NSW DEPARTMENT OF PRIMARY INDUSTRIES

Technical Reference
Electrical Engineering Safety
EES-007

NSW DPI Technical Reference

Licensing of Cable Repair Facilities for Reeling, Trailing and Flexible Feeder Cables used in NSW Underground Coal Mine Hazardous Zones

Coal Mine Health and Safety Act 2002
Coal Mine Health and Safety Regulation 2006

June 2007 (version 2)

NSW DEPARTMENT OF
PRIMARY INDUSTRIES

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PREFACE

Contemporary safety management requires fit for purpose equipment, competent personnel and appropriate procedures all within a managed work environment and supported by a systematic approach.

Underground coal mining presents engineering personnel with serious technical challenges; in this environment there often occurs potential for accumulation of explosive mixtures of methane and a further explosive dust hazard. A prime barrier to preventing explosions is the use of specially constructed mining cables and special (usually flameproof) plug attachments and glanding. These cables are used in a harsh environment and are regularly subject to abuse and damage. On average there are 600 cables damaged every month in NSW underground coal mine hazardous zones. This damage varies from minute pin holes in a cable sheath to the whole cable being pulled in half. To minimise the risk of fires, explosions and electric shock and burns it is essential that these damaged cables are returned to a condition that is as close to practical “as new”. Because the repair of flexible cables is complex it requires a high degree of expertise, a systematic process and special facilities. This high degree of rigor on the repair process is achieved through a legislative licensing process that requires competent people and proper facilities with specialist test and repair equipment. The licensed workshop and Cable Repair Signatory system approach, provide a framework for the provision of suitable facilities for the repair of flexible reeling, trailing and feeder cables for use in NSW underground coal mines.

Original cable manufacturers are not considered to have the necessary facilities and competent people to repair such cables.

This Technical Reference is intended to provide a basis from which cables can be restored to a fit for purpose condition, after damage, for the safety of mine workers, as required by legislation and community expectations.

Complementing the above are:

- Standards for the design and repair of cables
- Standards for the design, inspection, maintenance, overhaul and repair of cable accessories
- DPI Technical Reference for competency of people repairing cables and associated accessories

This Technical Reference will be used by Mine Safety Operations to assess cable repair facilities for licensing purposes.

John Francis Waudby
Senior Inspector of Electrical Engineering

NSW DEPARTMENT OF PRIMARY INDUSTRIES

CONTENTS

Chapter 1 Establishment

1.1 Title

This is the DPI Electrical Engineering Safety Technical Reference – Licensing of Cable Repair Facilities for Reeling, Trailing and Flexible Feeder Cables used in NSW Underground Coal Mine Hazardous Zones.

1.2 Purpose

This Technical Reference is published as an aid to applicants who are seeking:

- Licensing from the Department in accordance with the Coal Mine Health and Safety Act 2002, and its related Regulations and Amendments.

The Technical Reference sets out the minimum criteria that would be used for assessment of the workshop.

This Technical Reference is also intended to provide a framework for DPI officers to assess applications for licensing as a cable repair workshop. It is also the framework for ongoing surveillance of licensed facilities.

The outcomes sought to be achieved by this Technical Reference are to protect people and property from the risks associated with the use of electrical cables in coal operation hazardous zones including:

- Electrocution
- Electric Shock.
- Electrical burn injuries
- Arc blast injuries
- Injuries sustained through operation of the equipment
- Unintended operation of the equipment
- Ignitions of flammable mixtures of gas or dust
- Fire

1.3 Scope

This Technical Reference is primarily for cable repair facilities (workshops) located in NSW.

This Technical Reference is intended as an aid to applicants who are seeking workshop licensing in the role of repair of cables for use in NSW underground coal mines.

This Technical Reference is supplemented by the following Technical References:

- EES001 NSW DPI Technical Reference – Electrical Engineering Management Plan
- EES002 NSW DPI Technical Reference – Control and Supervision of Electrical Work
- EES003 NSW DPI Technical Reference – Practices for the Life-Cycle Management of Explosion Protected Equipment
- EES004 NSW DPI Technical Reference – Practices for Portable Electrical Apparatus

- EES005 NSW DPI Technical Reference - Electrical Protection and Earthing
- EES006 NSW DPI Technical Reference - Removal and Restoration of Power

1.4 Authority

This is an Electrical Engineering Safety Technical Reference and is recommended by the Department of Primary Industries. This document replaces VERSION 1.

