

<b>Title</b>	<b>Verify compliance of repaired reeling, trailing, and flexible electrical cables</b>		
<b>Level</b>	<b>4</b>	<b>Credits</b>	<b>1</b>

<b>Purpose</b>	<p>This unit standard covers compliance verification of repaired and tested reeling, trailing, and flexible cables for use in hazardous areas and explosive atmospheres, and their plugs/couplers assemblies by a responsible person. It requires the ability to work safely and to Standards, evaluate repairs against required standard and to maintain required repair records.</p> <p>This unit standard is intended for people who are responsible for electrical apparatus overhaul and verification of repaired reeling, trailing, and flexible cables in explosive atmospheres.</p> <p>People credited with this unit standard are able to:</p> <ul style="list-style-type: none"> <li>• demonstrate knowledge of reeling, trailing, and flexible cable, and repair techniques;</li> <li>• demonstrate knowledge of electrical fundamentals and testing techniques;</li> <li>• demonstrate knowledge of reeling, trailing, and flexible cable plug and coupler inspection and fitting techniques;</li> <li>• prepare to verify compliance of repaired cables;</li> <li>• carry out verification of compliance; and</li> <li>• complete and document cable repair work.</li> </ul>
----------------	---

<b>Classification</b>	Explosive Atmospheres > Electrical Apparatus in Explosive Atmospheres - Compliance
-----------------------	--

<b>Available grade</b>	Achieved
------------------------	----------

<b>Prerequisites</b>	Unit 26739, <i>Demonstrate introductory underpinning knowledge of electrical apparatus in explosive atmospheres</i> , or demonstrate equivalent knowledge and skills.
----------------------	---

## Guidance Information

- 1 This unit standard has been designed for training and assessment on-job or off-job in a simulated environment which includes explosion-protected apparatus and wiring systems similar to those encountered in a real workplace.

- 2 This unit standard is directly equivalent to Unit 2.26 *Verify compliance of repaired reeling, trailing and flexible cables* in the Australian/New Zealand Standard AS/NZS 4761.1:2008 *Competencies for working with electrical equipment in hazardous areas (EEHA) Part 1: Competency standards* and includes essential skills and knowledge as specified in the relevant clauses. It aligns with Australian Competency Standard *UEENEEM073A* from UEE07 Electrotechnology Training Package Version 3.1 (copyright Australian National Training Information Service).
- 3 This unit standard is intended to be delivered and assessed against in conjunction with other work skills related to general electrical overhaul or repair work.
- 4 References  
AS/NZS 1768:2007, *Lightning protection*;  
AS/NZS 2802:2000, *Electric cables – Reeling and trailing for mining and general use (other than underground coal mining)*;  
AS/NZS 2802:2000/Amendment 1:2003, *Electric cables – Reeling and trailing for mining and general use (other than underground coal mining)*;  
AS/NZS 3000:2007, *Electrical installations (known as the Australian/New Zealand Wiring Rules)*;  
AS/NZS 4761.1.2008, *Competencies for working with electrical equipment for hazardous areas (EEHA) Part 1 – Competency standards*;  
AS/NZS 4761.2.2008, *Competencies for working with electrical equipment in hazardous areas (EEHA) Part 2 – Guide to assessing competency*;  
AS/NZS 60079.10.1:2009, *Explosive atmospheres – Classification of areas – Explosive gas atmospheres*;  
AS/NZS 60079.14:2009, *Explosive atmospheres – Electrical installations design, selection and erection*;  
AS/NZS 60079.17:2009, *Explosive atmospheres – Electrical installations inspection and maintenance*;  
AS/NZS 60079.29.2.2008, *Explosive atmospheres – Gas detectors – Selection, installation, use and maintenance of detectors for flammable gases and oxygen*;  
AS/NZS 61241.0:2005, *Electrical apparatus for use in the presence of combustible dust – General requirements*;  
AS/NZS 61241.14:2005, *Electrical apparatus for use in the presence of combustible dust – Selection and installation*;  
AS/NZS 61241.2.1:2000, *Electrical apparatus for use in the presence of combustible dust – Test methods – Methods for determining the minimum ignition temperature of dust*;  
Electricity Act 1992;  
Electricity (Safety) Regulations 2010;  
Hazardous Substances and New Organisms Act 1996;  
Health and Safety in Employment Act 1992, and associated regulations;  
*Workplace Exposure Standards and Biological Exposure Indices*, available from the Department of Labour, <http://www.osh.govt.nz/order/catalogue/329.shtml>, and associated regulations;  
and their subsequent amendments and replacements.
- 5 Definitions  
*Appropriate personnel* – individuals with responsibilities for co-ordination, design, installation, maintenance, production, or servicing activities. This can include: site managers, project managers, engineers and technicians, technical experts, line

managers or supervisors, regulatory personnel, team leaders, other personnel designated by an organisation or enterprise.

