

Australian/New Zealand Standard™

Insulating and sheathing materials for electric cables



AS/NZS 3808:2000

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Australian Electrical and Electronic Manufacturers Association
Australian Industry Group
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Department of Mineral Resources, N.S.W.
Electrical Contractors Association of New Zealand
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Australian/New Zealand Standard™

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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 3808:1998, Insulating and sheathing materials for electric cables.

This Standard incorporates Amendment No. 1 (July 2002) and Amendment No. 2 (August 2004). The changes required by the Amendments are indicated in the text by a marginal bar and amendment number against the clause, note, table, figure or part thereof affected.

The objective of the Standard is to provide manufacturers and suppliers with specifications for compounds and tests, referenced in particular Standards, for insulating and sheathing materials used in the construction of electric cables and flexible cords.

This Standard does not supersede insulating and sheathing material requirements in existing cable Standards but will apply when referenced in future editions of cable Standards.

This Standard differs from the superseded Standard as follows:

- (a) The definition of materials used in reduced fire hazard cables has been modified.
- (b) X-FP-90 insulation has been deleted.
- (c) The median loss of mass criteria for PVC materials after ageing in an air oven has been increased.
- (d) The minimum oxygen concentration test for insulation materials used in reduced fire hazard cables has been deleted.

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.

Statements expressed in mandatory terms in notes to tables and figures are deemed to be requirements of this Standard.

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Australian/New Zealand Standard
Insulating and sheathing materials for electric cables

1 SCOPE

This Standard specifies the tests and criteria for elastomeric, PVC, reduced fire hazard and polyolefin insulating and sheathing materials used in the construction of electric cables and flexible cords and referenced in Australian and Australian/New Zealand Standards. It applies to electric cables and cords designed for working voltages up to and including 76/132(145) kV. This Standard does not cover tests that can only be conducted on completed cables, e.g. partial discharge, $\tan \delta$, impulse, high voltage, shrinkage and adhesion tests.

The requirements of this Standard only apply when referenced in other relevant Standards. This Standard does not supersede requirements in existing Standards.

NOTE: Insulating and sheathing materials in other relevant Standards are listed in Table A1 of Appendix A.

2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

1026	Electric cables—Impregnated paper insulated—Working voltages up to and including 33 kV
1049	Telecommunication cables—Insulation, sheath and jacket
1178	Concentric wire neutral cables—XLPE insulated—For electricity supply at working voltages of 0.6/1 kV
1429	Electric cables—Polymeric insulated
1429.1	Part 1: For working voltages 1.9/3.3(3.6) kV up to and including 19/33(36) kV
1747	Reeling, trailing and feeder cables used for mining—Repair and testing
1979	Electric cables—Lifts—Flexible travelling
2276	Cables for traffic signal installations
2276.1	Part 1: Multicore power cables
2276.3	Part 3: Loop cable for vehicle detectors
2802	Electric cables—Reeling and trailing—For mining and general use (other than underground coal mining)
3158	Approval and test specification—Electric cables—Glass fibre insulated for working voltages up to and including 0.6/1 kV
3178	Approval and test specification—Electric cables—Silicone rubber insulated—For working voltages up to and including 0.6/1 kV

AS

- 3599 Electric cables—Aerial bundled—Polymeric insulated—Voltages 6.35/11(12) kV and 12.7/22(24) kV
- 3599.1 Part 1 Metallic screened
- 3675 Conductors—Covered overhead—For working voltages 6.35/11 kV up to and including 19/33 kV
- 4026 Electric cables—For underground residential distribution systems