1.5 Definitions

Licensed Cable Repair Workshop - a quality accredited facility, with at least one Cable Repair Signatory in full-time employ and the necessary equipment and procedures deemed suitable to receive licensing as a cable repair workshop. Licensed workshops are required by the Department and Australian Standards to keep historical records of all repairs made to cables used in NSW coal mines.

Cable Repair Signatory - a person who has been verified as competent for the inspect, repair and testing of electrical reeling, trailing and feeder cables as defined in AS/NZS1747. This also includes the inspection, testing, fitting and replacement of parts of restrained and bolted plugs. Applicants shall have adequate knowledge and expertise to ensure compliance with the applicable parts of:

- AS/NZS 3800, “Electrical equipment for explosive atmospheres - Repair and overhaul”.
- AS/NZS 1747 “Reeling, trailing and feeder cables used for mining – Repair, testing and fitting of accessories”.

Cable Repairer Signatories are required to work under the auspices of a licensed workshop, and shall maintain appropriate records of overhaul & repair of cables.

Department - means Mine Safety, Department of Primary Industries.

1.6 Applicable legislation

The Occupational Health and Safety Act 2000

The Occupational Health and Safety Regulation 2001

The *Coal Mine Health and Safety Act 2002*

The *Coal Mine Health and Safety Regulation 2006*

1.7 Referenced Gazette Notices

Gazette Notice - Types of Plant that can be used in a Hazardous Zone

1.8 Referenced Standards and Guidelines

AS 1299	Electrical equipment for coal mines – Flameproof restrained plugs and receptacles
AS 1300	Electrical equipment for coal mines – Bolted flameproof cable coupling devices
AS/NZS 1747	Reeling, trailing and feeder cables used for mining - Repair, testing and fitting of accessories
AS/NZS 1802	Electric cables – Reeling and trailing – For underground coal mining purposes
AS/NZS 1972	Electric cables – Underground coal mines – Other than reeling and trailing
AS/NZS 2290.1	Electrical equipment for coal mines – Introduction and maintenance – For hazardous areas
AS/NZS 2802	Electric cables – Reeling and trailing for mining and general use (other than underground coal mining)
AS/NZS 3800	Electrical equipment for explosive atmospheres - Repair and overhaul
AS/NZS ISO 9001	Quality management systems - Requirements
AS/NZS 4871	Set 2007 - Electrical equipment for underground coal mines.
EES-012	Assessment and Registration of Competency – Cable Repairer for Reeling, Trailing and Flexible Feeder Cables used in NSW Underground Coal Mine Hazardous Zones

1.9 Acronyms

AS	Australian Standard
AS/NZS	Australian New Zealand Standard
Ex	Explosion protected

1.10 Amendments to previous versions

This document replaces Version 1

Changes:

Refer to Chapter 4

Chapter 2 Licensing

2.1 Flexible reeling, trailing and flexible feeder cables used in hazardous zones

Clause 19(1) (c) (d) (e) and (f) Coal Mine Health and Safety Regulation 2006
Requires that only specified plant be used in a hazardous zone, that this plant be maintained in an explosion-protected condition and that overhaul and repair of explosion-protected plant and flexible reeling, trailing and feeder cables is only to be done at licensed facilities.
Measures have to be taken to prevent arcing faults compromising explosion protection properties of plant and installations (including cables).

Flexible reeling, trailing and feeder cables must only be repaired at licensed facilities.

2.2 General requirements - Licensing

Clause 149 (1)(b) Coal Mine Health and Safety Regulation 2006

Defines a particular licensable activity as “repair of flexible reeling, feeder and trailing cables used in a hazardous zone.”

Good engineering practice is a primary goal of the cable repair workshop licensing scheme and associated Cable Repair Signatory scheme and is a prerequisite to the granting of any cable repair workshop license.

For details on how to obtain a license:

- Refer to Guidance Note GNC-010 – Licensing and associated application form
  http://www.dpi.nsw.gov.au/minerals/safety/legislation/commencement

Workshops licensed for the purposes of repair of cables shall comply with the requirements of AS/NZS1747.

The scope of work will typically encompass the overhaul, repair and testing of flexible mining cables and accessories such as restrained plugs, flit plugs, glands and stuffing boxes.

Occupational health and safety responsibilities embrace both the end-user and the workshop to ensure that all repaired cables are returned to service in a fit for purpose condition.

Assessment for licensing purposes will be conducted by the Inspectors of Electrical Engineering and/or Mine Safety Officer – Electrical Engineering from the Mine Safety Division, Department of Primary Industries.

