BRITISH STANDARD

BS 6346:1997
Incorporating Amendments Nos. 1 and 2

Electric cables — PVC insulated, armoured cables for voltages of 600/1 000 V and 1 900/3 300 V

ICS 29.060.20

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee GEL/20, Electric cables, upon which the following bodies were represented:

Association of Consulting Engineers

Association of Manufacturers of Domestic Electrical Appliances

BEAMA Electrical Cable and Conductor Accessory Manufacturers' Association

British Approvals Service for Cables

British Cables Association

British Iron and Steel Producers' Association

British Plastics Federation

Department of Trade and Industry (Consumer Safety Unit, CA Division)

Electricity Association

London Transport

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

Association of Manufacturers Allied to the Electrical and Electronic Industry (BEAMA Ltd.)

Chartered Institution of Building Services Engineers

ERA Technology Ltd.

Electrical Installation Equipment Manufacturers Association (BEAMA Ltd.)

Engineering Industries Association

Institution of Incorporated Executive Engineers

London Underground Ltd.

National Association of Lift Makers

Portable Electric Tool Manufacturers' Association

Transmission and Distribution Association (BEAMA Ltd.)

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Foreword

This British Standard has been prepared by Technical Committee GEL/20. It constitutes a major revision of the 1989 edition which is now withdrawn. BS 6346 is related to but not equivalent to IEC 60502-1:1998.

The start and finish of text introduced or altered by amendment is indicated in the text by tags [A1] ⟨A1]. Tags indicating changes to text carry the number of the amendment. For example, text altered by amendment No. 1 is indicated in the text by [A1] ⟨A1].

This edition makes changes to the scope so as to reflect those cable types in common use in the construction and industrial sector. Five-core cables have been introduced and the range of multicore auxiliary cables modified to include only the preferred number of cores up to 48-cores.

Unarmoured cable designs have been removed, but XLPE-insulated unarmoured types are specified in BS 7889.

The opportunity has also been taken to refer to BS 7655 for details of requirements for materials.

Further changes have been made to update and improve this standard in line with the corresponding revisions of BS 6724 and BS 5467.

Amendment No. 1:2004 implements the changes to the identification of cores by colours, in accordance with HD 308 S2. The principal identification colours are now:

Single phase – Green-and-yellow (Earth); blue (Neutral); brown (Live).

Three phase – Green-and-yellow (Earth); blue (Neutral); brown, black, grey (Live).

Users should ensure that any interconnection between cables with these new colours and those with pre-existing ones is carried out safely. BS 7671, as amended in parallel with this standard, gives some guidance in this respect, but does not cover all installation conditions or cable uses.

The provisions introduced by amendment No. 1:2004 are effective from 1st April 2004. The original version of this standard remains current until 31st March 2006.

Product certification/inspection/testing. Users of this British Standard are advised to consider the desirability of third-party certification/inspection/testing of product conformity with this British Standard. Users seeking assistance in identifying appropriate conformity assessment bodies or schemes may ask BSI to forward their enquiries to the relevant association.

WARNING This standard calls for the use of substances and/or procedures that may be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 33 and a back cover.

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1 Scope

This British Standard specifies requirements for construction and describes methods of test for armoured cable with PVC insulation of rated voltages 600/1 000 V and 1 900/3 300 V. Cables specified in this standard are intended for use in fixed installations in industrial areas, buildings and similar applications.

The insulation and other components are suitable to permit operation of the cables at a maximum sustained conductor temperature of 70 °C and for a maximum short-circuit conductor temperature of 160 °C for conductor sizes up to and including 300 mm^2 and 140 °C for conductor sizes greater than 300 mm^2.

The cables specified in this standard are as follows:

a) 600/1 000 V cables, either wire or aluminium strip armoured and oversheathed having:

single-core stranded copper conductor;

single-core solid aluminium conductor;

two-, three-, four- and five-core stranded copper conductor;

two-, three-, and four-core solid aluminium conductor;

multicore auxiliary stranded copper conductor.

b) 1 900/3 300 V cables, wire armoured and oversheathed having:

single-core stranded copper conductor;

single-core solid aluminium conductor;

three-core stranded copper conductor;

three-core solid aluminium conductor.

Annex A gives recommendations for the selection and operation of cables while recommendations for the installation of cables are given in Annex B. Annex C lists the information that should be given with an enquiry or order.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

〈A1〉 *Text deleted* 〈A1〉

BS 4727-2-0.8:1994*, Glossary of electrotechnical, power, telecommunication, electronics, lighting and colour terms — Part 2: Terms particular to power engineering — Group 08: Electric cables.*

BS 5099:1992*, Specification for spark testing of electric cables.*

BS 6360:1991*, Specification for conductors in insulated cables and cords.*

BS 7655-3.1:1993*, Specification for insulating and sheathing materials for cables — Part 3: PVC insulating compound — Section 3.1: Harmonized types.*

BS 7655-4.1:1993*, Specification for insulating and sheathing materials for cables — Part 4: PVC sheathing compounds — Section 4.1: Harmonized types.*

BS EN 10002-1:1990*, Tensile testing of metallic materials — Part 1: Method of test at ambient temperature.*

〈A1〉 BS EN 10244-2*, Steel wire and wire products — Non-ferrous metallic coatings on steel wire — Part 2: Zinc or zinc alloy coatings on steel wire.*

BS EN 50265-2-1*, Common test methods for cables under fire conditions — Test for resistance to vertical flame propagation for a single insulated conductor or cable — Part 2-1: Procedures — 1 kW pre-mixed flame.* 〈A1〉

BS EN 60811-1-1:1995*, Insulating and sheathing materials of electric cables — Common test methods — Part 1-1: General application — Measurement of thickness and overall dimensions — Tests for determining the mechanical properties.*

BS EN 60811-1-2:1995*, Insulating and sheathing materials of electric cables — Common test methods — Part 1-2: General application — Thermal ageing methods.*

3 Terms and definitions

For the purposes of this British Standard the definitions given in BS 727-2:Group 08 apply together with the following.

3.1
rated voltage U_0
the nominal power-frequency voltage between conductor(s) and armour or earth for which the cable is suitable

3.2
rated voltage U
the nominal power-frequency voltage between phase conductors for which the cable is suitable

3.3
maximum voltage U_m
the maximum sustained power-frequency voltage between phase conductors for which the cable is suitable

3.4
nominal value
the value by which a quantity is designated and which is often used in tables

NOTE In this standard, nominal values usually give rise to values to be checked by measurements taking into account specified tolerances.

3.5
approximate value
a value which is only indicative

NOTE In this standard, values described as approximate do not constitute requirements to be checked by measurement.

3.6
type tests (symbol T)
tests required to be made before supplying a type of cable specified in this standard, on a general commercial basis, in order to demonstrate satisfactory performance characteristics to meet the intended application. These tests are of such a nature that, after they have been made, they need not be repeated unless changes are made in the cable material, design or type of manufacturing process which might change the performance characteristics

3.7
sample tests (symbol S)
tests made on samples of completed cable, or components taken from a completed cable adequate to verify that the finished product meets the design specifications

3.8
routine tests (symbol R)
tests made on all production lengths to demonstrate their integrity

3.9
tests after installation
tests intended to demonstrate the integrity of the cable and its accessories as installed

4 Voltage designation

The cables shall be designated by the rated voltages U_0 and U, expressed in the form U_0/U.

The rated voltages recognized for the purposes of this standard are 600/1 000 V and 1 900/3 300 V.

The maximum designated voltages (U_m) for the purposes of this standard for 600/1 000 V and 1 900/3 300 V cables are recognized as 1 200 V and 3 600 V respectively.

NOTE Guidance on the selection of cables of appropriate voltage designations for particular systems is given in A.2.

5 Conductors

The conductors shall be either annealed copper or solid aluminium, as given in Table 5 to Table 19 inclusive, and shall conform to the requirements detailed in Table 2 and to BS 6360.

Where the manufacturer deems it necessary to use tinned copper conductors, they shall conform to the requirements of BS 6360 for metal coated conductors.

The conductors shall be circular, circular sectoral or shaped solid (class 1), or circular, circular compacted or shaped stranded (class 2), as specified in Table 5 to Table 19 inclusive.

6 Insulation

6.1 General

The insulation shall be PVC compound TI 1 conforming to BS 7655-3.1. The insulation shall be applied by the extrusion process to form a compact and homogeneous layer.

6.2 Thickness of insulation

The thickness of insulation, when determined by taking the average of a number of measurements in accordance with Annex D, shall be not less than the value given in Table 5 to Table 19, as appropriate, and the smallest of the measured values shall not fall below the value given in Table 5 to Table 19, as appropriate, by more than (10 % + 0.1 mm).

6.3 Spark testing of insulation

The core insulation shall conform to the requirements for spark testing specified in BS 5099 when tested in accordance with the a.c. or d.c. test methods specified in that standard.

7 Identification of cores

7.1 General

The cores of all cables shall be identified either by colour or by numbers. Numbers shall be marked sequentially starting with the number 1. Colour coding shall be in accordance with the following sequence.

Number of cores	Identification
▌A1⟩ Single-core	Brown or blue
Two-core	Brown, blue
Three-core	Brown, black, grey
Four-core	Blue, brown, black, grey
Five-core	Green-and-yellow, blue, brown, black, grey ⟨A1▌

The colour shall be applied either throughout the insulation or on its external surface.

Numbers on each core shall be printed in a colour contrasting with that of the insulation.

The height of the individual number shall be not less than 1.5 mm.

The spacing shall be such that each number is repeated at intervals not greater than 70 mm.

Conformity shall be checked by visual examination and measurement.

