



Australian Government

Department of Education, Employment and Workplace Relations

UEENEEM077A Install and maintain the integrity of fixed gas detection equipment

Release: 2

UEENEEM077A Install and maintain the integrity of fixed gas detection equipment

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1)

1.1) Descriptor

This unit covers the installation, calibration and response checking of permanent gas detection equipment. It requires the ability to match equipment with that specified for a given location and to use manufacturer manuals to maintain accuracy of gas monitoring devices.

This unit is directly equivalent to the Unit 2.6 *Install and maintain integrity of fixed gas detection 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 other formally-acquired competencies in a relevant industry and shall be used only in conjunction such competencies. It applies to electrical, instrumentation, electronics and data communication installation and maintenance job functions at AQF 3 level or higher.

Note:

Examples of relevant industries include aviations, electrical installation and maintenance, fuel storage and dispensing industrial process, instrumentation and control, marine, material handling and storage, mining, and petrochemical.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. Other conditions related to communications, electrical work, fire protection, gas work, high voltage work, refrigeration/air conditioning and security may apply in some jurisdictions subject to regulations. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as 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.

UEENEEM023A Install explosion-protected equipment and wiring systems coal mining
OR

UEENEEM024A Install explosion-protected equipment and wiring systems gas atmospheres
OR

UEENEEM025A Install explosion-protected equipment and wiring systems dust atmospheres
OR

UEENEEM027A Maintain equipment in hazardous areas coal mining
OR

UEENEEM028A Maintain equipment in hazardous areas gas atmospheres
OR

UEENEEM029A Maintain equipment in hazardous areas dust atmospheres.

For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2

Employability Skills Information

Employability Skills

3)

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.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit

Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT

PERFORMANCE CRITERIA

1 Prepare for installation gas detection equipment.	1.1	OHS policies and procedures for preparing to work in a hazardous area are followed.
	1.2	Location in which gas detection of equipment is to be installed is determined from design documents.
	1.3	Gas detection equipment markings are checked to ensure they conform to design specifications and certification documents.
	1.4	Certification document supplied with each item of gas detection equipment is collected for inclusion in site records.
2 Install gas detection equipment.	2.1	OHS policies and procedures are followed.
	2.2	Gas detection equipment is installed in appropriate locations and in conformance with design specifications, standards and within the limits specified by the equipment certification

ELEMENT

PERFORMANCE CRITERIA

- and manufacturer.
- 2.3 Gas detection is installed in a manner that does not reduce the type of protection afforded by any associated explosion-equipment design.
- 3 Response checking and calibration of gas detection equipment.
- 3.1 OHS policies and procedures are followed.
- 3.2 Gas detection equipment is formally checked and calibrated periodically in accordance with established site requirements and instrument accuracy.
- 3.3 Installation and maintenance of gas detection equipment is documented in accordance with requirements and forwarded to personnel responsible for compiling 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 installing and maintaining integrity of fixed gas detection equipment.

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

KS01-EM077A Gas detection installation and maintenance

Evidence shall show an understanding of gas detection installation and maintenance to an extent indicated by the following aspects:

T1 Explosion-protection equipment — Ex certification schemes encompassing:

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

T2 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.

T3 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

REQUIRED SKILLS AND KNOWLEDGE

Increased safety explosion-protected apparatus shall comply.

T4 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.

T5 Intrinsic safety (Ex 'i') explosion-protection technique encompassing:

- The purpose and characteristics of the design features of apparatus and circuits 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.

T6 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.

T7 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.

REQUIRED SKILLS AND KNOWLEDGE

T8 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 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).

T9 Preparation to install and maintain explosion-protected equipment in hazardous areas encompassing:

- OHS procedures to be followed when working in a hazardous area;
- the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment;
- the typical contents of a verification dossier and their purpose; and
- limitations in the use of tools and testing devices in hazardous areas.

T10 The relationship between explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions encompassing:

- the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment;
- matching explosion-protected equipment with certification documents and the equipment specified for an installation; and
- the location the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.

T11 Installation Standards and requirements applicable to hazardous encompassing:

- the wiring systems permitted and not permitted in or above hazardous areas;
- equipment not permitted in or above hazardous areas;
- the regulations and Standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied; and
- the documentation required as a record of the installation process, including certification documentation.