Prior to implementation of any changes to workshop practices, processes or materials, the licensed workshop shall assess such changes for on-going compliance with their license and advise the licensing authority where such changes may impact on the license, in particular where the practices impact on the control of the repair/overhaul processes for cables and fittings.

2.3 Specific requirements – Licensing

2.3.1 QUALITY MANAGEMENT SYSTEM COMPONENT

A licensed cable repair workshop shall have a Quality Management System to AS/NZS ISO 9001. That quality management system shall be certified by a JAS-ANZ accredited body or a signatory to the IAF MLA[1] for QMS.

Specific matters to be addressed within the Quality Management System are:

2.3.1.1 Certificates, Documentation and Records

The following records are required to be retained by the licensed cable repair workshop:

- All calibration certificates are to be held.
- Relevant examination, overhaul, test, compliance and verification certificates are to be established in accordance with the minimum requirements of the appendices of Australian Standards AS/NZS3800 for electrical apparatus and AS/NZS 1747 for mining cables.
- Records shall be kept in accordance with Section 2.2 and 2.3 of AS/NZS 1747.

2.3.1.2 Roles and Responsibility

The licensed cable repair workshop shall have a nominated management representative. At least one Cable Repair Signatory shall be permanently employed by the workshop.

The roles and responsibilities of the Cable Repair Signatory will be clearly documented and conform to the requirements specified in Chapter 3 of this document.

2.3.1.3 Resource management

The premises, tools and equipment shall be arranged to deal with the type of cables and fittings likely to be overhauled and/or repaired.

[1] IAF MLA – means 'International Accreditation Forum – Multilateral Agreement'

A workshop shall have apparatus applicable to the scope of work conducted, however the following list contains the majority of essential items;

- Flameproof checks of plugs
    - Straight edges
    - Feeler gauges
    - Depth gauges
    - Go – No go gauges for plugs
- Storage facilities for repair tapes (refer Appendix F, section F6 AS/NZS 1747)
- Test Equipment as specified in Appendix H, AS/NZS 1747

2.3.1.4 Technical Library

A technical library shall be established and maintained. Particular attention needs to be paid to maintain current standards. Typical technical library facilities may include:

- The relevant standards from the AS/NZS ISO 9000 series.
- Relevant Australian Standards and handbooks relating to electrical explosion-protected equipment.
- AS/NZS 1747, AS/NZS 1802, AS/NZS 1972, AS/NZS 2802, AS 1299, AS 1300, AS/NZS 2290.1, AS/NZS 3800.
- This technical reference (EES-007).
- Relevant legislation, codes of practice and guidelines.

2.3.1.5 Training and Competency

A training and competence program shall be established for all persons involved in activities such as inspection, repair, and overhaul or any other matter that may impact on the properties of mining cables or explosion protected properties of Ex plugs and fittings whilst at the licensed workshop's premises. The program shall:

- Maintain currency of training
- Provide for maintaining skills and knowledge
- Be consistent with the requirements of AS/NZS 4761
- Incorporate, safety, quality management, technical skills, legislation, standards requirements and this technical reference.

2.3.1.6 Product Realisation

Repaired or overhauled equipment shall be released from the licensed cable repair workshop's premises only when a Cable Repair Signatory is satisfied that all the required activities have been undertaken and the Cable Repair Signatory authorises the examination, inspection and tests results report.

Where a process can affect the integrity of a cable repair or the type of Ex protection and where the resulting integrity cannot be verified after completing the process (e.g. the environmental conditions required for curing an encapsulant), that specific process shall be measured or monitored and documentary evidence shall be maintained to demonstrate compliance with required parameters. On release of equipment the licensed cable repair workshop shall supply a "licensed cable repair workshop report" to cover each item released from the licensed cable repair workshop.

The licensed cable repair workshop shall establish procedures or work instructions for all types of inspections, repairs and tests specified in AS/NZS 1747. These procedures will include elements for:

- Identification of incoming product.
- Identification and acquisition of necessary documentation (approvals, certificates of conformity, relevant standards).
- Inspection, assessment, measurement, testing, disassembly, reassembly, final inspection and reporting.
- Provision of flowcharts or necessary information to identify processes used and human, material, equipment and test/inspection resources required.
- Recall of product after despatch, should the licensed cable repair workshop become aware of any critical or major defect after the repaired product has been released. Such procedures shall provide for the notification to the approving authority.
- Details and evidence of competency for persons nominated as Cable Repair Signatory.

2.3.1.7 Sub-contractor activities

The method of control the licensed cable repair workshop maintains over any subcontractor used to perform part of the repair and overhaul process, including testing and calibration activities. Any work carried out by the sub-contractor must be supervised to an appropriate degree. For example if the sub contractor is not quality accredited, the work should be continuously supervised by a Cable Repair Signatory.