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- 1429 Electric cables—Polymeric insulated
- 1429.2 Part 2: For working voltages above 19/33(36) kV up to and including 76/132(145) kV
- 1660 Test methods for electric cables, cords and conductors
- 1802 Electric cables—Reeling and trailing—For underground coal mining purposes
- 1972 Electric cables—Underground coal mines—Other than reeling and trailing
- 1995 Welding cables
- 2276 Cables for traffic signal installations
- 2276.2 Part 2: Feeder cable for vehicle detectors
- 2373 Electric cables for control and protection circuits
- 2273.1 Part 1: Multicore control cables
- 2273.2 Part 2: Twisted pair control cables
- 3008 Electrical installations—Selection of cables
- 3008.1 Cables for alternating voltages up to and including 0.6/1 kV (both parts)
- 3155 Approval and test specification—Electric cables—Neutral screened—For working voltages up to and including 0.6/1 kV
- 3166 Approval and test specification—Cables for high voltage luminous discharge tube installations
- 3187 Approval and test specification—Mineral-insulated metal-sheathed cables
- 3191 Approval and test specification—Electric flexible cords
- 3560 Electric cables—Cross-linked polyethylene insulated—Aerial bundled—For working voltages up to and including 0.6/1 (1.2) kV
- 3560.1 Part 1: Aluminium conductors
- 3599 Electric cables—Aerial bundled—Polymeric insulated—Voltages 6.35/11(12) kV and 12.7/22(24) kV
- 3599.2 Part 2: Non-metallic screened
- 4193 Electric cables for use in ships
- 4193.2 Part 2: Insulating materials for shipboard power cables
- 4193.3 Part 3: Sheathing materials for shipboard power, control and telecommunication cables
- 5000 Electric cables—Polymeric insulated
- 5000.1 Part 1: For working voltages up to and including 0.6/1 kV
- 5000.2 Part 2: For working voltages up to and including 450/750 V

3 DEFINITIONS

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

3.1 Maximum continuous operating temperature

The maximum temperature at which the material of the cable may be operated continuously.

3.2 Sample tests

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

3.3 Type tests

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

3.4 Voltage designation

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

where

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

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

U_m = the maximum r.m.s. power frequency voltage between any two phase 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 voltage variations due to fault conditions and sudden disconnection of large loads.

4 MATERIALS

4.1 Insulating material

A1 | Designations and descriptions of the insulating materials referenced in this Standard are as follows:

- (a) *EPR*—a cross-linked compound of ethylene propylene copolymer or terpolymer, suitable for up to 90°C maximum continuous operating temperature.
- (b) *HFI-75-TP*—a thermoplastic, halogen-free polymeric based material (e.g. polyolefin copolymer) having characteristics of reduced smoke emission and reduced flame propagation properties in fire conditions, suitable for up to 75°C maximum continuous operating temperature.
- (c) *HFI-90-TP*—a higher-temperature version of the above HFI-75-TP compound, suitable for up to 90°C maximum continuous operating temperature.
- (d) *PE*—a thermoplastic polyethylene of nominal density $<0.941 \text{ g/cm}^3$, for general application, suitable for up to 70°C maximum continuous operating temperature.
- (e) *PP*—a compound of thermoplastic polypropylene, suitable for up to 80°C maximum continuous operating temperature.
- (f) *R-CPE-90*—a cross-linked compound based on chlorinated polyethylene, suitable for up to 90°C maximum continuous operating temperature.
- (g) *R-CSP-90*—a cross-linked compound based on chlorosulphonated polyethylene, suitable for up to 90°C maximum continuous operating temperature.

- (h) *R-E-110*—a cross-linked compound based on elastomer, suitable for up to 110°C maximum continuous operating temperature.
- (i) *R-EP-90*—a cross-linked compound based on ethylene propylene copolymer, terpolymer or a blend of the two, suitable for up to 90°C maximum continuous operating temperature.
- (j) *R-EP-105*—a higher temperature version of R-EP-90, suitable for up to 105°C maximum continuous operating temperature.
- (k) *R-HF-90*—a halogen free cross-linked compound based on elastomer, having characteristics of reduced smoke emission and reduced flame propagation properties in fire conditions, suitable for up to 90°C maximum continuous operating temperature.
- (l) *R-HF-110*—a higher temperature version of R-HF-90, suitable for up to 110°C maximum continuous operating temperature.
- (m) *R-S-150*—a cross-linked compound based on polyorganosiloxane, suitable for up to 150°C maximum continuous operating temperature.
- (n) *R-S-200*—a higher temperature version of type R-S-150, suitable for up to 200°C maximum continuous operating temperature.
- (o) *TP-90*—a thermoplastic polymeric material complying with all the tests and criteria for V-90, suitable for up to 90°C maximum continuous operating temperature.
- (p) *TPE-75*—a thermoplastic elastomer which may be a blend of two or more polymeric materials, suitable for up to 75°C maximum continuous operating temperature.
- (q) *V-75*—a combination of materials, of which the base constituent is thermoplastic polyvinyl chloride, suitable for up to 75°C maximum continuous operating temperature.
- (r) *V-90 or V-90HT*—higher temperature versions of type V-75, suitable for up to 90°C maximum continuous operating temperature, see Note 2 in Clause 5.2.
- (s) *X-90*—a compound of cross-linked polyethylene, suitable for up to 90°C maximum continuous operating temperature.
- (t) *X-90UV*—a compound of cross-linked polyethylene, suitable for exposure to UV radiation and suitable for up to 90°C maximum continuous operating temperature.
- (u) *X-HF-90*—a cross-linked halogen-free polyolefin compound having characteristics of reduced smoke emission and reduced flame propagation properties in fire conditions, suitable for up to 90°C maximum continuous operating temperature.
- (v) *X-HF-110*—a higher temperature version of X-HF-90, suitable for up to 110°C maximum continuous operating temperature.
- (w) *XLPE*—a compound of cross-linked polyethylene, suitable for up to 90°C maximum continuous operating temperature.
- (x) *XR-EP-90*—a cross-linked compound based on ethylene propylene copolymer (EPM), or ethylene propylene terpolymer (EPDM or EPT), having enhanced properties compared with R-EP-90, suitable for up to 90°C maximum continuous operating temperature.
- (y) *XV-75*—a cross-linked combination of materials, of which the base constituent is polyvinyl chloride, suitable for up to 75°C maximum continuous operating temperature.
- (z) *XV-90*—a higher temperature version of type XV-75, suitable for up to 90°C maximum continuous operating temperature.

