



**Australian Government**

# **UEENEEM031A Overhaul and repair of explosion-protected equipment - coal mining**

**Release 4**

## UEENEEM031A Overhaul and repair of explosion-protected equipment - coal mining

### Modification History

| Release | Action | Core/Elective | Details                                                                                         | Points |
|---------|--------|---------------|-------------------------------------------------------------------------------------------------|--------|
| 4       | Update |               | Update pre-requisite<br>UEENEEM160A – Evaluate performance of LV electrical machines            |        |
| 4       | Update |               | Update pre-requisite<br>MEM15020C – Perform verification/certification or in-service inspection |        |

### Unit Descriptor

#### Unit Descriptor

1)

#### 1.1) Descriptor

This unit covers the explosion-protection aspects of overhauling and repairing explosion-protected equipment and the activities required of the responsible person. It requires the ability to establish and document the level of work required, arranging for the overhaul/repair to be carried, verify compliance of overhauled/repared equipment and complete the necessary documentation.

This unit is directly equivalent to the Unit 2.8 *Overhaul and repair of explosion-protected equipment* in the Australian/New Zealand Standard AS/NZS 4761.1 *Competencies for working with electrical equipment for hazardous areas (EEHA) Part 1: Competency Standards*. Equivalence includes endorsement in the explosion-protection techniques listed in the Range statement of this unit.

## Application of the Unit

### Application of the Unit 4)

This unit augments formally-acquired competencies applying to electrical, electronic, and/or mechanical equipment repair workshop supervisory job function. It is suitable for employment-based programs under an approved contract of training.

## Licensing/Regulatory Information

### 1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the work place for equipment that is disconnected from electrical supply. However practice in this unit is subject to regulations directly related to occupational health and safety and contracts of training such as new apprenticeships.

## Pre-Requisites

### Prerequisite Unit(s) 2)

#### 2.1) Competencies

Granting competency in this unit shall be made after or concurrently with confirming competency in any one of the following units.

|                 |                                                |
|-----------------|------------------------------------------------|
| UEENEEG1<br>60A | Evaluate performance of LV electrical machines |
|-----------------|------------------------------------------------|

|               |                                                             |
|---------------|-------------------------------------------------------------|
| MEM15020<br>C | Perform verification/certification or in-service inspection |
|---------------|-------------------------------------------------------------|

## Employability Skills Information

|                             |                                                                                                                                                                                                                                                                                                |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Employability Skills</b> | <p>3)</p> <p>The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.</p> |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Elements and Performance Criteria Pre-Content

|                                                       |                                                                                                                                                                                               |
|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6) Elements describe the essential outcomes of a unit | <p>Performance criteria describe the required performance needed to demonstrate achievement of the element.</p> <p>Assessment of performance is to be consistent with the evidence guide.</p> |
|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Elements and Performance Criteria

| ELEMENT                                     | PERFORMANCE CRITERIA                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 Prepare for overhaul/repair of equipment. | <p>1.1 Instructions on overhaul and/or repair are received and expected outcomes of the work confirmed with appropriate personnel.</p> <p>1.2 Certification documents for the equipment are sought and received in order to check that the equipment complies with the certification.</p>                                                                                                                                       |
| 2 Establish the level of overhaul required. | <p>2.1 Measurements, tests and inspections are carried out on the equipment in accordance with OHS and other established procedures.</p> <p>2.2 The extent of work to be done is determined from measurement, test and inspection results and their correspondence with original certification and the requirements of Standards.</p> <p>2.3 Specifications and instructions for the overhaul/repair work are documented in</p> |

| ELEMENT                                                       | PERFORMANCE CRITERIA                                                                                                                                                          |
|---------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                               | accordance with requirements.                                                                                                                                                 |
| 3 Arrange overhaul/repair work.                               | 3.1 Arrangements are made for the overhaul/repair work to be done in accordance with established procedures.                                                                  |
|                                                               | 3.2 A copy of overhaul/repair specifications and instructions is provided to personnel responsible for carrying out the work.                                                 |
| 4 Verify that equipment complies with original certification. | 4.1 Level of testing required to verify that overhauled/repaired equipment complies with original certification specifications is determined in accordance with requirements. |
|                                                               | 4.2 Verification tests are conducted in accordance with established procedures.                                                                                               |
| 5 Document overhaul/repair work.                              | 5.1 Equipment marking is checked and marked where applicable, in accordance with original certification.                                                                      |
|                                                               | 5.2 Overhaul/repair work is documented in accordance with requirements stating that the equipment complies with the original certification.                                   |
|                                                               | 5.3 Documentation of the repair work is retained and a copy is issued with the equipment for inclusion in the verification dossier.                                           |

## Required Skills and Knowledge

### REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and overhauling and repairing explosion protected equipment.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

#### **KS01-EM031 Explosion-protection equipment overhaul and repair A**

Evidence shall show an understanding of explosion-protection equipment overhaul and repair to an extent indicated by the following aspects:

T1 Occupational Health and Safety responsibilities related to hazardous areas encompassing:

- the main features and purpose of a ‘clearance to work’ system (includes hot work permit systems).
- typical safety procedures that should be followed before entering a hazardous area;
- the purpose of gas detectors and their limitations;
- effects of temperature on gas and vapour detection;
- frequency of monitoring for presence of gas or vapours, i.e. effects of temperature rise;
- factors affecting the accuracy of gas detectors, for example, contamination, condensation, temperature;
- safety in use of gas detectors, for example, ‘read and run concept’
- the safety precautions to be taken when working in a hazardous area.

