

Australian/New Zealand Standard™

**Electric cables— Cross-linked
polyethylene insulated— Aerial
bundled— For working voltages
up to and including 0.6/1(1.2) kV**

Part 1: Aluminium conductors



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AS/NZS 3560.1:2000

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee EL/3, Electric Wires and Cables. It was approved on behalf of the Council of Standards Australia on 31 January 2000 and on behalf of the Council of Standards New Zealand on 25 February 2000. It was published on 7 April 2000.

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Australian Electrical and Electronic Manufacturers Association
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Electrical Contractors Association of New Zealand
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This Standard was issued in draft form for comment as DR 97545.

Australian/New Zealand Standard™

Electric cables— Cross-linked polyethylene insulated— Aerial bundled— For working voltages up to and including 0.6/1(1.2) kV

Part 1: Aluminium conductors

Originated as AS 3560—1988.
Previous edition AS 3560—1991.
Jointly revised and redesignated as AS/NZS 3560.1:2000.

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Jointly published by Standards Australia International Ltd, PO Box 1055, Strathfield, NSW 2135 and Standards New Zealand, Private Bag 2439, Wellington 6020

ISBN 0 7337 3291 7

PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee EL/3, Electric Wires and Cables, and is based on a draft Standard prepared by representatives from the Electricity Supply Association of Australia and Australian cable manufacturers. It supersedes AS 3560—1991 and NZS/AS 3560—1991, *Electric cables—XLPE insulated—Aerial bundled—For working voltages up to and including 0.6/1 kV*.

The objective of this Standard is to specify construction, dimensions and tests for 0.6/1 kV rated cross-linked polyethylene insulated aerial bundled cables.

This revised Standard differs from the superseded Standard in the following significant ways:

- (a) Marking of cores has been changed.
- (b) The high voltage test has been increased to 3.75 kV.
- (c) Appendix B has been modified and the adhesion slip criteria increased to 3 mm.
- (d) X-FP-90 insulation has been deleted.
- (e) Table 2.2 has been deleted.
- (f) Tests on insulation reference AS/NZS 3808 instead of specifying tests separately.
- (g) An optional heat radiation test has been included.

The terms 'normative' and 'informative' have been used in this Standard to define the application of the appendix to which they apply. A 'normative' appendix is an integral part of a Standard, whereas an 'informative' appendix is only for information and guidance.

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SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard specifies the construction, dimensions and tests for 0.6/1 kV rated cross-linked polyethylene insulated aerial bundled cables (ABC) of 2, 3 or 4 cores having aluminium conductors with cross-sectional areas of 16 mm² to 150 mm².

The cables are designed for use with mechanical fittings for aerial bundled cables specified in AS 3766.

Cable construction, identification and preparation for delivery requirements are specified in Section 2 and tests in Section 3.

NOTES:

- 1 See Appendix A for guidelines on information that should be supplied with enquiries or orders.
- 2 See Appendix E for technical data on cables and a guide to cable selection.

1.2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS	
1125	Conductors in insulated electric cables and flexible cords
2193	Methods for calibrating and grading of force-measuring systems of testing machines
2706	Numerical values—Rounding and interpretation of limiting values
3766	Mechanical fittings for low voltage aerial bundled cables
3983	Metal drums for insulated electric cables and bare conductors
AS/NZS	
1660	Test methods for electric cables, cords and conductors (all parts)
2857	Timber drums for insulated electric cables and bare conductors
3008	Electrical installations—Selection of cables
3008.1.1	Part 1.1: Cables for alternating voltages up to and including 0.6/1 kV— Typical Australian installation conditions
3008.1.2	Part 1.2: Cables for alternating voltages up to and including 0.6/1 kV— Typical New Zealand installation conditions
3100	Approval and test specification—General requirements for electrical equipment
3808	Insulating and sheathing materials for electric cables

1.3 DEFINITIONS

For the purpose of this Standard, the relevant definitions given in the referenced Standards and those below apply.

1.3.1 Core (of a cable)

A conductor with its insulation.

1.3.2 Voltage designation

For cables for a.c. systems, the rated voltages U_o and U expressed in the form $U_o/U(U_m)$; or for cables for d.c. systems, the rated voltage U_o where —

U_o is the r.m.s. power frequency voltage to earth of the supply system for which the cable is designed.

U is the r.m.s. power frequency voltage between phases of the supply system for which the cable is designed.

U_m is the maximum r.m.s. power frequency voltage between any two conductors for which cables and accessories are designed. It is the highest voltage that can be sustained under normal operating conditions at any time and at any point in a system. It excludes temporary voltage variations due to fault conditions and sudden disconnection of large loads.