*Certification documentation* – document(s) that assure(s) the conformity of a product, process, system, person, or organisation with specified requirements.

*Established procedures* – formal documented arrangements of an organisation, enterprise or statutory authority in regard to how work is to be done and by whom and may include but are not limited to – quality management systems, safety management systems, work clearance systems, work instructions, reporting systems, and arrangements for dealing with emergencies.

*Explosion-protection techniques* – techniques applied to the design of electrical apparatus, components, and systems to prevent the electrical energy from becoming an ignition source in the presence of flammable vapours and gases or combustible dusts in explosive atmospheres. See *explosion-protected apparatus*.

*Explosion-protected apparatus* – electrical apparatus to which specific measures are applied to avoid ignition of a surrounding explosive atmosphere. Such apparatus employs one or more of the following explosion-protection techniques:

For gas and vapour atmospheres

Ex d – flameproof;

Ex e – increased safety;

Ex i – intrinsic safety; with levels of protection Ex ia, Ex ib and Ex ic;

Ex n – non-sparking;

For dusts

Ex iD – intrinsic safety (dusts);

Ex tD – enclosed;

Others, less common

Ex p – pressurisation; Ex pD (dust);

Ex m – encapsulation, with levels of protection Ex ma, Ex mb, Ex mc (gases and vapours), and Ex mD (dusts);

Ex s – special protection; categorised by Zone of application; e.g. 'Ex s (Zone 0);

Ex o – oil immersion;

Ex q – sand filled;

Ex v – ventilation.

*Responsible persons* – for the purpose of this unit standard are responsible for the processes involved in the inspection and maintenance of explosion-protected equipment and possess, at a minimum, the following:

- a) general understanding of relevant electrical engineering;
- b) practical understanding of explosion-protection principles and techniques;
- c) understanding and ability to read and assess engineering drawings;
- d) working knowledge and understanding of relevant standards in explosion-protection;
- e) basic knowledge of quality assurance, including the principles of auditing, documentation, traceability of measurement and instrument calibration.

Such persons confine their involvement to the management of skilled personnel.

## 6 Range

- a) Assessment is take account of variations between the industry sectors and enterprises. For example, apparatus used in underground coal mining will be different in some respects from that used in a petrochemical plant.
- b) Occupational Safety and Health (OSH) policies and procedures may include but are not limited to – work permits and clearances, hazard monitoring, evacuation procedures, plant and electrical isolation.

- c The application of contingency management skills must be demonstrated for all outcomes and evidence requirements.
- d Established maintenance procedures must be followed.
- e All activities and evidence presented for all outcomes and performance criteria in this unit standard must be in accordance with safe working principles and practices, legislation, policies, procedures, ethical codes and Standards, safe and sound practice, and industry practice; and, where appropriate, manufacturers' instructions, specifications, and data sheets.
- f Evidence is required for repair to at least four separate cables, which have all of the following features and associated AS/NZS designated cable type:
  - Standard conductor construction:  
209; 210; 240; 241; 260; 275; 409; 412.1; 440; 441.1; 441; 450; 455.
  - Super flexible:  
245.
  - HV-EP-90 insulated:  
441; 450; 455.
  - Semi conductive extruded screens:  
241; 245; 441.1; 441; 450; 455.
  - Metal braided screens:  
209; 210; 240; 260; 409; 440; 450.
  - Interstitial earths:  
241; 245; 275; 412.1; 441.1; 441; 450; 455.
  - Interstitial pilots:  
240; 260; 440; 450; 455.
  - Central pilot:  
209; 210; 241; 245; 275; 409; 441.1; 441.
  - Pliable armour:  
260; 412.1.

## Outcomes and performance criteria

### Outcome 1

Demonstrate knowledge of reeling, trailing, and flexible cable, and repair techniques.

