



Australian Government

UEENEEM054A Plan electrical installations for hazardous areas - gas atmospheres

Release 4

UEENEEM054A Plan electrical installations for hazardous areas - gas atmospheres

Modification History

Release	Action	Core/Elective	Details	Points
4	Update		Update recommended pre-requisite UEENEEG125A Plan electrical installations with a low voltage demand up to 400 A per phase	
4	Update		Update recommended pre-requisite UEENEEI112A Verify compliance and functionality of instrumentation and control installations	

Unit Descriptor

Unit Descriptor

1)

1.1) Descriptor

This unit covers the explosion-protection aspects planning electrical installations for hazardous areas. It requires the ability to identify hazardous area zones from classification diagrams, or from examples of previously classified areas or those given in Standards, and to select and locate explosion-protected equipment and wiring systems and other items that may influence the explosion-protection technique.

This unit is directly equivalent to the Unit 2.17 *Plan electrical installations for hazardous areas* 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 design job functions.

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 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:

UEENEEM0 Install explosion-protected equipment and
24A wiring systems gas atmospheres

OR

Prerequisite Unit(s) 2)

Competencies in planning general electrical/instrumentation installations at AQF4 or equivalent. Examples are (but not limited to):

UEENEEG1 Plan electrical installations with a low voltage demand up to 400 A per phase

UEENEEI11 Verify compliance and functionality of instrumentation and control installations

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 Verify hazardous classification for the area. | 1.1 Nature and characteristics of explosion hazards in the area are identified from plant specifications. |
| | 1.2 In the absence of classification documentation, arrangements are made to ensure the explosion hazard in the area is assessed and the area |

ELEMENT

PERFORMANCE CRITERIA

		classified.
	1.3	Classification, extent of zonings of the area, gas groups and temperature class are verified by reference to classification documents or Standards in which the explosion hazard, area classification and zonings are clearly identified.
2	Select and check equipment, wiring and accessories.	<p>2.1 Equipment and accessories are selected to suit area activities and comply with explosion-protection requirements.</p> <p>2.2 Wiring systems are selected to suit area activities, and comply with explosion-protection, load and duty requirements.</p> <p>2.3 Equipment compliance certification is checked for suitability for the area classification and zonings.</p> <p>2.4 Cables and accessories are checked for suitability for the area classification and zonings and load and duty requirements.</p>
3	Document installation plan.	<p>3.1 Installation specifications are documented in accordance with established procedures and requirements.</p> <p>3.2 Arrangements are made to file as-built installation documentation in the verification dossier in accordance with established procedures and requirements.</p>

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 electrical installations in hazardous areas.

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

KS01-EM054 Hazardous areas electrical installation planning

Evidence shall show an understanding of hazardous areas electrical installation planning 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 explosion-protection systems; enterprises and personnel engaged in the

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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.
- Schemes commonly used in countries other than Australia and New Zealand.

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- 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 protected by the Intrinsic safety (Ex ‘i’) technique (Examples of characteristics

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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 techniques (Other techniques include encapsulation Ex 'm'; oil-immersion Ex

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‘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 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.

T15 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.

T16 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.

T17 Cable termination types suitable for use in hazardous areas encompassing:

- Explosion protection features of cable terminations devices.
- Selecting compliant cable termination devices.

T18 Interpretation of documents showing the classification of a hazardous area encompassing:

- the methods used for classifying hazardous areas;
- the delineation of zones, temperature classes and gas groups of a given hazardous area from classification documents;
- the delineation of zones, temperature classes and gas groups of a given

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hazardous area from similar situations previously classified, such as those given in Standards; and

- situations where classification needs to be undertaken by a person competent in non-specific area classification i.e. a person who has attained either Units UEENEEM052A/UEENEEM053A Classify hazardous areas – gas atmospheres or dust atmospheres.

T19 Selecting and checking equipment, wiring and accessories encompassing:

- the impact of environmental conditions, such as corrosion and maintenance requirements, on explosion-protected equipment and accessories;
- explosion-protected equipment and accessories to suit the requirements of given hazardous areas;
- wiring systems to suit the requirements of a hazardous area, load and duty requirements and consideration of capacitive/inductive effects and inductance/resistance ratio where applicable;
- earthing and equipotential bonding requirements for a hazardous area installation;
- procedures used to check the compliance certification of equipment used in a hazardous area; and
- electrical protection systems and devices, for example, overloads, earth fault protection) appropriate to an explosion-protection technique.

T20 Documentation of hazardous area installation design encompassing:

- the items that should be included in the documentation for the design of a hazardous area installation;
- installation layout, specification, work schedule and other documentation required for inclusion in a verification dossier; and
- the essential documentation that needs to be specified/requested from manufacturers when purchasing explosion-protected equipment/ accessories.

T21 Common and specific hazardous areas for which classification examples are given in Standards encompassing:

- The example classifications given in Standards
- application of the classifications given in Standards to similar situations for the purpose of planning of electrical installations.

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)

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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:
 - Design electrical installations in hazardous areas as described in 8) and including:
 - A Interpreting area classification documentation or Standards.
 - B Classifying area from Standards.
 - C Documenting area classification.
 - D Selecting equipment for a given classified area.
 - E Selecting wiring systems for a given classified

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area.

- F Checking equipment certification for suitability for a given classified area. Documenting as-built installation.
- 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 designing electrical installations in hazardous areas.

EVIDENCE GUIDE

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 any of the following units:

UEENEEM024A Install explosion-protected equipment and wiring systems gas atmospheres

Competencies in planning general electrical/instrumentation installations at AQF4 or equivalent.

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 gas hazardous area and all the following explosion-protection techniques:

- Flameproof, (Ex 'd')
- Increased safety, (Ex 'e')
- Intrinsic safety, (Ex 'i')
- Non-sparking, (Ex 'n')

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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Custom Content Section

Competency Field 5)

Hazards