

Australian/New Zealand Standard™

Welding cables

AS/NZS 1995:2003

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee EL-003, Electric Wires and Cables. It was approved on behalf of the Council of Standards Australia on 25 August 2003 and on behalf of the Council of Standards New Zealand on 19 August 2003. It was published on 9 October 2003.

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RECONFIRMATION

OF
AS/NZS 1995:2003
Welding cables

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NOTES

Australian/New Zealand Standard™

Welding cables

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee EL-003, Electric Wires and Cables to supersede AS/NZS 1995:1995.

The objective of this Standard is to specify the construction, tests, current rating and duty cycle of welding cables.

The nominal cross-sectional areas of the conductors specified herein are identical with those specified in AS/NZS 1125, *Conductors in insulated electric cables and flexible cords*.

The range of copper conductors and maximum wire diameters is similar to that given in BS 638, *Arc welding power sources, equipment and accessories, Part 4: Specification for welding cables*, except that a 240 mm² size has been added.

Current ratings have been allocated with respect to a standard duty cycle in accordance with AS 1966, *Electric arc welding power sources*. Thus a cable may have four ratings which relate to duty cycles of 100, 60, 30 and 25 percent.

Acknowledgment is made of the assistance received from BS 638 and IEC 60245-6, *Rubber insulated cables—Rated voltages up to and including 450/750 V—Part 6: Arc welding electrode cables*.

This Standard differs from the 1995 edition as follows:

- (a) Current ratings have been provided for 30-second, 5-minute and 10-minute period duty cycles.
- (b) A definition for 100 percent duty cycle has been included.
- (c) Reference to voltage ratings has been deleted.
- (d) Compliance of conductors has been changed.
- (e) Covering materials have been referenced to AS/NZS 3808.
- (f) Compliance of any inner layer of covering has been changed to an insulation material selected from AS/NZS 3808 with a maximum continuous operating temperature of 90°C or higher.
- (g) A compatibility test has been introduced where two covering layers are applied.

The term 'informative' has been used in this Standard to define the application of the appendix to which it applies. An 'informative' appendix is only for information and guidance.

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STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard
Welding cables

1 SCOPE

This Standard applies to flexible cables for use with electric arc welding equipment rated in accordance with AS 1966 and AS/NZS 3195.

Current ratings are assigned for a range of operating duty cycles for each cable size. Selection of the cable should be made in accordance with the anticipated duty cycle.

NOTES:

- 1 Purchasing guidelines are given in Appendix A.
- 2 Current ratings are given in Tables B1, B2 and B3.

2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

1966 Electric arc welding power sources (all Parts)

AS/NZS

1125 Conductors in insulated electric cables and flexible cords

1660 Test methods for electric cables, cords and conductors

1660.1 Method 1: Conductors and metallic components

1660.2.1 Method 2.1: Insulation, extruded semi-conductive screens and non-metallic sheaths—Methods for general application

1660.2.2 Method 2.2: Insulation, extruded semi-conductive screens and non-metallic sheaths—Methods specific to elastomeric, XLPE and XLPVC materials

1660.3 Method 3: Electrical tests

1660.5.6 Method 5.6: Fire tests—Test for combustion propagation

3195 Approval and test specifications—Portable machines for electric arc welding and allied processes

3808 Insulating and sheathing materials for electric cables

BS

638 Arc welding power sources, equipment and accessories

638-4 Part 4: Specification for welding cable

3 DEFINITIONS

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

3.1 Duty cycle

For less than 100 percent duty cycle, the ratio of the total arc time to the duty cycle period, expressed as a percentage.

For 100 percent duty cycle, the equipment is operated continuously for one hour then switched off.

3.2 Routine tests

Tests made by the manufacturer on each manufactured length of cable to check that each length meets the specified requirements.

3.3 Sample tests

Tests made by the manufacturer on samples of completed cable, or components taken from completed cable, so as to verify that the finished product meets the design specification.

3.4 Type tests

Tests made before supplying, on a general commercial basis, a type of cable covered by this Standard, to demonstrate satisfactory performance characteristics that 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 or design which might change the performance characteristics.

4 CONDUCTORS

The conductors shall comply with the relevant requirements of AS/NZS 1125 for Class 6 conductors except as modified in Table 1.