T2 The roles of the parties involved in the safety of hazardous areas encompassing:

- common Acts and Regulations related to the safety of hazardous areas and the Authorities responsible for their implementation;
- where assistance and further information can be obtained to assist persons with hazardous area responsibilities, for example, Standard bodies, experienced consultants; and
- the hazardous area responsibilities of the owner of premises in which a hazardous area exists; the occupier of premises in which a hazardous area exists; enterprises and personnel engaged in installation and/or maintenance of

## REQUIRED SKILLS AND KNOWLEDGE

explosion-protection systems; enterprises and personnel engaged in the classification of hazardous areas and/or design of explosion-protection systems; enterprises and personnel engaged in the overhaul, modification and/or assessment of explosion-protected equipment; enterprises and personnel engaged in the inspection of explosion-protection installations; manufacturers of explosion-protected equipment; designated authorities; insurers.

T3 Properties of combustible substances and their potential to create an explosive hazard encompassing:

- condition in the workplace that will lead to an explosion;
- the terms ‘combustion’, ‘ignition’ and ‘propagation’;
- explosive range of substances encountered in the workplace i.e. LEL/UEL;
- explosive parameters of substances as given in tables of substance properties
- Note: Combustible materials are gases, vapours (from liquids), and dusts; flash point.
- the difference between gases and vapours; and
- the toxic nature of gases and vapours and potential harmful consequences.

T4 The nature of hazardous areas encompassing:

- the Standards definition of a ‘hazardous area’;
- the recommended methods for classifying the type and degree of explosion hazard in an area;
- hazardous area classifications as defined by Standards; and
- factors that are considered when a hazardous area is classified.
- the basics of how explosion-protection is achieved by the methods of exclusion, containment, energy limitation, dilution, avoidance of ignition source

T5 Explosive-protected equipment encompassing:

- The principles of each explosion-protection technique, the methods used and how each technique works (Flameproof (Ex ‘d’); Increased safety (Ex ‘e’); Non-sparking (Ex ‘n’); Intrinsic safety (Ex ‘i’) and Pressurization (Ex ‘p’) for gas atmospheres and Dust-exclusion enclosures (Ex ‘tD’); Pressurization (Ex ‘pD’); Encapsulation (Ex ‘mD’); and Intrinsic safety (Ex ‘iD’) for dusts)
- How explosion-protected equipment is identified by the ‘Ex’ symbol marked on the equipment, including old equipment and equipment certified in another country.
- Visible conditions or actions that would void the explosion-protection provided by a particular technique.

T6 Explosion-protection equipment — Ex certification schemes encompassing:

- Purpose and scope of certification schemes.
- Schemes accepted in Australia and New Zealand.

## REQUIRED SKILLS AND KNOWLEDGE

- Schemes commonly used in countries other than Australia and New Zealand.
  - Processes for having equipment certified under the acceptable Ex schemes — scheme procedures; quality management requirements; conformance testing and assessment; and requirements for ongoing certification.
- T7 Flameproof (Ex ‘d’) explosion-protection technique encompassing:
- The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex ‘d’) technique. (Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries).
  - Typical situations where the flameproof explosion-protection technique is used;
  - Actions or conditions that would void the protection provided the Flameproof technique;
  - The use of Standards in determining the requirements to which the installation of flameproof explosion-protected apparatus shall comply.
- T8 Increased safety (Ex ‘e’) explosion-protection technique encompassing:
- The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex ‘e’) technique (Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance distances, absence of sparking contacts and enclosure entries).
  - Typical situations where the Increased safety explosion-protection technique is used;
  - Actions or conditions that would void the protection provided the Increased safety technique;
  - The use of Standards in determining the requirements to which the installation of Increased safety explosion-protected apparatus shall comply.
- T9 Non-sparking (Ex ‘n’) explosion-protection technique encompassing:
- The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex ‘n’) technique (Examples of characteristics and design features are creepage and clearance distances and restricted breathing).
  - Typical situations where the Non-sparking explosion-protection technique is used;
  - Actions or conditions that would void the protection provided the Non-sparking technique; and
  - The use of Standards in determining the requirements to which the installation of Non-sparking explosion-protected apparatus shall comply.
- T10 Intrinsic safety (Ex ‘i’) explosion-protection technique encompassing:
- The purpose and characteristics of the design features of apparatus and circuits

## REQUIRED SKILLS AND KNOWLEDGE

protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances).

- Typical situations where the Intrinsic safety explosion-protection technique is used;
- Actions or conditions that would void the protection provided the Intrinsic safety;
- The use of Standards in determining the requirements to which the installation of Intrinsic safety explosion-protected apparatus shall comply.