1.3.3 Direction of lay

The direction of lay is defined as right hand or left hand, as follows:

- (a) *Right-hand lay*—when the slope of the cores or wires is in the direction of the central part of the letter Z when the cable or conductor is held vertically.
- (b) *Left-hand lay*—when the slope of the cores or wires is in the direction of the central part of the letter S when the cable or conductor is held vertically.

1.3.4 Length of lay (of the cores)

The axial distance between successive turns of the helix formed by a core of a bundled cable.

1.3.5 Routine tests

Tests made by the manufacturer on all cores and all production lengths of completed cable to demonstrate the integrity of the cable.

1.3.6 Sample tests

Tests made by the manufacturer on samples of completed cables or components taken from completed cables, at a specified frequency, so as to verify that the finished product meets this Standard.

NOTE: See Appendix A.

1.3.7 Type tests

Tests made by the manufacturer before supplying, on a general commercial basis, a type of cable covered by this Standard 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 materials, manufacturing method or design which might change the performance characteristics.

1.3.8 Adhesion

Resistance to relative axial movement between a conductor and its insulation.

SECTION 2 CONSTRUCTION

2.1 CONDUCTORS

The conductors shall be stranded compacted circular aluminium, complying with the requirements of Table 2.1. The wires used in the make-up of the conductors shall be alloy 1350 in accordance with AS 1125.

Successive layers of wires in multilayer conductors shall alternate in the direction of lay. The outermost layer of wires in all conductors shall be in right-hand direction of lay.

2.2 CONDUCTOR OPERATING TEMPERATURE

The cable is designed for a maximum continuous conductor operating temperature of 80°C, which is based on consideration of the performance of the fittings and strength of the conductors.

2.3 INSULATION

The insulation shall meet the requirements of X-90 cross-linked polyethylene material complying with AS/NZS 3808.

It shall be homogeneous, applied with a close fit, but being readily removable from the conductor and meeting the requirements of Table 2.1 and Section 3.

The use of a separator tape under the insulation (on conductor) is optional. Where used, it shall be non-hygroscopic, as defined in AS/NZS 3100, and shall be coloured or opaque if it does not adhere to the insulation.

2.4 IDENTIFICATION OF CORES

2.4.1 General

The cores shall be identified by continuous, longitudinal raised ribs as detailed in Clause 2.4.2 and Figure 1.

In addition, active cores shall be identified by the numerals and letters '1 ONE', '2 TWO', '3 THREE' printed along the core, the numeral matching the number of ribs on the core.

With normal or corrected vision the marking shall be legible from a distance of 1 m and shall remain legible after exposure to sunlight for a period of 12 months.

2.4.2 Rib details

The ribs on all cores shall be of uniform profile, within the dimensional constraints specified in Figure 1.

The neutral core (incorporated in all cables) shall have a series of approximately evenly spaced ribs around the circumference and the number of ribs shall be as specified in Figure 1.

The active cores shall have ribs as follows:

- (a) Two-core cable—one rib.
- (b) Three-core cable—one core with one rib and the other with two.
- (c) Four-core cable—one core with one rib, another with two and the third with three ribs.

2.4.3 Active core numbering details

The height of the numbers shall be not less than 3 mm for conductors up to and including 35 mm² nominal cross-sectional area and not less than 5 mm for cables with larger conductors, and the space between numbers shall not exceed 100 mm. The numerals shall be offset to the identification ribs, but may occasionally cross them.

2.5 METRE MARKING OF CABLE

One active core in each cable length shall be sequentially marked, numerically, at 1 m intervals. The metre marking shall be limited to six digits and any drum length may start at any integral number.

The cable shall be wound on the drum with the lowest number at the drum barrel (cable inner) end (see also Clause 2.10(d)).

NOTE: The metre marking, although adequate for establishing the approximate length of cable left on the drum following earlier use (cutting) of part of the drum length, should not be relied on for establishing the precise length left.

2.6 LAY-UP OF CORES

The cores shall be laid up with a left-hand direction of lay. The sequence of cores for four-core cable shall be neutral, 1, 2, 3.

The length of lay of the cores shall be not less than 22 times, nor more than 28 times the calculated maximum diameter of a circumscribing circle over the laid-up cores.

NOTE: See Tables E1 and E2 of Appendix E.

2.7 ADDITIONAL CORES

Although the inclusion of pilot and auxiliary cores in the construction of cables is not specifically covered by this Standard, pilot and auxiliary cores may be included in the cable as agreed between the supplier and the purchaser but due account should be taken of the mechanical and electrical characteristics.