The wires may be plain or tinned. However, tinned wires taken from a completed cable need not pass the continuity test for tin plating in AS/NZS 1660.1.

TABLE 1
DIMENSIONAL REQUIREMENTS

| 1 | 2 | 3 |
|---|---------------------------|----------------------------|
| Nominal cross-sectional area of conductor | Maximum diameter of wires | Covering thickness |
| mm ² | mm | <i>t_c</i> mm |
| 10 | 0.21 | 2.0 |
| 16 | 0.21 | 2.0 |
| 25 | 0.21 | 2.0 |
| 35 | 0.21 | 2.0 |
| 50 | 0.31 | 2.2 |
| 70 | 0.31 | 2.4 |
| 95 | 0.31 | 2.6 |
| 120 | 0.51 | 2.8 |
| 150 | 0.51 | 3.0 |
| 185 | 0.51 | 3.2 |
| 240 | 0.51 | 3.4 |

5 COVERING

5.1 Application

The covering shall be applied with a close fit and shall not adhere to the conductor. A separator tape may be used over the conductor. The covering may be applied in one or two layers.

5.2 Material

The outer layer shall comply with the requirements of R-CSP-90, R-CPE-90, V-90, V-90HT or TP-90, in accordance with AS/NZS 3808. Any inner layer shall be an insulating material selected from AS/NZS 3808 with a maximum continuous operating temperature of 90°C or higher.

Where two layers are applied the compatibility test in Table 2 shall be carried out.

5.3 Thickness

The average thickness of the covering or combined thickness of the two layers, determined by the method described in AS/NZS 1660.2.1, shall be not less than the thickness specified (t_c) in Table 1, and the minimum thickness at any point shall not fall below the specified thickness by more than 15 percent of the specified thickness plus 0.10 mm, i.e.

$$\text{minimum thickness} = (0.85 t_c - 0.10 \text{ mm})$$

Where the covering is a combination of layers, the average thickness of the outer layer shall be not less than 1.0 mm.

6 MARKING

6.1 Information to be marked

Cables shall be marked with a registered name or registered mark, which enables the manufacturer or supplier of the cable to be identified.

6.2 Means of marking

Marking shall be legible and durable and in accordance with either Items (a) or (b) as follows:

(a) Marking on covering

The marking shall consist of printing, embossing or indenting on the covering. The distance between the end of one block of marking and the beginning of the next shall not exceed 1 m.

(b) Marking on a tape

The marking shall consist of printing on a tape which is included throughout the length of the cable. The distance between the end of one block of marking and the beginning of the next shall not exceed 200 mm.

6.3 Marking of packaging

Every packaging unit of cable shall have the following information indicated by means of an attached tag or label, or by marking directly on the unit:

- (a) A registered name or registered mark which enables the manufacturer or supplier of the cable to be identified.
- (b) The size of the conductor.
- (c) Designation of outer covering.
- (d) The catalogue number or type number or other marking distinguishing the cable.
- (e) Length of cable in metres.

NOTE: Manufacturers making a statement of compliance with this Australian/New Zealand Standard on a product, packaging, or promotional material related to that product are advised to ensure that such compliance is capable of being verified.

7 TESTS

Cables shall comply with the tests specified in Table 2.

TABLE 2
TESTS ON CABLE — PASS CRITERIA, CATEGORY AND REFERENCE

| 1 | 2 | 3 | 4 | 5 |
|-------------|---|--|------------------|---------------------------|
| Test number | Test | Pass criteria | Category of test | Reference for test method |
| 1 | All tests, with the exception of continuity for tin plating, on conductors taken from a completed cable | As specified in AS/NZS 1125 for the relevant conductor | | |
| 2 | All tests on covering taken from a completed cable | As specified in AS/NZS 3808 for the relevant material designation | | |
| 3 | Measurement of covering thickness | The average and minimum thicknesses shall comply with Clause 5.3. | Sample* | AS/NZS 1660.2.1 |
| 4 | Spark test | No breakdown | Routine † | AS/NZS 1660.3 |
| 5 | High voltage test for 5 min | No breakdown | Sample | AS/NZS 1660.3 |
| 6 | Compatibility test after ageing in an air oven for covering layers Duration: 240 h Temperature: 100 ±2°C (1) Tensile strength, minimum, for each material (percentage of value found in the unaged specimen) (2) Elongation at rupture, minimum, for each material (percentage of value found in the unaged specimen) | 75% 65% | Type | AS/NZS 1660.2.2 |
| 7 | Combustion propagation test (see Notes 1 and 2) | The cable shall be self extinguishing. After all burning has ceased, the surface of the sample shall be wiped clean and the charred or affected portion shall not have reached within 50 mm of the lower edge of the top clamp. During the test, any falling particles shall not ignite the tissue paper underlay. | Type | AS/NZS 1660.5.6 |

