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REELING AND TRAILING ELECTRIC CABLES FOR UNDERGROUND COAL MINING PURPOSES

1802—1992 **Electric cables—Reeling and trailing—For underground coal mining purposes**
(In Professional Package 32) 41pp *H*

Specifies the application, materials, construction, dimensions and tests for elastomer insulated and sheathed reeling and trailing electric cables for use in underground coal mines.

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The following interests are represented on Committee EL/3:

Australian Electrical and Electronic Manufacturers Association

Confederation of Australian Industry

Defence Standardization Committee

Department of Aviation

Department of Industrial Relations (New South Wales)

Electrical Regulatory Authorities

Electrical Contractors Associations of Australia

Electrical Testing Laboratories

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Metals Industry Organizations

Railways of Australia Committee

Telecom Australia

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AUSTRALIAN STANDARD

REELING AND TRAILING ELECTRIC CABLES FOR UNDERGROUND COAL MINING PURPOSES

AS 1802—1985

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PREFACE

This edition of this standard was prepared by the Association's Committee on Electric Wires and Cables, to supersede AS 1802—1976, Trailing Cables for Mining Purposes (Including Underground Coal Mines, Metalliferous Mines, Open-cut Mines, Quarries and Dredges).

The standard aligns with a new standard (AS 2802, (see Clause 1.2)) for cables that have been developed to meet the special requirements of the Australian surface mining industry and the requirements of AS 3007, Electrical Installations for Outdoor Sites Under Heavy Conditions (Including Open Cast Mines and Quarries).

During the preparation of this standard, extensive consultations were held with cable users, manufacturers of cable and regulatory authorities to establish current requirements, the demand for certain types of cables and the different requirements for the size of earth conductors for cables subject to coal mining regulations and to the conditions specified in AS 3007.

This standard differs from AS 1802—1976 in the following ways:

(a) Types 102, 111 and 270 have been deleted because of low demand and the availability of other suitable cables.

(b) Types 112, 115, and 250 previously in AS 1802—1976 have been transferred to the new standard with the following qualifications:

  (i) Type 112. This type was previously specified for voltage ratings 660/1100 V, 1.9/3.3 kV, 3.8/6.6 kV and 6.4/11 kV. It will now be available with a voltage rating of 1.1/1.1 kV only and has been redesignated 412.

  (ii) Type 115. This type was previously rated at 250/440 V. It will now be available with a voltage rating of 1.1/1.1 kV only and has been redesignated 415.

  (iii) Type 250. This type was previously specified for voltage ratings 1.9/3.3 kV, 3.8/6.6 kV and 6.4/11 kV. It is now specified for ratings of 3.3/3.3 kV, 6.6/6.6 kV, 11/11 kV, 22/22 kV and 33/33 kV and has been redesignated 450.

(c) Types 209 and 241 are retained in this standard but with the following qualifications:

  (i) Type 209. This type was previously specified for voltage ratings of 660/1100 V, 1.9/3.3 kV, 3.8/6.6 kV and 6.4/11 kV. It is now rated at 1.1/1.1 kV, 3.3/3.3 kV, 6.6/6.6 kV and 11/11 kV. In AS 2802 cable of this construction is also specified for surface mining cables in Class 2, for voltage ratings of 1.1/1.1 kV up to and including 22/22 kV but has been designated Type 409.

  (ii) Type 241. This type was previously specified for voltage ratings of 660/1100 V, 1.9/3.3 kV, 3.8/6.6 kV and 6.4/11 kV. It is now rated at 1.1/1.1 kV, 3.3/3.3 kV, 6.6/6.6 kV and 11/11 kV. In AS 2802 cable of this construction is also specified in both Classes 1 and 2 but has been designated Type 441. For Class 1, the voltage ratings are from 3.3/3.3 kV up to and including 22/22 kV and for Class 2, the voltage rating is 1.1/1.1 kV. Type 241 now has a modified semiconductive elastomer covering on the earth conductor.

(d) Voltage ratings. In previous editions of AS 1802 the standardized voltage ratings for cables were 660/1100 V, 1.9/3.3 kV, 3.8/6.6 kV and 6.4/11 kV. In this standard they are 1.1/1.1 kV, 3.3/3.3 kV, 6.6/6.6 kV and 11/11 kV.

(e) In the light of superior performance of synthetic insulating materials, Type R-75 (substantially natural rubber compound) has been deleted.

(f) A new method for testing extensibility of central pilot conductors has been introduced and because of reduced slippage using the new method, the test criterion has been changed from 20 percent to 15 percent.

(g) The colour of the pilot cores has been changed from black to grey.

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REELING AND TRAILING CABLES FOR UNDERGROUND COAL MINING PURPOSES

FOREWORD

With the preparation of AS 2802, for cables that have been developed to meet the special requirements of the Australian surface mining industry, substantial rationalization of cable types has been made possible, so that the range of cables in this standard (AS 1802) is now restricted to those specifically designed to suit underground coal mining operations.

While the requirements of underground coal mining determined the cables to be incorporated in this standard, it is recognized that many of these cables will be equally applicable to other installations, e.g. underground metalliferous mines, ship loaders, travelling cranes, reclaimers at loading stations, and other large materials handling plants.

This standard also takes into account the superior performance of synthetic materials, improvements made in manufacturing techniques and quality control, with particular regard to the more stringent requirements for elastomeric conductor and insulation screens for cables rated 3.3/3.3 kV and above, as well as including additional test requirements.

Following the concept adopted for the majority of other cable standards, the method of calculating the dimensions of cable protective coverings, is based on the fictitious calculation method, and, together with modified application of tolerance, this has resulted in dimensional changes to most cables when compared with the dimension given in the 1976 edition of this standard.