7.2 Bi-colour combination

On the core marked with the bi-colour combination green-and-yellow, the distribution of the colours shall be such that for every 15 mm length of core, one of these colours shall cover at least 30 % and at most 70 % of the surface of the core, while the other colour covers the remainder of the surface.

NOTE 1 In cases of dispute and where appropriate to the method of colour marking of the insulation, a suitable test for checking conformity is given in Clause **8** of BS 6469-99.1:1992.

NOTE 2 It is understood that the colours green and yellow when they are combined as specified above are recognized as identifying exclusively the core intended for use as an earth connection or similar protection.

7.3 Clarity and durability

The colour or the number used for core identification shall be clearly identifiable and durable such that it cannot be removed when rubbed 10 times with a piece of cotton wool or cloth soaked in water.

8 Laying-up

8.1 General

The cores of cables having two, three, four or five cores shall be laid-up with a right-hand or right-and-left-hand alternating direction of lay. For multicore auxiliary cables the direction of lay shall alternate for each successive layer. Auxiliary cables having up to and including seven cores may be laid-up with a right-hand or left-hand or with a right-and-left-hand alternating direction of lay. Cores shall be laid-up in the sequence given in **7.1**.

Conformity shall be checked by visual examination.

If necessary, the formation of a compact and reasonably circular cable shall be achieved either by the bedding (see **9.1**), or by the application of synthetic fillers and binder tape.

It shall be possible to strip the fillers, if any, from the cable without damaging the insulation of the cores.

9 Bedding

9.1 General

For single core 600/1 000 V cables the bedding shall consist of an extruded layer of polymeric material compatible with the operating temperature of the cable. When tested in accordance with BS EN 60811-1-1 it shall have a tensile strength of not less than 4 N/mm^2 and elongation at break not less than 50 %.

For multicore 600/1 000 V cables the bedding shall be either:

a) an extruded layer of polymeric material compatible with the operating temperature of the cable which, when tested in accordance with BS EN 60811-1-1, shall have a tensile strength of not less than 4 N/mm^2 and elongation at break not less than 50 %; or

b) for cables having a nominal conductor area of 16 mm^2 and above, a taped bedding (as indicated in the relevant tables) comprising two or more layers of PVC tape or other synthetic tape applied so that any gaps between adjacent edges of each tape are not coincident through the thickness of the bedding. If there is a gap between adjacent edges of each tape, it shall not exceed 15 % of the tape width, as determined by measurement in accordance with **17.3**.

The bedding of all 1 900/3 300 V cables shall consist of an extruded layer of polymeric material compatible with the operating temperature of the cable. When tested in accordance with BS EN 60811-1-1 it shall have a tensile strength of not less than 4 N/mm^2 and elongation at break not less than 50 %.

It shall be possible to remove the bedding without damaging the insulation of the core(s).

9.2 Thickness of bedding

The approximate thickness of the taped bedding shall be 0.8 mm.

The minimum thickness of extruded bedding, measured in accordance with Annex D, shall not fall below the value given in Table 5 to Table 19, as appropriate, by an amount more than (20 % + 0.2 mm).

10 Armour

10.1 General

The armour shall consist of a single layer of wires or aluminium strips having nominal dimensions as given in Table 5 to Table 19, as appropriate. The armour shall be applied helically with a left-hand lay for cables having up to and including five cores. For multicore auxiliary cables, the armour shall be applied helically with a direction of lay opposite to that of the final layer of cores, except that for cables which have been laid-up with alternating right-and-left-hand lay, the armour may be applied with either a right-hand or a left-hand lay.

The manufacturer shall, where necessary, apply a suitable binder tape over the armour.

10.2 Aluminium strip armour

The thickness and width of aluminium strip, determined in accordance with **G.6** shall not differ from the values specified in the appropriate table by more than 10 %.

The tensile strength of aluminium strip when tested in accordance with **G.4**, shall not be less than 145 N/mm^2.

10.3 Wire armour

Wire armour for cables having two or more cores shall consist of a single layer of galvanized steel wires. Wire armour for single-core cables shall consist of a single layer of aluminium wires.

The armour wire shall conform to the following.

a) When determined in accordance with **G.1**, the diameter of the round armour wires, whether of galvanized steel or plain aluminium, shall fall within the minimum and the maximum wire diameters given in Table 1.

b) When determined in accordance with **G.2**, the mass of zinc coating of galvanized steel armour wire shall be not less than the value given in Table 1.

c) When tested in accordance with **G.3**, the mechanical characteristics of galvanized armour wires shall be such that none of the wires shall break.

d) When tested in accordance with **G.4**, the tensile strength of aluminium armour wires shall be not less than 125 N/mm^2.

Table 1 — Diameter of armour wire and mass of zinc coating

Nominal wire diameter	Wire diameter		Minimum mass of zinc coating
	Minimum	Maximum	
mm	mm	mm	g/m^2
0.9	0.85	0.95	112
1.25	1.18	1.32	150
1.6	1.51	1.69	172
2.0	1.90	2.10	180
2.5	2.37	2.63	195
3.15	2.99	3.31	206

10.4 Joints

Joints in steel wire armour shall be brazed or welded and any surface irregularity shall be removed.

Joints in aluminium wire or strip shall be made by cold pressure or fusion welding and all surface irregularities shall be removed.

A joint in any wire or strip shall be not less than 1 m from the nearest joint in any other armour wire or strip in the complete cable.

10.5 Armour resistance

When measured and corrected to 20 °C in accordance with **G.5**, the d.c. resistance of the armour of the completed cable shall not exceed the appropriate value given in Table H.1, Table H.2, Table H.3, Table H.4 or Table H.5.

11 Oversheath

11.1 General

The oversheath shall be an extruded layer of PVC material conforming to the requirements for TM 1 material specified in BS 7655-4.1.

NOTE Oversheaths are normally black, but colours other than black may be provided by agreement between the manufacturer and the purchaser, subject to their suitability for the particular exposure conditions in which the cables are to be used.

11.2 Thickness of oversheath

The minimum thickness of the oversheath, when measured in accordance with Annex D, shall not fall below the value given in Table 5 to Table 19, as appropriate, by an amount exceeding (20 % + 0.2 mm).

11.3 Spark testing of oversheath

The oversheath shall conform to the requirements for spark testing specified in BS 5099 when tested in accordance with the a.c. or d.c. test methods specified in that standard.

12 Cable marking

12.1 End marking

The ends of each factory length of cable having three or more cores of conductor size 25 mm^2 and above shall be marked red or green. The end at which the sequence of core colours, as specified in Clause **7**, is clockwise shall be marked red and the other end shall be marked green.

12.2 External marking

The external surface of all cables conforming to this British Standard shall be legibly marked with the following elements.

Element	Example of marking
a) Electric cable	ELECTRIC CABLE
b) Voltage designation	600/1 000 V
	3 300 V
	600/1 000 V AUX
c) British Standard number	BS 6346
d) Manufacturer's identification	XYZ
[A1] e) Number of cores, type and nominal area of conductor	
1) Copper conductor cables	4 × 50
2) Aluminium conductor cables	4 × 50AL [A1]

NOTE 1 4 × 50 indicates a four-core cable with 50 mm^2 copper conductors.

NOTE 2 4 × 50AL indicates a four-core cable with 50 mm^2 aluminium conductors.

The marking of the items a) to d) shall be by embossing or indenting on the oversheath.

For cables with tabulated approximate overall diameters greater than 15 mm, items a), b) and c) shall appear, in any sequence that is deemed neither to confuse nor conflict, on two or more primary lines along the axis of the cables, approximately equally spaced around the circumference of the cable.

Items d) and e) shall appear either on one of the primary lines, or on a secondary line or lines, in any sequence that is deemed neither to confuse nor conflict.

[A1] NOTE 3 [A1] Items d) and e) need not both appear on the same line.

For cables with tabulated approximate overall diameters up to and including 15 mm, the elements of the marking shall be disposed as for cables of greater than 15 mm diameter except that the marking for items a), b) and c) shall appear on one or more primary lines.

The letters and figures shall consist of upright block characters with a minimum height of 3 mm.

The distance between the end of one element of marking and the beginning of the next identical element of marking shall be not greater than 550 mm for items a), b) and c) and not greater than 1 100 mm for items d) and e).

Conformity shall be checked by visual examination and measurement.

12.3 Identification of year of manufacture

A means of identifying the year of manufacture shall be provided throughout the length of cable, either by marking or by an identification thread.

If the identification is by internal marking, the distance between the end of one mark and the beginning of the next mark shall be not greater than 550 mm.

If the identification is by marking on the surface, the maximum distance between marks shall be not greater than 1 100 mm.

12.4 The mark of an approval organization

If the mark of an approval organization is used it shall be provided throughout the length of the cable, either on the surface or as an identification thread.

If the mark is applied to the surface of the cable, it shall be in the form of symbol(s) specified by the approval organization, and the maximum distance between marks shall be not greater than 1 100 mm.

If the mark is in the form of an identification thread, it shall be as specified by the approval organization.

12.5 Additional marking

Any additional marking shall be throughout the length of the cable, and shall be either on the external surface of the cable, or by means of a tape or thread within the cable, or by a combination of these methods.

Such marking, however made, shall be repeated at intervals not exceeding 1 100 mm.

If the additional marking is applied to the surface of the cable, it shall not be such as to render illegible the marking specified in **12.2**, **12.3** and **12.4**.

13 End sealing

Before dispatch, the manufacturer shall cap the ends of the cable in order to form a seal to prevent the ingress of water during transportation and storage.

14 Schedule of tests

The tests to be performed on cables specified in this standard shall be as scheduled in Table 2, which refers to the relevant clauses of the standard specifying the requirements and test methods as well as the category of each test which applies, i.e. T, S or R (as defined in Clause **3**). Table 2 also indicates which tests relate to complete cable, and which relate to components.

