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Australian Standard 1747—1980

REPAIR AND TESTING OF TRAILING CABLES AND FEEDER CABLES USED FOR MINING

STANDARDS ASSOCIATION OF AUSTRALIA
Incorporated by Royal Charter

THE FOLLOWING SCIENTIFIC, INDUSTRIAL AND GOVERNMENTAL ORGANIZATIONS and departments were officially represented on the committee entrusted with the preparation of this standard:

Australian-British Trade Association

Australian Electrical and Electronic Manufacturers Association

Confederation of Australian Industry

Collieries

Defence Standardization Committee

Department of Housing and Construction

Department of Transport

Departments of Mineral Resources and Mines

Electrical approvals authorities

Electrical Contractors Associations of Australia

Electrical testing laboratories

Electricity Supply Association of Australia

Joint Coal Board

Metalliferous mines

Mines control authorities

Railways of Australia Committee

Representative of SAA Committee EL/2

Telecom Australia

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AUSTRALIAN STANDARD

REPAIR AND TESTING OF TRAILING CABLES AND FEEDER CABLES USED FOR MINING

AS 1747—1980

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PREFACE

This standard was prepared by the Association's Committee on Electric Wires and Cables to supersede AS 1747—1975. It provides a standard procedure for the repair of trailing cables and feeder cables used in underground coal mines and other mining applications, and establishes requirements for the repair of cables such as will ensure that the repaired cable is returned to a condition as near to the original design as is possible.

The requirements of this standard are intended to be mandatory for underground coal mines, but may be regarded as recommendations for other applications, e.g. metalliferous mines, quarries and dredges.

The standard is intended to standardize repair and testing procedures nationally and to give authoritative guidance to all those who are called upon to undertake repairs to trailing cables and feeder cables. The standard is further intended to be used as a basis for contract between cable owners and cable repairers, but attention is drawn to the fact that this standard does not purport to include all the necessary conditions of contract.

This standard is in metric units, but as the methods given herein will also be applicable for the repair of imperial dimensioned cables the nearest imperial-size cable is shown in parentheses alongside the metric size for the convenience of users.

It should be noted that this standard applies to trailing and feeder cables which were manufactured to AS C81 and AS C412 as well as AS 1802 and AS 1972. For this reason, the standard makes reference to types of cable that are not specified in current standards.

This standard may require reference to the following standards:

AS 1125	Conductors in Insulated Electric Cables and Flexible Cords
AS 1299	Flameproof Restrained Plugs and Receptacles for Use in Coal Mines*
AS 1300	Bolted Flameproof Cable Coupling Devices for Use in Coal Mines
AS 1802	Trailing Cables for Mining Purposes (Including Underground Coal Mines, Metalliferous Mines, Open-cut Mines, Quarries and Dredges)†
AS 1972	Cables for Use Below Ground in Coal Mines (Other than Trailing Cables)‡
AS 3116	Approval and Test Specification for Elastomer Insulated Electric Cables and Flexible Cables for Working Voltages of 0.6/1 kV
BS 219	Specification for Soft Solders
BS 2719	Methods of Use and Calibration of Pocket Type Rubber Hardness Meters

*In course of revision—see DR 79165.
†AS 1802 superseded AS C81.
‡AS 1972 superseded AS C412.

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STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard
for
THE REPAIR AND TESTING OF TRAILING CABLES AND FEEDER CABLES USED FOR MINING

FOREWORD

Preparation of the first edition of this standard (AS 1747—1975) was prompted by a need to formalize the practice of repairing trailing cables and feeder cables for use in underground coal mines so that some uniformity of practice could be established. For this reason this standard does contain a definite bias towards existing repair practices used in underground coal mines, where the need to ensure that premature failure of repaired cables does not occur is of paramount importance for safety.

It was the intention of the committee that practices which are essential only for underground coal mines should not be imposed upon other sections of the mining industry where they are not warranted. Some requirements of the standard may be unnecessarily stringent for other than underground coal mining applications, and it may be appropriate in such cases for the parties concerned to agree to use less stringent requirements.

It is realized that for on-site or temporary repairs it will not be practicable to carry out all the requirements of the standard, e.g. testing. In such cases, only those parts of the standard which may be appropriate need be used.

The standard specifies without exception the use of ferrules, which are subsequently soldered, for joining bunches that may be parts of conductors, conductors as a whole, pliable armouring and collective metallic or composite screens. Ferrules are also specified as one of two methods for the joining of individual metallic or composite screens. The standard does not provide for the use of other techniques in jointing, such as welding and crimping. These methods are under continuous review. Meanwhile, approaches may be made to statutory authorities for specific recognition of other techniques.

