EN 60947-4-1:2010+A1:2012	Contactors and motor starters – Electromechanical contactor and motor starters.	435.2 536.4.2.2 536.4.3.1 Table 537.4
BS EN 60947-5-1:2004 +A1:2009	Control circuit devices and switching elements – Electromechanical control circuit devices	Table 537.4
BS EN 60947-6-1:2005+A1:2014	Multiple function equipment – Transfer switching equipment	536.4.3.2 Table 537.4 Table A53.1 710.537.1
BS EN 60947-6-2:2003	Multiple function equipment – Control and protective switching devices (or equipment) (CPS)	Table 537.4 Table A53.1 722.533.101
BS EN 60947-7	Specification for low-voltage switchgear and controlgear	526.2 note 1
BS EN 60947-7-1:2009	Ancillary equipment. Terminal blocks for copper conductors	
BS EN 60947-7-2:2009	Ancillary equipment. Protective conductor terminal blocks for copper conductors	
BS EN 60950-1:2006 +A2:2013	Information technology equipment. Safety. General requirements	444.4.9
BS EN 60974-9:2010	Arc welding equipment. Installation and use	706.1
BS EN 60998	Connecting devices for low-voltage circuits for household and similar purposes	526.2 note 1 559.5.4(i)
BS EN 60998-2-1:2004	Particular requirements for connecting devices as separate entities with screw-type clamping units	715.521.107
BS EN 60998-2-2:2004	Particular requirements for connecting devices as separate entities with screwless-type clamping units	715.521.107
BS EN 61000	Electromagnetic compatibility (EMC) BS EN 61000 is a multiple part standard	515.2 Appx 4 sec 5.5.1
BS EN 61000-2	Electromagnetic compatibility (EMC). Environment	Appx 5 AM
BS EN 61000-4	Electromagnetic compatibility (EMC). Testing and measurement techniques	Appx 5 AM
BS EN 61000-6	Electromagnetic compatibility (EMC). Generic standards.	Table A444.1(i) & (ii)

APPENDIX 4 (Informative)

CURRENT-CARRYING CAPACITY AND VOLTAGE DROP FOR CABLES

CONTENTS

Tables:

- 4A1** Schedule of Installation Methods in relation to conductors and cables
- 4A2** Schedule of Installation Methods of cables (including Reference Methods) for determining current-carrying capacity
- 4A3** Schedule of cable specifications and current rating tables
- 4B1** Rating factors (Ca) for ambient air temperatures other than 30 °C
- 4B2** Rating factors (Ca) for ambient ground temperatures other than 20 °C
- 4B3** Rating factors (Cs) for soil resistivity, for cables buried direct or in underground conduit
- 4B4** Rating factors (Cd) for depths of laying other than 0.7 m for direct buried cables and cables in buried ducts
- 4B5** Rating factors for cables having more than 4 loaded cores
- 4C1** Rating factors (Cg) for one circuit or one multicore cable or for a group of circuits or multicore cables
- 4C2** Rating factors (Cg) for more than one circuit, cables buried directly in the ground
- 4C3** Rating factors (Cg) for more than one circuit, cables in ducts buried in the ground
- 4C4** Rating factors (Cg) for groups of more than one multicore cable on trays or cable ladders
- 4C5** Rating factors (Cg) for groups of one or more circuits of single-core cables on trays or cable ladders
- 4C6** Rating factors (Cg) for cables enclosed in infloor concrete troughs

4D1	Single-core non-armoured, with or without sheath	70 °C thermoplastic insulated cables	Copper conductors
4D2	Multicore non-armoured		
4D3	Single-core armoured (non-magnetic armour)		
4D4	Multicore armoured		
4D5	Flat cable with protective conductor		
4E1	Single-core non-armoured, with or without sheath	90 °C thermosetting	
4E2	Multicore non-armoured		
4E3	Single-core armoured (non-magnetic armour)		
4E4	Multicore armoured		
4F1	60 °C thermosetting insulated flexible cables	Flexible cables	
4F2	90 °C and 180 °C thermosetting insulated flexible cables		
4F3	Flexible cables		
4G1	Bare and exposed to touch, or having an overall thermoplastic covering	Mineral insulated cables	
4G2	Bare and neither exposed to touch nor in contact with combustible materials		
4H1	Single-core non-armoured, with or without sheath	70 °C thermoplastic insulated cables	
4H2	Multicore non-armoured		
4H3	Single-core armoured (non-magnetic armour)		
4H4	Multicore armoured		
4J1	Single-core non-armoured, with or without sheath	90 °C thermoplastic thermosetting insulated cables	
4J2	Multicore non-armoured		
4J3	Single-core armoured (non-magnetic armour)		
4J4	Multicore armoured		

COPPER CONDUCTORS

**TABLE 4F3A - Flexible cables,
non-armoured
(COPPER CONDUCTORS)**

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

Conductor cross-sectional area	Current-carrying capacity		Maximum mass supportable by twin flexible cable (see Regulations 522.7.2 and 559.5.2)
	Single-phase AC	Three-phase AC	
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 4F1A.

RATING FACTOR FOR AMBIENT TEMPERATURE

60 °C thermoplastic or thermosetting insulated cable:

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

110 °C flexible cable:

Ambient temperature	35 to 80 °C	85 °C	90 °C	95 °C	100 °C	105 °C
Rating factor	1.0	0.96	0.85	0.74	0.60	0.42

90 °C thermoplastic or thermosetting insulated cable:

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

150 °C flexible cable:

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

Glass fibre flexible cable:

Ambient temperature	35 to 50 °C 35 to 150 °C	155 °C	160 °C	165 °C	170 °C	175 °C
Rating factor	1.0	0.92	0.82	0.71	0.57	0.40