



Australian Government

UEENEEM079A Design of gas detection systems

Release: 3

UEENEEM079A Design of gas detection systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor

1)

1.1) Descriptor

This unit covers the selection aspects of gas detection equipment for the design of gas detection systems and installations for hazardous areas. It requires the ability to establish equipment parameters and to evaluate these against manufacturer specifications.

This unit is directly equivalent to the Unit 2.19 *Design gas detection systems and installations* 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 engineering design job function at, at least, an engineering associate level.

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 do not require a license to practice in the work place. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training.

Pre-Requisites

Prerequisite	Unit(s)	2)
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2.1) Competencies

Granting competency in this unit shall be made only after competency in any of the following units.

UEENEEM0 Design explosion-protected electrical
57A systems and installations gas atmospheres

OR

UEENEEM0 Design explosion-protected electrical
58A systems and installations dust
atmospheres

OR

UEENEEM0 Design explosion-protected electrical
59A systems and installations pressurisation

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 Establish gas detection parameters.	1.1	Requirements for gas detection are obtained or established with the appropriate personnel.
	1.2	The parameters for gas detection are obtained and documented from consultation with appropriate personnel.
	1.3	An explosion-protection requirement for gas detection equipment is established from area classification documents.
2 Select gas detection equipment.	2.1	Manufacturer specification and limitations of appropriate gas equipment are sought.
	2.2	Manufacturer specification and limitations are compared with the established parameters for gas detection.
	2.3	Gas detection equipment is selected on compatibility with the established parameters and economic considerations.

ELEMENT	PERFORMANCE CRITERIA
3 Document details of gas detection equipment to be used.	3.1 Proposed gas detection equipment is checked under established procedures for compliance with all relevant requirements.
	3.2 A complete specification for gas detection equipment to be used is documented in accordance with established procedures.

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 designing gas detection systems.

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

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Gas detection systems

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

T1 Maintenance procedures in hazardous areas that will ensure the integrity of the explosion-protection technique encompassing:

- 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.

T2 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.

T3 Location of fixed sample points or sensors encompassing:

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

T4 Gas and vapour releases encompassing—

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

REQUIRED SKILLS AND KNOWLEDGE

T5 Common problems with fixed gas detectors.

T6 Calibration and response checking.

T7 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
 - 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.

T8 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.

T9 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.

T10 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.

T11 Measuring principles of thermal conductivity sensors, flame ionization, detectors (FID), flame temperature analyzers (FTA), photo ionisation detectors (PID) and paramagnetic oxygen detectors.

REQUIRED SKILLS AND KNOWLEDGE

T12 Selection of apparatus encompassing:

- environment;
- system response delay; and
- gas to be detected with respect to measurement principles.

T13 Behaviour of gas and vapour releases encompassing:

- rate of release;
- density; and
- temperature/pressure.

T14 Design and installation encompassing:

- sensor, sampling or open path;
- location;
- site; and
- environmental conditions.

NOTE: These include adverse weather, excess temperature, vibration and other mechanical interference, hosing, airborne contaminants and corrosion.

T15 Integrity and safety encompassing:

- redundancy; and
- protection against loss of power supply.

T16 Commissioning and scheduled maintenance encompassing:

- sample lines;
- diffusion sensor screens;
- initial gas calibration;
- adjustment of alarm set points; and
- plans and records.

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 9.1)

EVIDENCE GUIDE

Assessment

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:
 - Design gas detection systems as described in 8) and including:
 - A Accessing and interpreting gas detection needs and parameters.
 - B Providing selection options based on parameters for gas detection and economic considerations.
 - C Following checking and documentation procedures.
 - D 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 designing gas detection systems.

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 of the following units.

UEENEEM056A Design explosion-protected electrical systems and installations gas atmospheres

UEENEEM057A Design explosion-protected electrical systems and installations gas atmospheres

EVIDENCE GUIDE

UEENEEM058A Design explosion-protected electrical
systems and installations dust atmospheres

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 must be demonstrated in relation to the design of electrical systems for any classified explosive gas atmosphere hazardous area.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in 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	5	Writing	5	Numeracy	5
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2.2) Literacy and numeracy skills

Competency Field 5)

Hazards