Table 2 — Schedule of tests

Test	Requirement given in clause	Test method	Category
Tests on components			
Conductor construction	**5**	BS 6360	S
Insulation			
material	**6.1**	BS 7655-3.1	T
thickness	**6.2**	Annex D	S
spark test	**6.3**	BS 5099	R
Core identification		Visual examination and measurement	S
Laying-up			
direction and sequence of lay	**8.1**	Visual examination	S
fillers and binders	**8.1**	Visual examination	S
Bedding			
taped bedding — gaps	**9.1**	**17.3**	S
extruded bedding —			
physical properties	**9.1**	BS EN 60811-1-1	T
thickness	**9.2**	Annex D	S
Armour			
Wire armour			
diameter	**10.3**a)	**G.1**	S
mass of zinc coating	**10.3**b)	**G.2**	T
wrapping test	**10.3**c)	**G.3**	T
tensile test (aluminium wire)	**10.3**d)	**G.4**	T
Aluminium strip armour			
dimensions of individual strips	**10.2**	**G.6**	S
tensile test	**10.2**	**G.4**	T
Oversheath			
physical properties	**11.1**	BS 7655-4.1	T
thickness	**11.2**	Annex D	S
spark test	**11.3**	BS 5099	R
Tests on completed cables			
Cable markings	**12**	Visual examination and measurement	R
Conductor resistance test	**16.2**	BS 6360	R
Voltage test on completed cables	**16.3**	Annex K	R
Insulation resistance test	**16.4**	Annex L	R
Armour resistance test	**10.5**	**G.5**	S
Tests under fire conditions			
flame propagation test on single cable	**17.2**	[A1] BS EN 50265-2-1 [A1]	S
Compatibility test	**18.2**	Annex M and BS EN 60811-1-1 and BS EN 60811-1-2	T

NOTE Tests classified as sample (S) and routine (R) may be required as part of a type approval scheme.

15 Test conditions

15.1 Ambient temperature

Tests shall be performed at an ambient temperature of (20 ± 15) °C unless otherwise specified in the details for the particular test.

15.2 Frequency and waveform of power frequency test voltages

Unless otherwise specified in the particular test, the frequency of the alternating test voltages shall be in the range of 49 Hz to 61 Hz. The waveform shall be substantially sinusoidal.

16 Routine tests

16.1 General

Routine tests shall be performed as indicated by the symbol "R" in Table 2.

NOTE Those requirements for which routine testing is specified, and which are not fully covered by earlier clauses, are detailed in **16.2**, **16.3** and **16.4**.

16.2 Conductor resistance

The d.c. resistance of each conductor shall conform to BS 6360 when measured in accordance with that standard and corrected to 20 °C.

NOTE For convenience, maximum conductor resistance values are given in Table H.1, Table H.2, Table H.3, Table H.4 and Table H.5.

16.3 Voltage test on completed cables

When the completed cable is tested in accordance with Annex K, the insulation shall not break down.

16.4 Insulation resistance

When the completed cable is tested in accordance with Annex L the insulation resistance shall not be less than the appropriate value given in Table 3.

Table 3 — Minimum insulation resistance values

Nominal cross-sectional area of conductor	Insulation resistance per kilometre at 20 °C	
	600/1 000 V	1 900/3 300 V
mm^2	MΩ	MΩ
1.5	10	—
2.5	9	—
4	8	—
6	7	—
10	7	—
16	6	10
25	5	8
35	5	7
50	5	6
70	5	6
95 and above	5	5

17 Sample tests

17.1 General

Sample tests shall be performed as indicated by the symbol "S" in Table 2.

NOTE Those requirements for which sample testing is specified, and which are not fully covered by earlier clauses, are detailed in **17.2** and **17.3**.

17.2 Flame propagation on single cable

[A1] Cables shall be tested in accordance with BS EN 50265-2-1. The test shall be carried out on a sample of completed cable. After the test, the cable shall conform to the performance recommendations given in BS EN 50265-2-1:1999, Annex A. [A1]

17.3 Measurement of gap between tapes of taped bedding

The gap between adjacent edges of each bedding tape, measured at right angles to the tape, and the tape width, shall be measured on a representative sample of cable 300 mm long, taken not less than 150 mm from the end of a factory length.

The measurements shall be made by suitable means in which the error of determination does not exceed 0.5 mm. The gaps shall be measured at four positions, approximately 50 mm apart, along the length of the sample.

The average gap determined from the results shall not exceed the limit specified in **9.1**.

18 Type tests

18.1 General

Type tests shall be performed as indicated by the symbol "T" in Table 2 (see also Annex P).

NOTE Those requirements for which type testing is specified, and which are not fully covered by earlier clauses, are detailed in **18.2**.

18.2 Compatibility test

When a sample of complete cable is aged in accordance with **M.2**, the insulation and oversheath shall conform to the requirements given in Table 4. In addition, at the end of the test period in the oven, the blotting paper shall be free of stains.

Table 4 — Compatibility test requirements

Component	Test	Requirement	
		TI 1	TM 1
Insulation	Minimum tensile strength (N/mm^2)	12.5	—
	Minimum percentage elongation at break	125	—
	Maximum percentage variation[a] of tensile strength	20	—
	Maximum percentage variation[a] of elongation at break	20	—
Oversheath	Minimum tensile strength (N/mm^2)	—	12.5
	Minimum percentage elongation at break	—	125
	Maximum percentage variation[a] of tensile strength	—	20
	Maximum percentage variation[a] of elongation at break	—	20

[a] The variation is the difference between the respective values obtained prior to and after heat treatment, expressed as a percentage of the former.

Table 5 — Single-core 600/1 000 V cables with circular stranded copper conductor

Nominal cross-sectional area of conductor[a] mm²	Thickness of insulation mm	Thickness of extruded bedding mm	Nominal aluminium armour wire diameter mm	Thickness of oversheath mm	Approximate overall diameter mm
50	1.4	0.8	1.25	1.5	19.1
70	1.4	0.8	1.25	1.6	21.1
95	1.6	0.8	1.25	1.6	23.4
120	1.6	1.0	1.6	1.7	26.3
150	1.8	1.0	1.6	1.7	28.3
185	2.0	1.0	1.6	1.8	30.8
240	2.2	1.0	1.6	1.9	34.1
300	2.4	1.0	1.6	1.9	37.0
400	2.6	1.2	2.0	2.1	42.0
500	2.8	1.2	2.0	2.1	45.6
630	2.8	1.2	2.0	2.2	49.7
800	2.8	1.4	2.5	2.4	55.8
1 000	3.0	1.4	2.5	2.5	61.0

[a] Circular or compacted circular stranded conductor (class 2).

Table 6 — Single-core 600/1 000 V cables with solid aluminium conductor

Nominal cross-sectional area of conductor mm²	Thickness of insulation mm	Thickness of extruded bedding mm	Nominal aluminium armour wire diameter mm	Armour strip		Thickness of oversheath mm	Approximate overall diameter	
				Nominal thickness mm	Nominal width mm		Wire-armoured mm	Strip-armoured mm
Circular solid conductor (class 1)								
50	1.4	0.8	1.25	0.6	2.4	1.5	17.8	16.5
70	1.4	0.8	1.25	0.6	2.4	1.6	19.6	18.3
95	1.6	0.8	1.25	0.6	2.4	1.6	21.7	20.4
120	1.6	1.0	1.6	0.6	2.4	1.7	24.3	22.3
150	1.8	1.0	1.6	0.6	2.4	1.7	26.1	24.1
185	2.0	1.0	1.6	1.0	3.6	1.8	28.3	27.1
240	2.2	1.0	1.6	1.0	3.6	1.9	31.2	30.0
300	2.4	1.0	1.6	1.0	3.6	1.9	33.7	32.5
Circular sectoral conductor								
380 (4 × 95)	2.6	1.2	2.0	1.4	4.8	2.0	38.4	37.2
480 (4 × 120)	2.8	1.2	2.0	1.4	4.8	2.1	41.7	40.5
600 (4 × 150)	2.8	1.2	2.0	1.4	4.8	2.2	44.6	43.4
740 (4 × 185)	2.8	1.4	2.5	1.4	4.8	2.3	49.5	47.3
960 (4 × 240)	3.0	1.4	2.5	1.8	6.4	2.5	54.9	53.5
1 200 (4 × 300)	3.0	1.6	2.5	1.8	6.4	2.6	59.7	58.3

Table 7 — Two-core 600/1 000 V cables with stranded copper conductors

Nominal cross-sectional area of conductor	Thickness of insulation	Thickness of extruded bedding	Nominal steel armour wire diameter	Thickness of oversheath	Approximate overall diameter	
					Extruded bedding	Taped bedding
mm^2	mm	mm	mm	mm	mm	mm
1.5[a]	0.6	0.8	0.9	1.4	12.3	—
2.5[a]	0.7	0.8	0.9	1.4	13.6	—
4[a]	0.8	0.8	0.9	1.4	15.1	—
6[a]	0.8	0.8	0.9	1.5	16.5	—
10[a]	1.0	0.8	1.25	1.6	20.1	—
16[a]	1.0	0.8	1.25	1.6	21.9	21.9
25[b]	1.2	1.0	1.6	1.7	23.0	22.6
25[a]	1.2	1.0	1.6	1.7	26.7	26.3
35[b]	1.2	1.0	1.6	1.8	24.8	24.4
35[a]	1.2	1.0	1.6	1.8	29.2	28.8
50[b]	1.4	1.0	1.6	1.9	27.8	27.4
70[b]	1.4	1.0	1.6	1.9	30.4	30.0
95[b]	1.6	1.2	2.0	2.1	35.5	34.7
120[b]	1.6	1.2	2.0	2.2	38.0	37.2
150[b]	1.8	1.2	2.0	2.3	41.3	40.5
185[b]	2.0	1.4	2.5	2.4	46.4	45.2
240[b]	2.2	1.4	2.5	2.5	51.2	50.0
300[b]	2.4	1.6	2.5	2.7	56.4	54.8
400[b]	2.6	1.6	2.5	2.9	61.9	60.3

[a] Circular or compacted circular stranded conductors (class 2).
[b] Shaped stranded conductor (class 2).