Vulcanizing by the use of a heated pressure moulding machine is the only method acceptable in an underground coal mining operation. Alternative methods are no doubt satisfactory in surface applications, but it is the opinion of the committee that the bonding obtained between original material and repair material by vulcanizing is far superior to that obtained by any other method available at this time. Nevertheless, Clause 3.15 indicates that alternative methods may be employed for surface applications subject to the approval of the relevant Statutory Authority.

Testing procedures contained in the standard are those procedures which are considered essential for ensuring that repairs made to cables are of the highest possible quality. It is recognized, however, that some of these tests would be quite impracticable in surface applications. The test methods and equipment recommended in the standard are in line with the present state of the art, but it is not in any way intended that development in these fields should be impeded by the need to comply with the existing provisions of the standard. As new developments occur the Standards Association of Australia should be notified so that the matter can be put before the committee with the view to modifying the standard to keep pace with technology.

SECTION 1. SCOPE AND DEFINITIONS

1.1 SCOPE. This standard sets out requirements for the repair and testing of cables used in underground coal mines. The requirements may be regarded as recommendations for the repair of cables used elsewhere, e.g. metalliferous mines, open cut mines, quarries and dredges.

The standard establishes sound practice for the repair and testing of—

(a) trailing cables used for underground coal mines, metalliferous mines, open-cut mines, quarries and dredges; and

(b) feeder cables used for underground coal mines and having insulation and sheaths of elastomer.

The standard is limited to repairs using soldered connections (see Note 2).

The standard also applies to the repair of plugs fitted to the cables and to the test equipment used for testing the cable.

NOTES:

1. The standard applies particularly to trailing cables complying with AS 1802 and the former AS C81, and to feeder cables complying with AS 1972 and the former AS C412, but is not restricted in application to such cables.
   Where type or code numbers are referred to in the standard for trailing cables, the numbers are as specified in AS 1802 and the former AS C81.
2. Other forms of connection are under consideration. Meanwhile, approaches may be made to statutory authorities for specific recognition of other jointing techniques.

1.2 DEFINITIONS. For the purpose of this standard, the following definitions apply:

1.2.1 Trailing cable—a cable having multiple stranded conductors, insulation, filling, reinforcement or protective covering and specially designed to provide a flexible electrical connection between d.c. or multiphase a.c. portable or mobile equipment and a fixed point or points of supply.

1.2.2 Feeder cable—a cable intended primarily for use between a transportable substation and associated equipment, e.g. gate-end box or distribution centre, where the cable is required to be moved frequently.

1.2.3 Individually screened cable—a cable in which the insulation of each power core is separately enclosed in a conducting layer.

1.2.4 Collectively screened cable—a cable in which the insulation of all conductors is collectively enclosed in a conductive layer.

1.2.5 Conductor screen—a non-metallic semiconductive tape and/or extrusion over a power conductor.

1.2.6 Insulation screen—a non-metallic semiconductive tape or extrusion over insulation of a power core.

1.2.7 Power core—a power conductor with insulation and, when appropriate, the semiconductive conductor and insulation screen, but not including any other protective covering.

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

1.2.9 Pilot core—a conductor with insulation or covering 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 core), or is otherwise laid up in the cable for use in conjunction with a pilot protection system.

1.2.10 Covered conductor—a conductor having insulation of a specified radial thickness less than that of an insulated conductor of corresponding size.

1.2.11 Centre filler—a section of elastomeric material which completely fills the centre interstice of the core assembly of a multicore cable.

1.2.12 Cradle separator—a shaped section of elastomeric material designed to support the core assembly, fill the centre interstice and by means of fingers provide a specified separation between the individual screened or unscreened power cores.

1.2.13 Sheath.

1.2.13.1 *Inner sheath*—the component of a cable which is applied immediately over the core assembly to protect the cores against degradation from the armouring or collective screen.

1.2.13.2 *Outer sheath*—the outermost component of a cable which encloses the underlying components and protects them against damage during use of the cable.

1.2.14 Direction of lay—the slope of the conductor wire, core, screen wire or armour wire. 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.

1.2.15 Pitch of lay—the distance measured parallel to the axis in which—

(a) a bunch makes a complete turn about the conductor;

(b) a core or conductor makes a complete turn about the axis of a cable; or

(c) a screen or armour strand makes a complete turn about the axis of a core or cable.

NOTE: Pitch of lay is also referred to as 'length of lay'.

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

1.2.17 Multiple (or rope) strand—a group of bunches laid up helically and symmetrically so that within any one layer the pitch of bunch is uniform.

1.2.18 Semiconductive elastomer—a rubber-like material with semiconductive properties which, when vulcanized, would comply with the test requirements in the needle penetration test of AS 1802.

1.2.19 Partial break detection device—a device used to locate broken wires in a cable.

1.2.20 Spark or sheath tester—device used to detect 'pin holes' or other sheath faults.

1.2.21 Vulcanizer—a device used to provide the necessary heat and pressure to effectively vulcanize and mould the raw core and sheath repair materials and bond them to the original parent material of the cable.