T11 Pressurization (Ex ‘p’) explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex ‘p’) technique (Examples of characteristics and design features are exclusion and dilution; purge periods, controlled shut down, monitoring and sources of internal release).
- Typical situations where the pressurization explosion-protection technique is used;
- Actions or conditions that would void the protection provided the pressurization technique;
- The use of Standards in determining the requirements to which the installation of pressurization explosion-protected apparatus shall comply.

T12 Enclosures for dusts (Ex ‘tD’) - explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts (Examples of characteristics and design features are for enclosures; pressurization; encapsulation; and intrinsic safety).
- Typical situations where the each dust explosion-protection technique is used;
- Actions or conditions that would void the protection provided the each dust technique;
- The use of Standards in determining the requirements to which the installation of dust explosion-protected apparatus shall comply.

T13 Common characteristics of explosion-protection techniques encompassing:

- The purposes of ‘temperature classification’ and ‘gas grouping/apparatus grouping’.
- Compliance plate markings.
- Limitations of non-metallic or specific alloy enclosures.
- The purpose of conformity and certification/approval for equipment used in hazardous areas.
- Environmental conditions that may impact on explosion-protection techniques.
- The principles and applications of other and mixed explosion-protection

## REQUIRED SKILLS AND KNOWLEDGE

techniques (Other techniques include encapsulation Ex ‘m’; oil-immersion Ex ‘o’; powder-filling Ex ‘q’; ventilation Ex ‘v’ and special protection Ex ‘s’).

- Features and purpose of conduit seals and cable termination devices designed for use in hazardous areas (These include conduit seals and barrier and compression glands for cables with or without armouring, screening and/or drain wires).

T14 The scope and limitations for overhaul and repair of explosion-protected equipment encompassing:

- the requirements for registration of a workshop;
- the requirements of a ‘competent person’ for a registered workshop engaged in the overhaul/repair of explosion-protected equipment; and
- the scope and limitations of work permitted under workshop registration.

T15 Overhaul and repair (technical) Standard encompassing:

- the documentation/information required to enable overhaul/repair to be undertaken;
- categories of work, for example, overhaul; no repair; overhaul-repair;
- modifications that are, and are not, permitted within the equipment certification; and
- the requirements for overhaul/repair processes relevant to the type of protection and equipment.

T16 Requirements for documentation and identification of overhauled/repairs explosion-protected encompassing:

- overhaul/repair report document; and
- requirements for distribution of overhaul/repair reports.

T17 Quality management systems as covered by international Standards encompassing:

- documentation regime of a quality management system;
- principle of document and data control covering both internally and externally generated documents and data; and
- principles of process control as applied to the overhaul and repair of explosion-protected equipment.

T18 The level of overhaul/repair required encompassing:

- Standards and their use for determining the requirement for a specific explosion-protection technique;
- measurement/tests and equipment required to determine whether an item of equipment meets the certification requirements;
- requirements for maintaining the accuracy/calibration of measuring/test equipment;

## **REQUIRED SKILLS AND KNOWLEDGE**

- measurement/test procedures for determining whether an item of equipment meets the certification requirements;
- level of overhaul/repair required from comparisons of test results and requirements specified in the original certification; and
- specifying overhaul/repair work required to restore an item of explosion-protected equipment to conform with the original certification.

T19 Measurement/tests procedures to verify that an item of equipment meets the original certification requirements

## Evidence Guide

### EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all components parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

#### Overview of Assessment

##### 9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

#### Critical aspects of 9.2)

## EVIDENCE GUIDE

### **evidence required to demonstrate competency in this unit**

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, policies and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Overhaul and repair explosion-protected equipment as described in 8) and including:
    - A Following OHS procedures.
    - B Interpreting certification documentation and Standards.
    - C Measuring, testing and inspecting equipment for compliance with certification and Standards.
    - D Specifying overhaul/repair work.

## EVIDENCE GUIDE

- E Documenting overhaul/repair work.
- F Using quality systems.
- G Applying relevant contingency management skills.

### Context of and specific resources for assessment

#### 9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should also be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to overhauling and repairing explosion protected equipment.

### Method of assessment

#### 9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment primarily intended for learning/assessment which incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

### Concurrent assessment and relationship with other units

#### 9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with competence in the overhaul and repair of general low-voltage or extra-low-voltage equipment.

## **Range Statement**

### **RANGE STATEMENT**

**8)** This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to any hazardous area of coal mining and all the following explosion-protection techniques:

- Flameproof, (Ex 'dI')
- Increased safety, (Ex 'eI')
- Intrinsic safety, (Ex 'iI')
- Pressurization, (Ex 'p')

Note: 'I' signifies Group I equipment

The following constants and variables included in the element/performance criteria in this unit are fully described in the Volume 2, Part 2.1.

## **Unit Sector(s)**

Not Applicable

## Competency Field

### 2.2) Literacy and numeracy skills

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

|         |   |         |   |          |   |
|---------|---|---------|---|----------|---|
| Reading | 3 | Writing | 3 | Numeracy | 3 |
|---------|---|---------|---|----------|---|

## Custom Content Section

|                  |         |
|------------------|---------|
| Competency Field | 5)      |
|                  | Hazards |