Table 8 — Two-core 600/1 000 V cables with solid aluminium conductors

Nominal cross-sectional area of conductor	Thickness of insulation	Thickness of extruded bedding	Nominal steel armour wire diameter	Armour strip		Thickness of oversheath	Approximate overall diameter		
				Nominal thickness	Nominal width		Wire-armoured		Strip-armoured (taped bedding)
							Extruded bedding	Taped bedding	
mm^2	mm	mm	mm	mm	mm	mm	mm	mm	mm
16[a]	1.0	0.8	1.25	0.6	2.4	1.6	20.6	20.6	19.3
25[b]	1.2	1.0	1.6	0.6	2.4	1.7	21.3	20.9	18.9
25[a]	1.2	1.0	1.6	0.6	2.4	1.7	25.0	24.6	22.6
35[b]	1.2	1.0	1.6	0.6	2.4	1.8	22.9	22.5	20.5
35[a]	1.2	1.0	1.6	0.6	2.4	1.8	27.2	26.8	24.8
50[b]	1.4	1.0	1.6	0.6	2.4	1.9	25.5	25.1	23.1
70[b]	1.4	1.0	1.6	1.0	3.6	1.9	27.7	27.3	26.1
95[b]	1.6	1.2	2.0	1.0	3.6	2.1	32.4	31.6	29.6

[a] Solid circular conductor (class 1).
[b] Solid sector shaped conductor (class 1).

Table 9 — Three-core 600/1 000 V cables with stranded copper conductors

Nominal cross-sectional area of conductor	Thickness of insulation	Thickness of extruded bedding	Nominal steel armour wire diameter	Thickness of oversheath	Approximate overall diameter	
					Extruded bedding	Taped bedding
mm^2	mm	mm	mm	mm	mm	mm
1.5[a]	0.6	0.8	0.9	1.4	12.8	—
2.5[a]	0.7	0.8	0.9	1.4	14.1	—
4[a]	0.8	0.8	0.9	1.4	15.8	—
6[a]	0.8	0.8	1.25	1.5	18.0	—
10[a]	1.0	0.8	1.25	1.6	21.2	—
16[a]	1.0	0.8	1.25	1.6	23.1	23.1
25[b]	1.2	1.0	1.6	1.7	25.0	24.6
25[a]	1.2	1.0	1.6	1.7	28.2	27.8
35[b]	1.2	1.0	1.6	1.8	27.1	26.7
35[a]	1.2	1.0	1.6	1.8	30.8	30.4
50[b]	1.4	1.0	1.6	1.9	30.5	30.1
70[b]	1.4	1.2	2.0	2.0	35.0	34.2
95[b]	1.6	1.2	2.0	2.1	39.3	38.5
120[b]	1.6	1.2	2.0	2.2	42.2	41.4
150[b]	1.8	1.4	2.5	2.4	47.5	46.3
185[b]	2.0	1.4	2.5	2.5	51.9	50.7
240[b]	2.2	1.6	2.5	2.6	57.8	56.2
300[b]	2.4	1.6	2.5	2.8	63.2	61.6
400[b]	2.6	1.6	2.5	3.0	69.6	68.0

[a] Circular or compacted circular stranded conductors (class 2).
[b] Shaped stranded conductor (class 2).

Table 10 — Three-core 600/1 000 V cables with solid aluminium conductors

Nominal cross-sectional area of conductor	Thickness of insulation	Thickness of extruded bedding	Nominal steel armour wire diameter	Armour strip		Thickness of oversheath	Approximate overall diameter		
				Nominal thickness	Nominal width		Wire-armoured		Strip-armoured (taped bedding)
							Extruded bedding	Taped bedding	
mm^2	mm	mm	mm	mm	mm	mm	mm	mm	mm
16[a]	1.0	0.8	1.25	0.6	2.4	1.6	21.7	21.7	20.4
25[b]	1.2	1.0	1.6	0.6	2.4	1.7	23.9	23.5	21.5
25[a]	1.2	1.0	1.6	0.6	2.4	1.7	26.4	26.0	24.0
35[b]	1.2	1.0	1.6	0.6	2.4	1.8	25.8	25.4	23.4
35[a]	1.2	1.0	1.6	0.6	2.4	1.8	28.7	28.3	26.3
50[b]	1.4	1.0	1.6	1.0	3.6	1.9	28.9	28.5	27.3
70[b]	1.4	1.2	2.0	1.0	3.6	2.0	33.0	32.2	30.2
95[b]	1.6	1.2	2.0	1.4	4.8	2.1	37.1	36.3	35.1
120[b]	1.6	1.2	2.0	1.4	4.8	2.2	39.7	38.9	37.7
150[b]	1.8	1.4	2.5	1.4	4.8	2.4	44.7	43.5	41.3
185[b]	2.0	1.4	2.5	1.4	4.8	2.5	48.7	47.5	45.3
240[b]	2.2	1.6	2.5	1.8	6.4	2.6	54.2	52.6	51.2
300[b]	2.4	1.6	2.5	1.8	6.4	2.8	59.2	57.6	56.2

[a] Solid circular conductor (class 1).
[b] Solid sector shaped conductor (class 1).

Table 11 — Four-core 600/1 000 V cables with stranded copper conductors

Nominal cross-sectional area of conductor	Thickness of insulation	Thickness of extruded bedding	Nominal steel armour wire diameter	Thickness of oversheath	Approximate overall diameter	
					Extruded bedding	Taped bedding
mm^2	mm	mm	mm	mm	mm	mm
1.5[a]	0.6	0.8	0.9	1.4	13.5	—
2.5[a]	0.7	0.8	0.9	1.4	15.0	—
4[a]	0.8	0.8	1.25	1.5	17.8	—
6[a]	0.8	0.8	1.25	1.5	19.2	—
10[a]	1.0	0.8	1.25	1.6	22.8	—
16[a]	1.0	1.0	1.6	1.7	26.3	25.9
25[b]	1.2	1.0	1.6	1.8	27.8	27.4
25[a]	1.2	1.0	1.6	1.8	30.7	30.3
35[b]	1.2	1.0	1.6	1.9	30.3	29.9
35[a]	1.2	1.0	1.6	1.9	33.7	33.3
50[b]	1.4	1.2	2.0	2.0	35.4	34.6
70[b]	1.4	1.2	2.0	2.1	39.2	38.4
95[b]	1.6	1.2	2.0	2.2	44.3	43.5
120[b]	1.6	1.4	2.5	2.4	49.3	48.1
150[b]	1.8	1.4	2.5	2.5	53.6	52.4
185[b]	2.0	1.6	2.5	2.6	59.0	57.4
240[b]	2.2	1.6	2.5	2.8	65.7	64.1
300[b]	2.4	1.6	2.5	3.0	72.0	70.4
400[b]	2.6	1.8	3.15	3.3	81.3	79.3

[a] Circular or compacted circular stranded conductors (class 2).
[b] Shaped stranded conductor (class 2).

Table 12 — Four-core 600/1 000 V cables with solid aluminium conductors

Nominal cross-sectional area of conductor	Thickness of insulation	Thickness of extruded bedding	Nominal steel armour wire diameter	Armour strip		Thickness of oversheath	Approximate overall diameter		
				Nominal thickness	Nominal width		Wire-armoured		Strip-armoured (taped bedding)
							Extruded bedding	Taped bedding	
mm^2	mm	mm	mm	mm	mm	mm	mm	mm	mm
16[a]	1.0	1.0	1.6	0.6	2.4	1.7	24.7	24.3	22.3
25[b]	1.2	1.0	1.6	0.6	2.4	1.8	26.3	25.9	23.9
25[a]	1.2	1.0	1.6	0.6	2.4	1.8	28.7	28.3	26.3
35[b]	1.2	1.0	1.6	0.6	2.4	1.9	28.6	28.2	26.2
35[a]	1.2	1.0	1.6	0.6	2.4	1.9	31.3	30.9	28.9
50[b]	1.4	1.2	2.0	1.0	3.6	2.0	33.3	32.5	30.5
70[b]	1.4	1.2	2.0	1.0	3.6	2.1	36.8	36.0	34.0
95[b]	1.6	1.2	2.0	1.4	4.8	2.2	41.5	40.7	39.5
120[b]	1.6	1.4	2.5	1.4	4.8	2.4	46.1	44.9	42.7
150[b]	1.8	1.4	2.5	1.4	4.8	2.5	50.1	48.9	46.7
185[b]	2.0	1.6	2.5	1.8	6.4	2.6	55.1	53.5	52.1
240[b]	2.2	1.6	2.5	1.8	6.4	2.8	61.2	59.6	58.2
300[b]	2.4	1.6	2.5	1.8	6.4	3.0	67.0	65.4	64.0

[a] Solid circular conductor (class 1).
[b] Solid sector shaped conductor (class 1).