T12 Maintenance procedures in hazardous areas that will ensure the integrity of the explosion-protection technique encompassing:

REQUIRED SKILLS AND KNOWLEDGE

- the purpose of a maintenance schedule;
- the purpose and extent of ‘close’, ‘sample’ and ‘periodic’ inspections;
- the features of each explosion-protection techniques that should be included in a maintenance schedule;
- the impact of environmental conditions on explosion-protected equipment, including corrosion and frequency of maintenance;
- the documentation requirements for recording the maintenance process and results;
- the use of Standards in determining the requirements with which the design of explosion-protected apparatus shall comply.

T13 Cable termination types suitable for use in hazardous areas encompassing:

- explosion protection features of cable terminations devices.
- selecting compliant cable termination devices.

T14 Terminating cables suitable for use in hazardous areas encompassing:

- installing conduit systems, where applicable, including seals to meet hazardous areas requirements. (Gases only.)
- terminating a cable with a barrier gland. (Gases only.)
- terminating a multipair, SWA, overall screened, individual screened cable into an enclosure.
- testing termination/connections of installed cables/circuits.

T15 Techniques for the installation and maintenance of fixed gas detection equipment encompassing:

- Use of manufacturer’s instruction manual; for example, operating instructions, adjustments procedures and operational limitations.
- Installation and maintenance of Standards and/or Codes of Practice for gas detection equipment.

T16 Location of fixed sample points or sensors encompassing:

- optimal sensing;
- maintainability and ease of calibration; and
- protection against environmental and mechanical damage.

T17 Gas and vapour releases encompassing—

- the nature of a site; and
- natural and mechanical ventilation.

T18 Common problems with fixed gas detectors.

T19 Calibration and response checking.

T20 Factors to consider in the evaluation and selection of portable and fixed gas detection equipment encompassing:

- Requirements for gas detection for a given situation:
 - sources for obtaining data on physical chemistry of the gas to be detected; and

REQUIRED SKILLS AND KNOWLEDGE

- sources for obtaining data on the conditions under which the gas may be present.
- processes of assessing the specifications of gas detection equipment against established requirements.

T21 Detecting gases and vapours encompassing:

- apparatus capability and users' knowledge;
- propagation of gases - This includes release of gas and vapours, ventilation, density, temperature and location.
- gases to be detected and not to be detected;
- intended application;
- environmental effects;
- safety when monitoring for flammable gases where personnel could be present;
- common properties of gases and vapours - This includes density of gases, vapours and their mixtures; effect of temperature on density; LEL and UEL of combustibles and toxicity.
- the differences between detecting gases and vapours - These include added complication of evaporation, condensation and temperature effects of vapours and their effect on propagation, calibration and detection, including sampling.

T22 Oxygen deficiency and effects on safety encompassing:

- chemical reaction of oxygen with solid products;
- chemical reaction of oxygen with gaseous products; and
- dilution of the air by displacement by some other gas or vapour.

T23 Measuring principles of catalytic sensors, electrochemical sensors, infrared sensors and semi-conductor sensors encompassing:

- common applications;
- limitations and safety;
- interferences of other gases with the measurement; and
- poisoning of the sensor.

NOTE: Detailed information on gas detection is given in AS/NZS 60079.29.2.

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

EVIDENCE GUIDE

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 evidence required to demonstrate competency in this unit

9.2)

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

EVIDENCE GUIDE

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:
 - Install and maintain integrity of fixed gas detection equipment as described in 8) and including:
 - A Working safely in a potentially hazardous area or confined space including the use of work permits and clearances, hazard monitoring and evacuation procedures and plant and electrical isolation
 - B Handling and installing equipment and wiring in a manner that does not reduce the integrity afforded by the equipment design
 - C Checking equipment against certification documents and design specifications
 - D Documenting installation and maintenance activities
 - E Following procedures to maintain the integrity of gas detection
 - F Applying relevant contingency management skills.

EVIDENCE GUIDE

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 installing and maintaining integrity of fixed gas detection 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 any prerequisite unit.

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 classified hazardous area and explosion-protection techniques specified for at least one of the prerequisites.

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
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2.2) Literacy and numeracy skills

Competency Field 5)

Hazards