### Performance criteria

- 1.1 Cable types are described in terms of construction, materials, and design features.
  - Range function of each design feature, cable storage conditions, Standards to which cables are manufactured, applications.
- 1.2 Cable repair preparation and conductor splicing methods are explained.
  - Range criteria for determining the section of cable suitable to be joined; cable preparation and methods; splicing methods and application for power, pilot and earthing conductors.

- 1.3 Replacement of cable insulation is explained.
- Range preparation of power conductors prior to the application of insulation; types of insulation repair tapes and their application; techniques for applying insulation repair tape.
- 1.4 Techniques for joining pliable wire armour are described.
- 1.5 Techniques for replacing and repairing cable sheath are described.
- Range setting up a vulcanizer to vulcanize a repair, vulcanizing techniques and issues.

## Outcome 2

Demonstrate knowledge of electrical fundamentals and testing techniques.

### Performance criteria

- 2.1 Nature of electrical current and charge is explained.
- 2.2 Sources of electricity are identified.
- 2.3 Effects of current are described.
- 2.4 Single-source single-load circuits in terms of components that make up the circuit and the relationship between voltage and current.
- 2.5 Consequences of a short circuit and an open circuit are explained.
- 2.6 Insulation materials are described in terms of insulating properties and types and applications in cable technology.
- 2.7 Conducting materials are described in terms of conducting properties, factor affecting resistance and types and applications in cable technology.
- 2.8 Semiconducting materials are described in terms of properties, types, and applications in cable technology.
- 2.9 Electrical parameters of cables and their measurement are described.
- 2.10 Care and handling of testing devices and requirement for measuring instruments to have current calibration certification are explained.
- 2.11 Types of devices used for testing cables are identified.

2.12 Testing design parameters of cables and cable assemblies are explained.

Range cable tests – continuity, phase rotation, insulation resistance, high-voltage proof, partial break, symmetrical load, sheath hardness tests;  
test outcomes – causes of inaccuracies and methods to overcoming them, test device set up and safety procedures, interpretation of test readings, expected test results that show a cable complies with the Standards requirements.

### Outcome 3

Demonstrate knowledge of reeling, trailing, and flexible cable plug and coupler inspection and fitting techniques.

#### Performance criteria

3.1 Types of plugs and couplers are described.

3.2 Inspection process and techniques are explained.

Range parts of plug and couplers that are required to be inspected, inspection procedures, condition of each component's effect on fitness for service.

3.3 Fitting processes and techniques are described.

Range factors affecting the correct fitting of plug and coupler, cable preparation requirements and techniques, conductor termination methods and techniques.

### Outcome 4

Prepare to verify compliance of repaired cables.

#### Performance criteria

4.1 Specifications and instructions for cable repair are received and expected outcomes of the work confirmed with appropriate personnel.

4.2 Cable history test records are reviewed to identify potential issues and ascertain the viability of repair.

4.3 Certification documentation for plugs/couplers is obtained in order to check that the apparatus complies with the certification.

4.4 Tools, apparatus and testing devices needed to verify compliance are obtained and checked for correct operation, safety and currency of calibration certification.

**Outcome 5**

Carry out verification of compliance.

**Performance criteria**

- 5.1 Documentation of pre- and post-repair test results are compared with requirements of compliance standards.
- 5.2 Compliance verification measurements, tests and inspections carried out on the repaired cable and fitted plugs/couplers assemblies are in accordance with OHS and other established procedures.
- 5.3 Actions are taken to have any non-compliance identified by measurements, tests and inspections rectified in accordance with established procedures.

**Outcome 6**

Complete and document cable repair work.

**Performance criteria**

- 6.1 Verification of compliance is documented, including cable test history records in accordance with established procedures.
- 6.2 Verification of compliance is issued to the appropriate personnel in accordance with established procedures.

**This unit standard is expiring. Assessment against the standard must take place by the last date for assessment set out below.**

**Status information and last date for assessment for superseded versions**

Process	Version	Date	Last Date for Assessment
Registration	1	20 May 2011	31 December 2024
Review	2	2 March 2023	31 December 2024

**Consent and Moderation Requirements (CMR) reference**

0003

This CMR can be accessed at <http://www.nzqa.govt.nz/framework/search/index.do>.