Table 13 — *Spare*

Table 14 — Five-core 600/1 000 V cables with stranded copper conductors

Nominal cross-sectional area of conductor[a]	Thickness of insulation	Thickness of extruded bedding	Nominal steel armour wire diameter	Thickness of oversheath	Approximate overall diameter	
					Extruded bedding	Taped bedding
mm^2	mm	mm	mm	mm	mm	mm
1.5	0.6	0.8	0.9	1.4	14.3	—
2.5	0.7	0.8	0.9	1.5	16.3	—
4	0.8	0.8	1.25	1.5	19.0	—
6	0.8	0.8	1.25	1.6	20.9	—
10	1.0	1.0	1.6	1.7	25.8	—
16	1.0	1.0	1.6	1.7	28.4	28.0
25	1.2	1.0	1.6	1.9	33.5	33.1
35	1.2	1.0	1.6	1.9	36.6	36.2
50	1.4	1.2	2.0	2.1	43.0	42.2
70	1.4	1.2	2.0	2.2	48.1	47.3

[a] Circular or compacted circular stranded conductors (class 2).

Table 15 — Single-core 1 900/3 300 V cables with circular stranded copper conductor

Nominal cross-sectional area of conductor[a]	Thickness of insulation	Thickness of extruded bedding	Nominal aluminium armour wire diameter	Thickness of oversheath	Approximate overall diameter
mm^2	mm	mm	mm	mm	mm
50	2.2	0.8	1.25	1.6	21.0
70	2.2	0.8	1.25	1.6	22.8
95	2.2	1.0	1.6	1.7	26.0
120	2.2	1.0	1.6	1.7	27.7
150	2.2	1.0	1.6	1.8	29.4
185	2.2	1.0	1.6	1.8	31.3
240	2.2	1.0	1.6	1.9	34.1
300	2.4	1.0	1.6	1.9	37.0
400	2.6	1.2	2.0	2.1	42.0
500	2.8	1.2	2.0	2.1	45.6
630	2.8	1.2	2.0	2.2	49.7
800	2.8	1.4	2.5	2.4	55.8
1 000	3.0	1.4	2.5	2.5	61.0

[a] Circular or compacted circular stranded conductor (class 2).

Table 16 — Single-core 1 900/3 300 V cables with solid aluminium conductor

Nominal cross-sectional area of conductor	Thickness of insulation	Thickness of extruded bedding	Nominal aluminium armour wire diameter	Thickness of oversheath	Approximate overall diameter
mm^2	mm	mm	mm	mm	mm
Circular solid conductor (class 1)					
50	2.2	0.8	1.25	1.6	19.8
70	2.2	0.8	1.25	1.6	21.3
95	2.2	1.0	1.6	1.7	24.3
120	2.2	1.0	1.6	1.7	25.6
150	2.2	1.0	1.6	1.8	27.1
185	2.2	1.0	1.6	1.8	28.8
240	2.2	1.0	1.6	1.9	31.2
300	2.4	1.0	1.6	1.9	33.7
Circular sectoral conductor					
380 (4 × 95)	2.6	1.2	2.0	2.0	38.4
480 (4 × 120)	2.8	1.2	2.0	2.1	41.7
600 (4 × 150)	2.8	1.2	2.0	2.2	44.6
740 (4 × 185)	2.8	1.4	2.5	2.3	49.5
960 (4 × 240)	3.0	1.4	2.5	2.5	54.9
1 200 (4 × 300)	3.0	1.6	2.5	2.6	59.7

Table 17 — Three-core 1 900/3 300 V cables with stranded copper conductors

Nominal cross-sectional area of conductor	Thickness of insulation	Thickness of extruded bedding	Nominal steel armour wire diameter	Thickness of oversheath	Approximate overall diameter
mm^2	mm	mm	mm	mm	mm
16[a]	2.2	1.0	1.6	1.8	30.3
25[a]	2.2	1.0	1.6	1.8	33.1
35[b]	2.2	1.0	1.6	1.9	32.1
35[a]	2.2	1.0	1.6	1.9	35.8
50[b]	2.2	1.2	2.0	2.0	35.6
70[b]	2.2	1.2	2.0	2.1	38.9
95[b]	2.2	1.2	2.0	2.2	42.3
120[b]	2.2	1.4	2.5	2.3	46.6
150[b]	2.2	1.4	2.5	2.4	49.4
185[b]	2.2	1.4	2.5	2.5	52.8
240[b]	2.2	1.6	2.5	2.6	57.8
300[b]	2.4	1.6	2.5	2.8	63.2
400[b]	2.6	1.6	2.5	3.0	69.6

[a] Circular or compacted circular stranded conductors (class 2).
[b] Shaped stranded conductors (class 2).

Table 18 — Three-core 1 900/3 300 V cables with solid aluminium conductors

Nominal cross-sectional area of conductor mm²	Thickness of insulation mm	Thickness of extruded bedding mm	Nominal steel armour wire diameter mm	Thickness of oversheath mm	Approximate overall diameter mm
16[a]	2.2	1.0	1.6	1.8	28.9
25[a]	2.2	1.0	1.6	1.8	31.3
35[b]	2.2	1.0	1.6	1.9	30.6
35[a]	2.2	1.0	1.6	1.9	33.7
50[b]	2.2	1.2	2.0	2.0	33.9
70[b]	2.2	1.2	2.0	2.1	36.9
95[b]	2.2	1.2	2.0	2.2	40.0
120[b]	2.2	1.4	2.5	2.3	44.0
150[b]	2.2	1.4	2.5	2.4	46.5
185[b]	2.2	1.4	2.5	2.5	49.6
240[b]	2.2	1.6	2.5	2.6	54.2
300[b]	2.4	1.6	2.5	2.8	59.2

[a] Solid circular conductor (class 1).
[b] Solid sector shaped conductor (class 1).

Table 19 — 600/1 000 V armoured auxiliary cables with stranded copper conductors

Number of cores[a]	Nominal cross-sectional area of conductor[b] mm²	Thickness of insulation mm	Thickness of extruded bedding mm	Nominal steel armour wire diameter mm	Thickness of oversheath mm	Approximate overall diameter mm
7	1.5	0.6	0.8	0.9	1.4	15.2
12			0.8	1.25	1.5	19.4
19			0.8	1.25	1.6	22.2
27			1.0	1.6	1.7	26.7
37			1.0	1.6	1.8	29.2
48			1.0	1.6	1.9	32.9
7	2.5	0.7	0.8	1.25	1.5	18.0
12			0.8	1.25	1.6	22.4
19			1.0	1.6	1.7	26.6
27			1.0	1.6	1.8	30.7
37			1.0	1.6	1.9	34.0
48			1.2	2.0	2.1	39.5
7	4	0.8	0.8	1.25	1.6	20.5
12			1.0	1.6	1.7	26.8
19			1.0	1.6	1.8	30.5
27			1.2	2.0	2.0	37.1
37			1.2	2.0	2.1	40.8
48			1.2	2.0	2.2	46.0

[a] The numbers of cores given here are preferred. Other numbers are permitted subject to agreement between the purchaser and manufacturer and, where such other numbers are manufactured, the dimensional details shall be as for the next highest preferred number of cores.
[b] Circular or compacted circular stranded copper conductors (class 2).

Annex A (informative)
Recommendations for the selection and operation of cables

A.1 General

The cables specified in this standard are designed to be installed in air, or for burial in free draining soil conditions.

Where the cables are to be laid in any other environment, reference should be made to the cable manufacturer.

A.2 Voltage ratings

The rated voltage of the cable for a given application should be suitable for the operating conditions in the system in which the cable is used. To facilitate the selection of the cable, systems are divided into three categories as follows:

a) category A
This category comprises those systems in which any phase conductor that comes in contact with earth or an earth conductor is disconnected from the system within 1 min.

b) category B
This category comprises those systems which, under fault conditions, are operated for a short time with one phase earthed. This period, according to IEC 60183, should not exceed 1 h. For cables specified in this standard, a longer period, not exceeding 8 h on any occasion, can be tolerated. The total duration of earth faults in any year should not exceed 125 h.

c) category C
This category comprises all systems which do not fall into categories A and B.

NOTE It should be realized that, in a system where an earth fault is not automatically and promptly isolated, the extra stresses on the insulation of cables during the earth fault reduce the life of the cables to a certain degree. If the system is expected to be operated fairly often with a permanent earth fault, it may be advisable to classify the system into a higher category.

Table A.1 gives the lowest rated voltage of cable that should be used for an a.c. system according to the system voltage and category.

Table A.1 — Selection of cables for a.c. systems

System voltage		System category	Minimum rated voltage of cable (U_0/U)
Nominal voltage (U)	Maximum sustained voltage (U_m)		
kV	kV		kV
Up to 1.0	1.2	A, B or C	0.6/1
1.9 to 3.3	3.6	A or B	1.9/3.3

The nominal system voltage, U, given in Table A.1 is the nominal voltage between phases.

The maximum sustained system voltage, U_m, is the highest voltage between phases that can be sustained under normal operating conditions at any time and at any point in the system. It excludes transient voltage variations, due, for example, to lightning impulses, fault conditions and rapid disconnection of loads.

Single-core 600/1 000 V cables are suitable for d.c. systems operating up to 1 000 V to earth and two-core 600/1 000 V cables up to 1 500 V between conductors. Single-core 1 900/3 300 V cables are suitable for d.c. operating up to 3 000 V to earth.

However, consideration should be given to the peak value when determining the voltage of a d.c. system derived from rectifiers, bearing in mind that smoothing does not modify the peak value when the rectifiers are operating on an open circuit.

A.3 Hazardous areas

Where cables are required to be installed in areas classified as hazardous, i.e. potentially explosive gas atmospheres, reference should be made to ⟩A1⟩ BS EN 60079-14 ⟨A1⟨.