* This test may be conducted during production or on completed cable.

† This test is carried out on the full length of cable during production.

(continued)

NOTES TO TABLE 2: (continued)

- 1 *Application to assessment of fire hazard* The test provides direct data as to the likelihood of a single electric cable igniting and transmitting fire when exposed to a specified external ignition source. Fire, however, is a complex phenomenon, and fire associated with a cable run is a function of the characteristics of the cable materials, the method of installation and the environment in which it is used. Consequently, no single test can give a full assessment of the fire hazard under all conditions of fire that may apply. There shall be a constant awareness of these interrelated factors and the effects of important variables in using this test to assess the fire hazard in any particular situation (e.g. in high vertical runs of bunches of cables). Special installation precautions may have to be taken as it cannot be assumed that a bunch of cables will behave in the same way as a single cable.
- 2 *Reporting of results* When reporting the results, the following cautionary note shall be added:
Individual items of this test report should not be quoted in isolation as proof of product acceptability nor applied to directly assess performance under conditions other than those envisaged by the reference specification, e.g. individual fire tests to prove an overall acceptable fire hazard level.

APPENDIX A
PURCHASING GUIDELINES
(Informative)

A1 GENERAL

Australian/New Zealand Standards are intended to include the technical requirements for relevant products, but do not purport to comprise all the necessary provisions of a contract. This Appendix contains advice and recommendations on the information to be supplied by the purchaser at the time of enquiry or order.

A2 INFORMATION TO BE SUPPLIED BY THE PURCHASER

The purchaser should supply the following information at the time of enquiry and order, after making due reference to the explanation, advice and recommendations contained in this Appendix:

- (a) The number of this Standard, i.e. AS/NZS 1995.
- (b) Length of cable and individual drum lengths required.
- (c) Conductor size, i.e. nominal cross-sectional area.
- (d) Whether the conductor is to be tinned.
- (e) Type of covering, e.g. R-CSP-90, TP-90.
- (f) Type of construction, e.g. single or dual covering.
- (g) Specific marking or colour.

APPENDIX B
CURRENT RATINGS

(Informative)

The current ratings of welding cables are given in Tables B1, B2 and B3 below.

TABLE B1
CURRENT RATINGS OF WELDING CABLES FOR
30-SECOND PERIOD DUTY CYCLE

| 1 | 2 | 3 | 4 | 5 |
|--|---|-----|------|------|
| Nominal cross-sectional area of conductor mm ² | Current rating A | | | |
| | Maximum duty cycle, percent (see Notes) | | | |
| | 100 | 60 | 30 | 25 |
| 10 | 90 | 120 | 165 | 180 |
| 16 | 125 | 160 | 225 | 245 |
| 25 | 165 | 210 | 300 | 330 |
| 35 | 205 | 265 | 375 | 410 |
| 50 | 260 | 335 | 475 | 520 |
| 70 | 325 | 415 | 590 | 645 |
| 95 | 390 | 505 | 715 | 780 |
| 120 | 455 | 585 | 830 | 910 |
| 150 | 535 | 690 | 975 | 1070 |
| 185 | 600 | 775 | 1095 | 1200 |
| 240 | 715 | 920 | 1305 | 1430 |

NOTES:

- 1 Table B1 contains the current ratings as originally specified in AS/NZS 1995:1995 but has now been changed to apply to 30-second duty cycles as the equation previously used applies only to short duty cycles.
- 2 The current ratings are based on a conductor temperature of 90°C and an ambient air temperature of 40°C.
- 3 The current ratings of the cables may be re-calculated based on different ambient conditions by multiplying the rating given in Table B1 by the factor given below.