2.3.1.8 Measuring Equipment

The licensed cable repair workshop shall:

- Identify ALL the meters, instruments and measuring devices that are used to establish cable repair integrity and explosion protected properties. These shall be applicable to the scope of work undertaken and the types of equipment worked upon.
- Verify test equipment shall conform to Appendix I AS/NZS 1747.
- Keep all the measuring devices that are used to establish cable repair integrity and explosion protected properties in calibration.
- Establish calibration traceability to the National Measuring Institute or equivalent.
- Calibrate measuring equipment and test instruments in accordance with Appendix I AS/NZS 1747.
- Document the procedure for calibration of test and measurement equipment.
- Review calibration certificates to establish fitness for purpose.
- Ensure corrections are applied to the working instruments used in the workshop (where calibration certificates indicate correction required).
- Regard calibration laboratories as sub-contractors which supply a service and therefore be included in the review of sub-contractors. Such reviews shall include confirmation that any accreditation remains current and valid.

2.3.1.9 Non Conforming Product

The licensed cable repair workshop shall take action, appropriate to the degree of risk, where non-conforming product has been supplied to a customer for all non-conforming products that have been released and the licensed cable repair workshop shall maintain records of:

- Serial numbers or identification of product supplied;
- The customer who received the product;
- The action taken to inform customers and the relevant Assessment Body; and
- The action taken to implement corrective and preventative action

2.3.1.10 Identification of cable arcing in a hazardous zone

When evidence of arcing has been identified on a cable that may have been in use in a hazardous zone the licensed cable repair workshop shall take action to inform the coal operator or delegate of the evidence of arcing. Similarly for the failure of explosion protected properties of cable fittings. Refer to the example flow chart at www.dpi.nsw.gov.au/minerals/safety/resources/electrical-engineering/incidents-and-statistics

Chapter 3 Cable Repair Signatory

3.1 General

A Cable Repair Signatory shall be a person who has been verified as competent in the repair of cables and the inspection and replacement of parts of cable fittings. That person shall have adequate knowledge and expertise to ensure compliance with the applicable parts of AS/NZS 3800, AS/NZS 1747 and with other standards relevant to the apparatus or cables.

3.2 Responsibilities

A Cable Repair Signatory is responsible for:

- The identification of cables submitted for repair.
- The identification of correct documents for cables under repair.
- The verification/evaluation of the results of repairs and testing of cables.
- The verification/evaluation of the fitting of flameproof plugs and replacement parts of plugs and inspection of completed work (refer Section 4.5, AS/NZS 1747).
- The issuing and authorisation of documentation, certifying compliance with the relevant procedures, certification or approval documentation and Standards for repair and overhaul work.
- The technical validity and accuracy of all information contained in inspection, report and statement of compliance documents.

3.3 Accreditation

Refer to NSW DPI publication Technical Reference Electrical Engineering Safety EES-012.

Chapter 4 Amendments

EES-007 is to become a quality document. This will require amendments being carried out to facilitate this. When amendments are issued they will be numbered in sequence and dated with the subsequent reprint of the guide including the amendment in the text and the appendix.

The user of EES-007 should:

1. Advise the editor of changes, errors or omissions.
2. Keep the guide up to date with the latest amendment.
3. Send to:

The Editor, EES-007

Paul De Gruchy

Mine Safety Officer Electrical Engineering

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AMENDMENT UP-DATE SHEET

No	AMENDMENT	Date of Amendment	Date entered	Entered by
0	Initial document based on MDG2003. MDG2003 dealt with Ex repair facilities and cable repairers and was based on the 1999 regulations. EES007 deals solely with cable repairs and is based on the 2006 legislation	January 2007	22/01/2007	J F Waudby
1	Competent Person – Cable Repairer is now termed Cable Repair Signatory (The terminology is now aligned to nationally recognised schemes). References and web addresses have been updated. Minor editorial changes made.	May 2007	18/05/2007	J F Waudby
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Chapter 5 Feedback Form

Your comments will be very helpful in reviewing and improving this document.

Please copy and complete the Feedback Form and return it to:

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Fax: (02) 4931 6790
Phone: (02) 4931 6641

How did you use, or intend to use, this Technical Reference?

What do you find most useful about this Technical Reference?

What do you find least useful?

Do you have any suggested changes to this Technical Reference?

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NSW DEPARTMENT OF PRIMARY INDUSTRIES

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