A.4 Current ratings

A.4.1 *Cables installed in and around buildings*

For current ratings of cables installed in and around buildings, reference should be made to BS 7671.

A.4.2 *Other installations*

For the current ratings for cables installed in situations other than those covered by **A.4.1**, reference should be made to the *Current Rating Standards for Distribution Cables* ERA 69-30 Part III.

Annex B (informative)
Recommendations for the installation of cables

B.1 General

Cables should be installed and used in association with other equipment in accordance with BS 7671 and/or the [A1] Electricity Safety, Quality and Continuity Regulations [A1] as appropriate.

NOTE In countries outside the UK, corresponding national regulations may apply.

In special environments, the appropriate regulations and codes of practice should be observed

B.2 Minimum temperature during installation

It is recommended that the cables specified in this standard be installed only when both the cable and ambient temperatures are above 0 °C and have been so for the previous 24 h, or where special precautions have been taken to maintain the cable above this temperature.

B.3 Minimum installation radius

None of the cables specified in this standard should be bent during installation to a radius smaller than that given in Table B.1.

Table B.1 — Minimum installation radius

Construction	Minimum internal radius of bend
Circular copper conductors	6*D*
Solid aluminium or shaped copper conductors	8*D*
NOTE *D* is the tabulated overall diameter of the cable.	

Wherever possible, larger installation radii should be used.

B.4 Prevention of moisture ingress

Care should be exercised during installation to avoid any damage to cable coverings. This is important in wet or other aggressive environments. The protective cap should not be removed from the ends of the cable until immediately prior to termination or jointing, especially for cables that do not have an extruded bedding. When the caps have been removed, the unprotected ends of the cable should not be exposed to moisture.

The possibility of damage to moisture seals during handling and installation or during storage of the cable should be borne in mind. Where such damage may have occurred, the seals should be inspected and remade if necessary.

B.5 Earthing bonds and clamps

Owing to the absence of a metal sheath, all earth fault currents will return through the armour unless there is a parallel bonding connection to relieve them of some of the fault current. In either event it is necessary to ensure that there is no discontinuity in the return circuit via the armour and no local spot of high resistance. Careful attention should therefore be paid to the design of all bonding clamps in joints and terminations to ensure that each armour wire contributes equally to the conductance of the bonding connection and that the resistance across a connector is not higher than that of the equivalent length of connected armour of the cable.

It is also important to ensure that all armour wires and all faces of armour clamps or connectors making contact with them are thoroughly cleaned during installation and that the clamps are adequately tightened to ensure good electrical contact.

Bonding clamps in joints should be electrically connected with a bond having a conductance at least equal to that of an equal length of the complete armour of the cable, and with adequate thermal capacity to avoid excessive overheating under short-circuit conditions.

B.6 Compound filling

For compound filled joints, the design of the box and the composition of the filling compound should provide an effective seal to prevent moisture gaining access to the conductor ferrules and armour connections. The filling compound should be compatible with the materials of the cable components with which it comes into contact. Account should be taken of the pouring temperatures or the temperatures resulting from exothermic reaction.

Compound filling is not necessary for terminations, provided that adequate clearances are maintained between phases and between each phase and earth. The minimum clearances should be related to the voltage and category of systems and environmental conditions. Guidance on minimum clearances can be obtained from the appropriate standards for equipment.

Where the required clearances cannot be achieved, it is necessary to provide some other effective means of insulation.

B.7 Earthing of armour

Provision should be made for earthing the armour to the main earth system at the supply end by means of a metallic bond of adequate conductance, the bonding connection being as short and straight as possible.

Special precautions may be necessary to eliminate the risk of corrosion, especially corrosion due to the use of dissimilar metals.

B.8 Test after installation

A voltage test after installation is not a requirement of this standard, but if a test is made it should be performed with direct current, the value of the voltage being as given in Table B.2.

Table B.2 — Test voltages after installation

Cable voltage designation	D.C. test voltage	
	Between conductors	Between each conductor and armour
V	V	V
600/1 000	3 500	3 500
1 900/3 300	10 000	7 000

During the test the voltage should be increased gradually to the full value and maintained continuously for 15 min. The test should be made between conductors and between each conductor and armour.

No breakdown should occur.

Sequence testing may be used to reduce overall testing time for multicore auxiliary cables, as indicated in Annex K.

The test voltages given in Table B.2 are intended for cables immediately after installation and not for cables that have been in service. When testing is required after cables have been in service, regardless of service duration, the manufacturer should be consulted for the appropriate test conditions, which depend on the individual circumstances.

Annex C (informative)
Information to be provided with enquiry or order

The following information should be given with an enquiry or order:

a) the number of this British Standard;

b) length of cable required and individual drum lengths, if important;

c) voltage designation (see Clauses **4** and **A.2**);

d) number of cores;

e) ▌A1⟩ size of phase conductor; ⟨A1▐

f) conductor material (i.e. copper or aluminium);

g) type of conductor (i.e. stranded or solid, shaped or circular);

h) whether cable is liable to be exposed to any potentially aggressive environments (e.g. water, oil or acid);

i) type of finish, i.e.:

1) armoured with aluminium wire (single-core only), steel wire or aluminium strip;

2) whether taped or extruded bedding (where appropriate) is required for armoured cables. This will depend on the circumstances of installation and in particular on whether the environmental conditions are especially onerous, e.g. aggressive or wet. In cases of doubt advice should be sought from the cable manufacturer.

NOTE See Annex A for recommendations for selection of cables.

Annex D (normative)
Measurement of thickness

D.1 Sampling

For measurements of the thickness of insulation, bedding and oversheath listed in Table 2, take a sample from one end of each drum length of cable selected for the test, discarding any portion which may have suffered damage.

D.2 Test procedure

Make measurements for thickness of insulation, bedding and oversheath either by the method described in BS EN 60811-1-1 or by use of a calibrated hand lens or micrometer. In case of dispute, use the equipment specified in BS EN 60811-1-1.

For multicore cables, take measurements of insulation thickness on each core up to a maximum of five-cores.

When determining an average thickness from several measurements, round the resultant value to the nearest 0.1 mm (0.05 mm rounded upwards).

If any of the thicknesses measured does not conform to **6.2**, **9.2** and **11.2**, check two further samples in respect of the non-conforming dimensions. If both of the further pieces meet the specified requirements, the cable is deemed to conform, but if either does not meet the requirements the cable is deemed not to conform.

Annex E
Spare

Annex F
Spare

Annex G (normative)
Armour wire tests

G.1 Measurement of diameter of round wire armour

Take at random, from one sample of completed cable, 10 % of the total number of wires, and determine the diameter of each wire with a micrometer by taking two measurements at right angles to each other. Take the average of all the measurements as the wire diameter.

G.2 Mass of zinc coating of galvanized steel wire

Take at random, from one sample of completed cable, 10 % of the total number of wires and determine the mass of zinc coating by either a gravimetric or gas volumetric method as described in [A1] **5.2** of BS EN 10244-2:2001 [A1]. Take the average of all the measurements as being the mass of zinc coating.

G.3 Wrapping test for galvanized steel wire

Take at random, from one sample of completed cable, 10 % of the total number of wires. Wrap each wire round a cylindrical mandrel for one complete turn. The mandrel shall have a diameter of approximately four times the specified nominal wire diameter under test.

G.4 Tensile test for aluminium wires

Take at random, from one sample of completed cable, 10 % of the total number of wires. Measure the tensile strength of each wire in accordance with BS EN 10002-1.

The load shall be applied gradually and the rate of separation of the jaws of the testing machine shall be not less than 25 mm/min and not greater than 100 mm/min. The initial distance between the grips of the machine shall be (250 ± 2) mm.

The average of all the measurements shall be taken as being the tensile strength.

G.5 Armour resistance test

Determine the d.c. resistance of the armour by measuring the resistance of all the armour wires of the completed cable connected together.

Temperature correction multiplication factors, k_t, for armour resistance, to correct the measured resistance at t °C to 20 °C, are given in Table G.1.

G.6 Measurement of dimensions of aluminium strip armour

Take at random, from one sample of completed cable, 10 % of the total number of strips. Measure the thickness and width of each strip using a dial micrometer or vernier caliper.

The average of all the measurements shall be taken as the thickness and width as appropriate.

Table G.1 — Temperature correction multiplication factors

Temperature of armour at time of measurement, t °C	Correction factor k_t	
	Galvanized steel wire armour	Aluminium wire armour
5	1.072	1.064
6	1.067	1.059
7	1.062	1.055
8	1.057	1.050
9	1.052	1.046
10	1.047	1.042
11	1.042	1.037
12	1.037	1.033
13	1.033	1.029
14	1.028	1.025
15	1.023	1.020
16	1.018	1.016
17	1.014	1.012
18	1.009	1.008
19	1.005	1.004
20	1.000	1.000
21	0.996	0.996
22	0.991	0.992
23	0.987	0.988
24	0.982	0.984
25	0.978	0.980
26	0.974	0.977
27	0.969	0.973
28	0.965	0.969
29	0.961	0.965
30	0.957	0.962
31	0.953	0.958
32	0.949	0.954
33	0.945	0.951
34	0.941	0.947
35	0.937	0.943

NOTE The values of correction factor k_t are based on resistance temperature coefficients at 20 °C of 0.004 5 per K for galvanized steel wire and 0.004 0 per K for aluminium wire.

Annex H (normative)
Resistance of conductor and armour

Table H.1, Table H.2, Table H.3, Table H.4 and Table H.5 give maximum values of the conductor resistance and of the resistance of the aluminium wire, aluminium strip and galvanized steel wire armour for single-core and multicore cables with rated voltage of 600/1 000 V and 1 900/3 300 V as designated in Table 5 to Table 19.