| | | | | | | |
|--------|------|------|------|------|------|------|
| °C | 20 | 25 | 30 | 35 | 40 | 45 |
| Factor | 1.22 | 1.17 | 1.11 | 1.05 | 1.00 | 0.94 |

TABLE B2
CURRENT RATINGS OF WELDING CABLES FOR
5-MINUTE PERIOD DUTY CYCLE

| 1 | 2 | 3 | 4 | 5 |
|--|---|-----|------|------|
| Nominal cross-sectional area of conductor mm ² | Current rating A | | | |
| | Maximum duty cycle, percent (see Notes) | | | |
| | 100 | 60 | 30 | 25 |
| 10 | 90 | 96 | 114 | 121 |
| 16 | 125 | 137 | 169 | 181 |
| 25 | 165 | 188 | 239 | 257 |
| 35 | 205 | 238 | 309 | 334 |
| 50 | 260 | 308 | 407 | 440 |
| 70 | 325 | 391 | 523 | 567 |
| 95 | 390 | 476 | 644 | 700 |
| 120 | 455 | 559 | 762 | 829 |
| 150 | 535 | 661 | 904 | 985 |
| 185 | 600 | 747 | 1027 | 1120 |
| 240 | 715 | 895 | 1236 | 1348 |

NOTES:

- 1 The current ratings in Table B2 have been calculated based on BS 638-4.
- 2 The current ratings are based on a conductor temperature of 90°C and an ambient air temperature of 40°C.
- 3 The current ratings of the cables may be re-calculated based on different ambient conditions by multiplying the rating given in Table B2 by the factor given below.

| | | | | | | |
|--------|------|------|------|------|------|------|
| °C | 20 | 25 | 30 | 35 | 40 | 45 |
| Factor | 1.22 | 1.17 | 1.11 | 1.05 | 1.00 | 0.94 |

TABLE B3
CURRENT RATINGS OF WELDING CABLES FOR
10-MINUTE PERIOD DUTY CYCLE

| 1 | 2 | 3 | 4 | 5 |
|--|---|-----|------|------|
| Nominal cross-sectional area of conductor mm ² | Current rating A | | | |
| | Maximum duty cycle, percent (see Notes) | | | |
| | 100 | 60 | 30 | 25 |
| 10 | 90 | 91 | 99 | 102 |
| 16 | 125 | 129 | 145 | 151 |
| 25 | 165 | 175 | 206 | 218 |
| 35 | 205 | 223 | 270 | 288 |
| 50 | 260 | 289 | 361 | 386 |
| 70 | 325 | 370 | 471 | 507 |
| 95 | 390 | 454 | 590 | 637 |
| 120 | 455 | 536 | 705 | 763 |
| 150 | 535 | 636 | 843 | 914 |
| 185 | 600 | 723 | 968 | 1051 |
| 240 | 715 | 870 | 1174 | 1276 |

NOTES:

- 1 The current ratings in Table B3 have been calculated based on BS 638-4.
- 2 The current ratings are based on a conductor temperature of 90°C and an ambient air temperature of 40°C.
- 3 The current ratings of the cables may be re-calculated based on different ambient conditions by multiplying the rating given in Table B3 by the factor given below.

| | | | | | | |
|--------|------|------|------|------|------|------|
| °C | 20 | 25 | 30 | 35 | 40 | 45 |
| Factor | 1.22 | 1.17 | 1.11 | 1.05 | 1.00 | 0.94 |

NOTES

NOTES

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www.standards.com.au

www.standards.co.nz



GPO Box 5420 Sydney NSW 2001

Administration

Phone (02) 8206 6000

Fax (02) 8206 6001

Email mail@standards.com.au

Customer Service

Phone 1300 65 46 46

Fax 1300 65 49 49

Email sales@standards.com.au

Internet www.standards.com.au



Level 10 Radio New Zealand House

155 The Terrace Wellington 6001

(Private Bag 2439 Wellington 6020)

Phone (04) 498 5990

Fax (04) 498 5994

Customer Services (04) 498 5991

Information Service (04) 498 5992

Email snz@standards.co.nz

Internet www.standards.co.nz

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