A1

4.2 Sheathing material

A1 | Designations and descriptions of the sheathing materials referenced in this Standard are as follows:

- (a) *3V-75*—a modified form of *4V-75* with reduced mechanical properties to facilitate stripping from the cable, suitable for up to 75°C maximum continuous operating temperature.
- (b) *3V-90*—a higher temperature version of the above *3V-75* compound, suitable for up to 90°C maximum continuous operating temperature.
- (c) *4V-75*—a combination of materials, of which the base constituent is thermoplastic polyvinyl chloride, suitable for up to 75°C maximum continuous operating temperature.
- (d) *5V-90*—a higher temperature version of *4V-75*, suitable for up to 90°C maximum continuous operating temperature.
- (e) *E-110-R*—a cross-linked elastomer compound for higher temperature applications, suitable for up to 110°C maximum continuous operating temperature.
- (f) *GP-75-TPE*—a compound of thermoplastic elastomer which may be a blend of two or more polymeric materials, suitable for up to 75°C maximum continuous operating temperature.
- (g) *GP-85-PCP*—a general purpose cross-linked compound based on polychloroprene, suitable for up to 85°C maximum continuous operating temperature.
- (h) *GP-90-CPE*—a general purpose cross-linked compound based on chlorinated polyethylene, suitable for up to 90°C maximum continuous operating temperature.
- (i) *GP-90-CSP*—a general purpose cross-linked compound based on chlorosulphonated polyethylene, suitable for up to 90°C maximum continuous operating temperature.
- (j) *GP-100-CPE*—a higher temperature version of *GP-90-CPE*, suitable for up to 100°C maximum continuous operating temperature.
- (k) *GP-100-CSP*—a higher temperature version of *GP-90-CSP*, suitable for up to 100°C maximum continuous operating temperature.
- (l) *GP-150-S*—a general purpose cross-linked compound based on polyorganosiloxane, suitable for up to 150°C maximum continuous operating temperature.
- (m) *HD-85-PCP*—a heavy duty version of *GP-85-PCP*, suitable for up to 85°C maximum continuous operating temperature.
- (n) *HD-90-CPE*—a heavy duty version of *GP-90-CPE*, suitable for up to 90°C maximum continuous operating temperature.
- (o) *HD-90-CSP*—a heavy duty version of *GP-90-CSP*, suitable for up to 90°C maximum continuous operating temperature.
- (p) *HD-105-CPE*—a heavy duty cross-linked compound based on chlorinated polyethylene, suitable for up to 105°C maximum continuous operating temperature.
- (q) *HD-105-CSP*—a heavy duty cross-linked compound based on chlorosulphonated polyethylene, suitable for up to 105°C maximum continuous operating temperature.
- (r) *HDPE*—a high density thermoplastic polyethylene of nominal density $\geq 0.941 \text{ g/cm}^3$ intended for use where abrasion resistance is a particular requirement, suitable for up to 90°C maximum continuous operating temperature.
- (s) *HF-90-R*—a halogen-free cross-linked elastomeric material having characteristics of reduced smoke emission and reduced flame propagation properties in fire conditions, suitable for up to 90°C maximum continuous operating temperature.