Table H.1 — Maximum resistance of conductor and armour for single-core cable having aluminium wire armour

Nominal cross-sectional area of conductor	Maximum resistance per km of cable at 20 °C					
	Copper conductor	Aluminium conductor	Aluminium wire armour			
			Cables with stranded copper conductor		Cables with solid aluminium conductor	
			600/1 000 V	1 900/3 300 V	600/1 000 V	1 900/3 300 V
mm²	Ω	Ω	Ω	Ω	Ω	Ω
50	0.387	0.641	0.82	0.73	0.90	0.79
70	0.268	0.443	0.73	0.65	0.79	0.71
95	0.193	0.320	0.64	0.45	0.71	0.49
120	0.153	0.253	0.45	0.42	0.49	0.46
150	0.124	0.206	0.40	0.39	0.45	0.43
185	0.099 1	0.164	0.37	0.36	0.41	0.40
240	0.075 4	0.125	0.33	0.33	0.37	0.37
300	0.060 1	0.100	0.30	0.30	0.34	0.34
400	0.047 0	0.077 8	0.21	0.21	—	—
500	0.036 6	0.060 5	0.19	0.19	—	—
630	0.028 3	0.046 9	0.18	0.18	—	—
800	0.022 1	0.036 7	0.13	0.13	—	—
1 000	0.017 6	0.029 1	0.12	0.12	—	—
Circular sectoral conductors						
380	—	0.080 0	—	—	0.24	0.24
480	—	0.063 3	—	—	0.22	0.22
600	—	0.051 5	—	—	0.20	0.20
740	—	0.041 0	—	—	0.15	0.15
960	—	0.031 3	—	—	0.13	0.13
1 200	—	0.025 0	—	—	0.12	0.12

Table H.2 — Maximum resistance of conductor and armour for two-, three-, four- and five-core cables having wire armour

Nominal cross-sectional area of conductor	Maximum resistance per km of cable at 20 °C									
	Copper conductor[a]	Aluminium conductor	Steel wire armour							
			Cables with stranded copper conductors					Cables with solid aluminium conductors		
			Two-core	Three-core		Four-core	Five-core	Two-core	Three-core		Four-core
			600/1 000 V	600/1 000 V	1 900/3 300 V	600/1 000 V	600/1 000 V	600/1 000 V	600/1 000 V	1 900/3 300 V	600/1 000 V
mm²	Ω	Ω	Ω	Ω	Ω	Ω	Ω	Ω	Ω	Ω	Ω
1.5	12.1	—	10.2	9.5	—	8.8	8.2	—	—	—	—
2.5	7.41	—	8.8	8.2	—	7.7	6.8	—	—	—	—
4	4.61	—	7.5	7.0	—	4.6	4.1	—	—	—	—
6	3.08	—	6.8	4.6	—	4.1	3.8	—	—	—	—
10	1.83	—	3.9	3.7	—	3.4	2.3	—	—	—	—
16	1.15	1.91	3.4	3.1	1.9	2.2	2.0	3.7	3.4	1.9	2.4
25	0.727	1.20	2.6	2.4	1.7	2.1	1.7	2.9	2.5	1.8	2.3
35	0.524	0.868	2.4	2.1	1.7	1.9	1.5	2.7	2.3	1.9	2.0
50	0.387	0.641	2.1	1.9	1.3	1.3	1.1	2.4	2.0	1.4	1.4
70	0.268	0.443	1.9	1.4	1.2	1.2	0.89	2.1	1.4	1.2	1.3
95	0.193	0.320	1.3	1.2	1.1	0.98	—	1.5	1.3	1.1	1.1
120	0.153	0.253	1.2	1.1	0.74	0.71	—	—	1.2	0.80	0.78
150	0.124	0.206	1.1	0.74	0.69	0.65	—	—	0.82	0.74	0.71
185	0.099 1	0.164	0.78	0.68	0.64	0.59	—	—	0.73	0.69	0.64
240	0.075 4	0.125	0.69	0.60	0.58	0.52	—	—	0.65	0.63	0.57
300	0.060 1	0.100	0.63	0.54	0.53	0.47	—	—	0.59	0.57	0.52
400	0.047 0	—	0.56	0.49	0.48	0.34	—	—	—	—	—

[a] The values given are for plain annealed copper conductors. For tinned conductors reference should be made to BS 6360.

Table H.3 — Maximum resistance of conductor and armour for 600/1 000 V auxiliary cables with copper conductors having steel wire armour

Nominal cross-sectional area of conductor	Maximum resistance per km of cable at 20 °C						
	Copper conductor[a]	Steel wire armour: number of cores[b]					
		7	12	19	27	37	48
mm²	Ω	Ω	Ω	Ω	Ω	Ω	Ω
1.5	12.1	7.5	4.0	3.5	2.3	2.0	1.8
2.5	7.41	4.6	3.5	2.3	1.9	1.7	1.2
4	4.61	3.9	2.2	1.9	1.3	1.1	0.96

[a] The values given are for plain annealed copper conductors. For tinned conductors reference should be made to BS 6360.
[b] For a non-preferred number of cores, the maximum resistance shall not be greater than that of the next lowest preferred number of cores.

Table H.4 — Maximum resistance of conductor and armour for single-core cables having solid aluminium conductors and aluminium strip armour

Nominal cross-sectional area of conductor	Maximum resistance per km of cable at 20 °C	
	Aluminium conductor	Strip armour
mm²	Ω	Ω
Circular solid conductor (class 1)		
50	0.641	1.8
70	0.443	1.6
95	0.320	1.4
120	0.253	1.2
150	0.206	1.1
185	0.164	0.57
240	0.125	0.51
300	0.100	0.46
Circular sectoral conductor		
380	0.080 0	0.29
480	0.063 3	0.27
600	0.051 5	0.24
740	0.041 0	0.22
960	0.031 3	0.15
1 200	0.025 0	0.14

Table H.5 — Maximum resistance of conductor and armour for two-, three- and four-core cables having solid aluminium conductors and aluminium strip armour

Nominal cross-sectional area of conductor	Maximum resistance per km of cable at 20 °C			
	Aluminium conductor	Strip armour		
		Two-core	Three-core	Four-core
		600/1 000 V	600/1 000 V	600/1 000 V
mm^2	Ω	Ω	Ω	Ω
16	1.91	1.5	1.4	1.2
25	1.2	1.6	1.3	1.2
35	0.868	1.4	1.2	1.1
50	0.641	1.2	0.57	0.51
70	0.443	0.60	0.51	0.44
95	0.320	0.54	0.31	0.28
120	0.253	—	0.29	0.25
150	0.206	—	0.27	0.23
185	0.164	—	0.24	0.16
240	0.125	—	0.16	0.14
300	0.100	—	0.15	0.13

Annex J
Spare

Annex K (normative)
Voltage test on completed cables

Apply the test voltage, having an r.m.s. value in accordance with Table K.1, between the conductors and between each conductor and the armour, which shall be earthed. Perform the test at room temperature, increasing the voltage gradually and maintaining it at the full value specified for 5 min.

Alternatively, for 600/1 000 V auxiliary cables, a voltage of 5 kV a.c. may be applied for 1 min between each conductor and the remaining conductors connected to the armour and earthed.

For three-core 1 900/3 300 V cables, the test shall either be made as a three phase test or as a single-phase test, at the discretion of the manufacturer.

The conductors of multicore auxiliary cables may be suitably connected for successive application of the test voltage to limit the total testing time provided that the sequence of connections ensures that the voltage is applied, for the time given, between each conductor and each other conductor, and between each conductor and the armour, which shall be earthed.

Table K.1 — Test voltage on completed cable

Voltage designation	Alternating test voltage (r.m.s.)	
	Between conductors	Between each conductor and armour
V	V	V
600/1 000	3 500	3 500
1 900/3 300	11 250	6 500

Annex L (normative)
Insulation resistance test

After completion of the voltage test given in **16.3**, apply a minimum voltage of 500 V d.c. for 1 min and measure the insulation resistance between each conductor and the remaining conductors connected to the armour.

NOTE For auxiliary cables, the cores may be connected in groups so that the insulation of each conductor is proved with respect to all the others.

Annex M (normative)
Compatibility test

M.1 General

This test is intended to demonstrate that the insulation and oversheath are not likely to deteriorate due to contact with the other components in the cable.

M.2 Test method

Age the sample for 7 days at (80 ± 2) °C in an air oven in accordance with **8.1.4** of BS EN 60811-1-2.

Place a sheet of clean white blotting paper under each test piece in the oven to detect any exudation which may drip from the cable.

After completion of the ageing test, the tensile strength and the elongation at break for insulation and sheath shall be measured in accordance with BS EN 60811-1-1.

Annex N (informative)
Gross cross-sectional area of armour

Table N.1, Table N.2, Table N.3 and Table N.4 contain gross cross-sectional areas of armour for use in calculating the maximum fault current permissible for conformity to Chapter 54 of BS 7671.