2.8 MANUFACTURER'S IDENTIFICATION

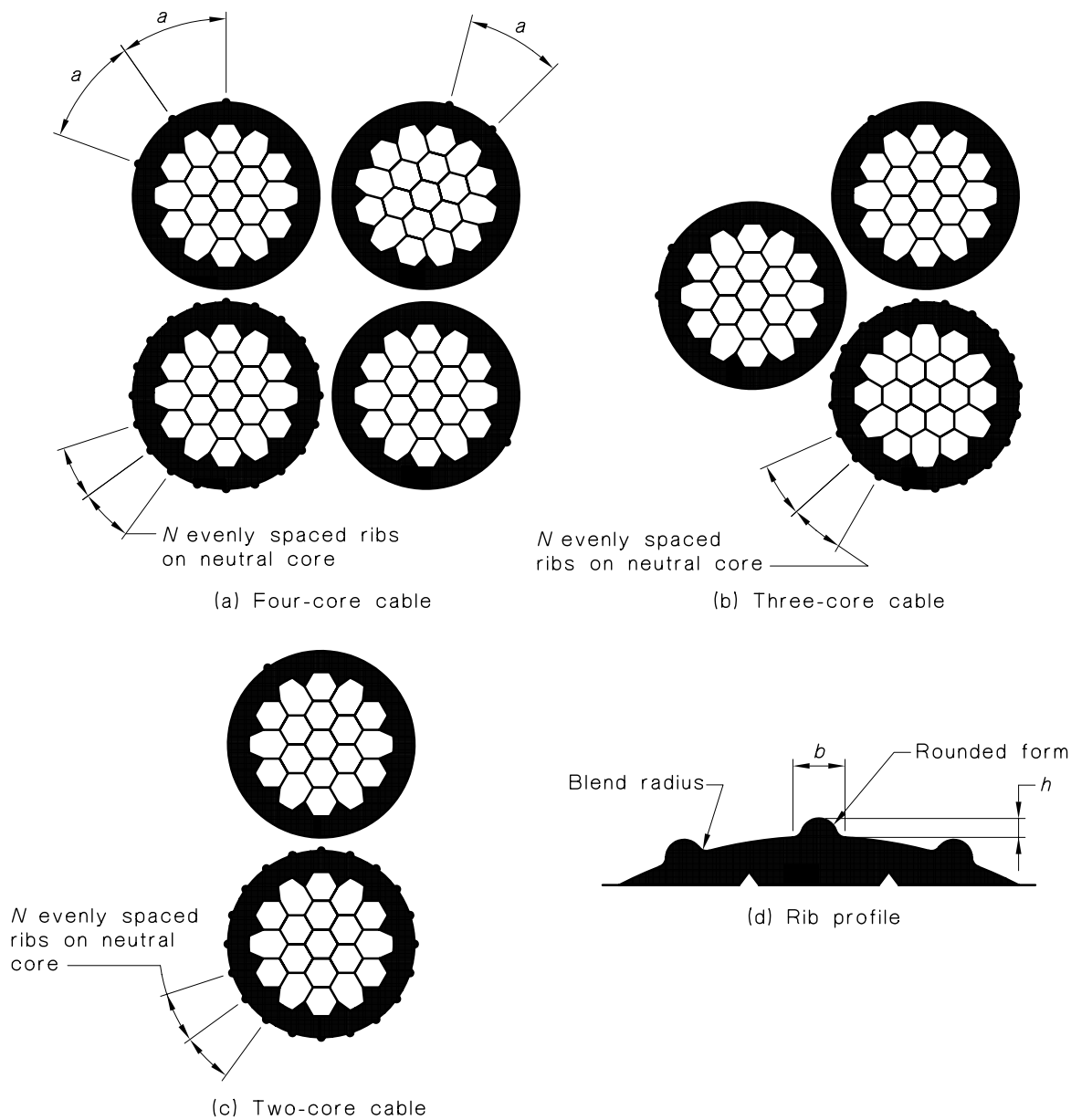
Identification shall consist only of a laminated polyethylene terephthalate tape laid over the conductor in active core 1 throughout the length of the core. The tape shall be legibly marked with the manufacturer's name or registered trade name or mark and the year of manufacture, at intervals not greater than 100 mm. An interval shall be the distance between the end of one block of marking and the beginning of the next.

No information specific to a purchaser shall be provided in or on the cable.

2.9 DRUMS

The cable shall be supplied on timber drums in accordance with AS/NZS 2857 or steel drums in accordance with AS 3983.

Drums shall be suitable for use with round spindles and be suitable for outdoor storage.



	Base width (<i>b</i>) mm	Height (<i>h</i>) mm
Rib dimensions—active cores	1.0 ±0.2	0.5 ±0.1
Rib dimensions—neutral core	0.6 ±0.2	0.3 ±0.1

Spacing *a* —16 mm² to 35 mm² conductors —3 ±1 mm
—50 mm² to 150 mm² conductors —5 ±1 mm

Conductor size mm ²	16	25	35	50	70	95	120	150
No. of evenly spaced ribs on neutral core, <i>N</i>	10	12	14	16	18	20	22	24

FIGURE 1 RIB DETAILS