In this edition, however, to satisfy the power requirements of larger machines, the range of conductor sizes has been extended for the majority of types.

One insulating material and three sheathing materials are specified, viz ethylene propylene rubber (R-EP-90) for insulation and polychloroprene (PCP), chlorosulphonated polyethylene (CSP) and chlorinated polyethylene (CPE) for sheathing. The insulating compound R-75 (a compound substantially of natural rubber) has been deleted because synthetic insulating materials have superior performance.

The proven superior performance of Type 275 over Type 270, coupled with low demand for the latter, enabled the deletion of Type 270 as well as the modification to the design of Type 241, in which the earth conductor is now covered with semiconductive elastomer to a round cross-section in lieu of embedment in shaped semiconductive elastomer filler pads.

Where a method of testing differs from, or has not yet been included in AS 1660, the appropriate test method has been included in Clause 25 and appendices to this standard.

SPECIFICATION

1 SCOPE AND REFERENCED DOCUMENTS.

1.1 Scope. This standard specifies elastomer-insulated, elastomer-sheathed reeling and trailing electric cables for underground coal mining purposes.

An essential feature of this standard is the requirement that cables used for a.c be electrically symmetrical.

This standard is intended to apply only to cables of the types and sizes provided for in the Tables of Construction and Dimensions (Tables 10.1 to 10.7).

It is not intended, however, that the use of other types or sizes of cables should be precluded from use and regulatory authorities may give approval to new types and sizes as they are developed. Appropriate requirements for new types and sizes will eventually be included in this standard as the need arises.

1.2 Referenced documents. The following standards are referred to in this standard:

AS 1125 Conductors in Insulated Electric Cables and Flexible Cords

AS 1505 Designation of Yarns

AS 1660 Methods of Test for Electric Cables and Flexible Cords (Including Conductors Insulation and Sheath)

AS 1852 International Electrotechnical Vocabulary

AS 1931 High Voltage Testing Techniques

AS 2802 Reeling and Trailing Electric Cables for Mining and General Use (Other than underground coal mining) (Elastomeric Flexible Cables For Working Voltages 1.1/1.1 kV up to and including 33/33 kV)

AS 3116 Approval and Test Specification for Elastomer Insulated Electric Cables and Flexible Cables for Working Voltages of 0.6/1 kV

BS 1442 Galvanised Mild Steel Wire for Armouring Cables

2 DEFINITIONS.

For the purpose of this standard, the definitions given in AS 1852, AS 1125 and the following apply:

2.1 Power core—a power conductor with insulation of the appropriate voltage grade including, where applicable, semiconductive and composite screens.

2.2 Conductor screen—a layer of non-metallic semiconductive material applied directly over the conductor.

2.3 Insulation screen—a non-metallic semiconductive material applied directly over insulation and where applicable, a composite screen over the non-metallic part.

2.4 Composite screen—a screen comprising stranded or bunched copper wires applied in one direction and interwoven in the opposite direction with polyethylene terephthalate, or equivalent yarn.

2.5 Triple extrusion—the simultaneous extrusion of conductor screen, insulation and semiconductive insulation screen over a power conductor.

2.6 Earth conductor—a conductor laid up in the cable for the purpose of providing earth continuity.

2.7 Pilot core—a pilot conductor with insulation or covering and which is installed either in the centre of a cradle separator (central pilot core) or in the outer interstices between the power cores (interstitial pilot cores), for use in conjunction with a pilot protection system.

2.8 Conductor covering—elastomeric insulation of a specified radial thickness which differs from that required by the voltage rating of the cable. Semiconductive elastomeric material may be used as a covering on earth conductors for specific cables.

2.9 Cradle separator—a shaped section of elastomeric material, designed to support the core assembly, fill the centre interstice and provide a specified separation between individual power cores.

2.10 Reeling and trailing cable—a cable having multiple stranded conductors, insulation incorporating conductor and insulation screens where appropriate, filling, reinforcement where appropriate and protective covering(s), and specially designed to provide a flexible electrical connection between portable or mobile equipment and a point of supply.

2.11 Maximum conductor temperature—the permitted maximum temperature at the surface of the conductor.

2.12 Direction of lay—the slope direction of the conductor wire, bunch, core, screen or armour strand when the stranded conductor or cable is held vertically.

It is right-hand when the slope is in the direction of the central part of the letter Z, and left-hand when the slope is in the direction of the central part of the letter S.

2.13 Length of lay—the axial length of one complete turn of the helix formed by a cable component, e.g.

— a bunch of a multiple stranded conductor;
— a core of a laid up core assembly;
— the strands of pliable armour in a cable.

2.14 Pitch circle diameter—the diameter of a circle which passes through the mid-points of like cable components, e.g.

— the laid up cores of a multicore circular cable;
— the composite screen of a core or strands of pliable armour in a circular cable.

2.15 Strand—an assembly of round wires spun helically in one or more layers.

2.16 Bunch—a number of wires all of which are twisted together in the same direction and with the same length of lay throughout.

2.17 Multiple strand—a group of bunches laid up helically and symmetrically such that within any one layer the length of lay of bunches is uniform.

2.18 Fictitious diameter—diameter calculated according to a formula based only on cross-sectional area of conductor, numbers of cores and specified component dimensions and which ignores conductor makeup and the possibility of components having dimensions other than as specified.

The fictitious value is only used to determine the mechanical protective coverings of the cable, i.e. inner and outer sheath and pliable armour strand size.

2.19 Routine tests—tests made by the manufacturer on all finished cable lengths to demonstrate the integrity of the cable.