Table N.1 — Gross cross-sectional area of armour wires for single-core 600/1 000 V cables having aluminium wire armour

Nominal cross-sectional area of conductor	Gross cross-sectional area of armour wires	
	Cables with stranded copper conductors	Cables with solid aluminium conductors
mm^2	mm^2	mm^2
50	39	35
70	44	40
95	50	45
120	72	66
150	80	72
185	88	78
240	98	88
300	108	96
400	153	—
500	169	—
630	185	—
800	260	—
1 000	289	—
Circular sectoral conductor		
380	—	138
480	—	150
600	—	163
740	—	225
960	—	255
1 200	—	279

A1

Table N.2 — Gross cross-sectional area of armour wires for two-, three-, four- and five-core 600/1 000 V cables having steel wire armour

Nominal cross-sectional area of conductor	Gross cross-sectional area of armour wires						
	Cables with stranded copper conductors				Cables with solid aluminium conductors		
	Two-core	Three-core	Four-core	Five-core	Two-core	Three-core	Four-core
mm^2	mm^2	mm^2	mm^2	mm^2	mm^2	mm^2	mm^2
1.5	15	16	17	19	—	—	—
2.5	17	19	20	22	—	—	—
4	20	22	34	38	—	—	—
6	22	34	38	41	—	—	—
10	40	42	46	68	—	—	—
16	46	50	72	78	42	46	66
25	60	66	76	94	54	62	70
35	66	74	84	106	58	68	78
50	74	84	122	153	66	78	113
70	84	119	138	175	74	113	128
95	122	138	160	—	109	128	147
120	131	150	220	—	—	138	201
150	144	211	240	—	—	191	220
185	201	230	265	—	—	215	245
240	225	260	299	—	—	240	274
300	250	289	333	—	—	265	304
400	279	319	467	—	—	—	—

A1

Table N.3 — Gross cross-sectional area of armour wires for 600/1 000 V auxiliary cables with copper conductors having steel wire armour

Nominal cross-sectional area of conductor	Gross cross-sectional area of armour wires					
	Number of cores					
	7	12	19	27	37	48
mm^2	mm^2	mm^2	mm^2	mm^2	mm^2	mm^2
1.5	20	39	45	70	78	90
2.5	34	45	70	84	92	138
4	40	72	84	128	144	163

NOTE For a non-preferred number of cores, the gross cross-sectional area of armour will be at least equal to that of the next lowest preferred number of cores.

Table N.4 — Gross cross-sectional area of aluminium strip armour for single-, two-, three- and four-core 600/1 000 V cables with solid aluminium conductors

Nominal cross-sectional area of conductor	Gross cross-sectional area of aluminium strip armour with solid aluminium conductors			
	Single-core	Two-core	Three-core	Four-core
mm^2	mm^2	mm^2	mm^2	mm^2
16	—	23	26	29
25	—	22	27	30
35	—	24	30	34
50	19	29	60	67
70	22	56	67	78
95	26	63	110	123
120	29	—	117	136
150	31	—	130	149
185	60	—	143	214
240	67	—	214	248
300	74	—	237	271
Circular sectoral conductors				
380	117	—	—	—
480	130	—	—	—
600	143	—	—	—
740	156	—	—	—
960	226	—	—	—
1 200	248	—	—	—

Annex P (informative)
Notes on type tests

P.1 General

Type tests, after they have been completed, need not be repeated unless changes have been made that affect conformity to the test requirements. This means that type tests should not normally be required on cables for individual contracts provided that such type tests have already been successfully performed by the manufacturer.

Subclauses **P.2**, **P.3** and **P.4** give guidance as to the amount of type testing that may reasonably be required.

P.2 Sample selection for type tests

Table 2 indicates which tests relate to complete cable and which relate to components.

Type tests for components may be performed on any one cable sample.

NOTE The results of these type tests are not determined by the cable size or construction.

For the type tests on finished cable, conformity to the requirements can be confirmed for the complete range of cables in this standard by selecting samples for test as follows:

any one sample of cable having copper conductor(s); plus

any one sample of cable having solid aluminium conductor(s).

In addition, where manufacturers wish to demonstrate conformity to this standard, the cable samples should be subjected to full dimensional checks and to all other sample (S) and routine (R) tests given in Table 2.

P.3 Type tests

P.3.1 *Compatibility test (see 18.2)*

One test should be carried out on each size of cable selected.

P.4 Change of material

The tests referred to in **P.3** assume that the materials are consistent throughout the range of cables for which conformity is to be confirmed. Where a change occurs, it is necessary to include additional testing to ensure that such changes are adequately examined

P.5 Evidence of type testing

A certificate of type test signed by the representative of a competent witnessing body, or a properly authorized report by the manufacturer giving the test results, should be acceptable as evidence of type testing.

When evidence of type testing is required, this should be stated at the enquiry stage. Because of the possible variations in cable designs, it should not be assumed that full type test information will be available for the size and type of cable of a particular enquiry.

Annex Q (informative)
Guide to use

Q.1 Aim

The aim of this appendix is to inform users of characteristics and limitations of electric cables and thereby to minimize their misuse.

It is assumed that the design of installations and the specification, purchase and installation of cables specified in this British Standard is entrusted to suitably skilled and competent people.

In cases of doubt as to the suitability of cables in this British Standard for a particular use, further specific information should be obtained from the manufacturer.

Q.2 Cable selection and design

Q.2.1 The products specified in this British Standard are intended to be used for the supply of electrical energy up to the rated voltage indicated on the cable. **A.2** classifies the voltage ratings of cables manufactured to this specification. These ratings should not be exceeded.

Q.2.2 These cables are intended for use within a nominal power frequency range of 49 Hz to 61 Hz.

Q.2.3 In addition to the current ratings, due regard should be given to:

a) the capability of the cable to withstand the worst anticipated fault condition of the system;

b) the earth loop impedance;

c) the operating characteristics of the connected equipment;

d) the voltage drop requirements during normal load or motor starting conditions.

Q.2.4 The possible effects of transient over-voltages should be recognized as they can be detrimental to cables.

[A1] *Text deleted* [A1]

Q.3 Environment and application

Q.3.1 Reasonable protection against mechanical damage, appropriate to the choice of cable and the installation conditions, should be provided.

Q.3.2 Cables specified in this British Standard contain PVC, and when exposed to the effects of external fire will produce harmful smoke and fumes, and where bundled together may propagate fire. When circumstances dictate, consideration should be given to the use of cables manufactured in accordance with BS 6724.

Q.3.3 Cables may be harmed by exposure to corrosive products or solvent substances, especially petroleum based chemicals or their vapours.

Q.3.4 Special precautions are required when cables are to be installed in areas classified as hazardous and reference should be made to [A1] BS EN 60079-14 [A1].

Q.3.5 Cables specified in this British Standard are not specifically designed for use:

a) as self-supporting aerial cables;

b) as submarine cable or for laying in water-logged conditions;

c) where subsidence is likely, unless special precautions are taken to minimize damage;

d) where any exposure to excessive heat is involved;

e) where the oversheath is subjected to a voltage test after installation.

Q.3.6 If cables in accordance with this specification are exposed to localized heat, solar radiation or high temperature ambient conditions, or there is a possibility of higher soil resistivity, the current carrying capacity will be reduced.

Q.3.7 The standard sheathing compounds supplied on these cables do not provide protection against damage by rodents, termites etc.

Q.3.8 Loaded cables may have surface temperatures which require protection against accidental contact.

Q.4 Installation

Q.4.1 Precautions should be taken to avoid mechanical damage to the cables before and during installation.

Q.4.2 Exceeding the manufacturer's recommended maximum pulling tensions may result in damage to the cable.

Q.4.3 If cables are to be installed in ducts, the correct size of duct should be used. Reference should be made to ERA Publication 69-30, Part III.

Q.4.4 The type of jointing and filling compounds employed should be chemically compatible with the cable materials.

Q.4.5 The cable support system should be such as to avoid damage or danger under normal or fault conditions.

Q.4.6 Cables specified in this British Standard are designed for fixed installations only; e.g. they are not for use as trailing or reeling cables.

Q.4.7 Repeated over-voltage testing can lead to premature failure of the cable.

Q.4.8 The selection of cable glands, accessories and any associated tools should take account of all aspects of intended use.

Q.5 Storage and handling of drums

Q.5.1 Cable drums should be regularly inspected during storage to assess their physical condition.

Q.5.2 Battens, where applied, should not be removed from drums until the cable is about to be installed.

Q.5.3 When handling drums reasonable precautions should be taken to avoid injury. Due regard should be paid to the weight, method and direction of rolling, lifting, protruding nails and splinters.

Q.5.4 Care should be taken to avoid deterioration of drums or their becoming a hazard to the general public.

Q.5.5 A detailed guide to the safe handling of cable drums is available from the cable manufacturer.

Q.6 Scrap cable — incineration

Incineration of scrap cable should only be undertaken by a licensed contractor. For further information, the Environment Agency should be contacted.

Bibliography

Standards publications

[A1⟩ *Text deleted* ⟨A1]

BS 5467:1997, [A1⟩ *Electric cables — Thermosetting insulated, unarmoured cables for a voltage of 600/1 000 V and 1 900/3 300 V.* ⟨A1]

BS 6469-99.1:1992, *Insulating and sheathing materials for electric cables — Part 99: Test methods used in the United Kingdom but not specified in Parts 1 to 5 — Section 99.1: Non-electrical tests.*

BS 6724:1997, [A1⟩ *Electric cables — Thermosetting insulated, armoured cables for voltages of 600/1 000 V and 1 900/3 300 V.* ⟨A1]

BS 7671:1992, *Requirements for electrical installations — IEE Wiring Regulations. Sixteenth edition.*

BS 7889:1997, [A1⟩ *Electric cables — Thermosetting insulated, unarmoured cables for a voltage of 600/1 000 V.* ⟨A1]

[A1⟩ BS EN 60079-14, *Electric apparatus for explosive gas atmospheres — Part 14: Electrical installations in hazardous areas (other than mines).*

HD 308 S2, *Identification of cores in cables and flexible cords.* ⟨A1]

IEC 60183:1984, *Guide to the selection of high-voltage cables.*

Other publications

ERA Publication 69-30, Part III, *Sustained current ratings for PVC insulated cables.*[1)]

[1)] Obtainable from ERA Technology Ltd., Cleeve Road, Leatherhead, Surrey KT22 7SA.

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