

Title	Design gas detection systems and installations for hazardous areas		
Level	6	Credits	8

Purpose	<p>This unit standard covers the selection aspects of gas detection apparatus for the design of gas detection systems and installations for hazardous areas. It requires the ability to establish apparatus parameters and to evaluate these against the manufacturer’s specifications.</p> <p>This unit standard is intended for engineers who are responsible for the design of gas detection systems and installations for hazardous areas.</p> <p>People credited with this unit standard are able to:</p> <ul style="list-style-type: none"> • demonstrate knowledge of requirements and techniques for the installation and maintenance of fixed gas detection apparatus; • establish gas detection parameters; • select gas detection apparatus; and • document details of gas detection apparatus to be used.
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Classification	Explosive Atmospheres > Electrical Apparatus in Explosive Atmospheres - Operations
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Available grade	Achieved
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Prerequisites	Unit 26742, <i>Demonstrate underpinning knowledge of permanently-installed gas detection apparatus in explosive atmospheres</i> , and Unit 17072, <i>Design explosion-protected electrical systems and installations</i> , or demonstrate equivalent knowledge and skills.
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Guidance Information

- 1 This unit standard has been designed for training and assessment on-job or off-job in a simulated environment which includes explosion-protected apparatus and wiring systems similar to those encountered in a real workplace.
- 2 Candidates who achieve this unit standard will be given industry endorsement for explosion-protection techniques relating to one or more of: mining, gases or dusts, depending on which explosion-protection technique competence is demonstrated. The explosion-protection endorsements are as follows:

Unit endorsement suffix Competence demonstrated

Ex 'd' Flameproof

Ex 'i' Intrinsic safety

Ex 's' Special protection

'I' Group I apparatus only.

For further detail about the explosion-protection endorsements, please contact ETITO at <http://www.etito.co.nz>.

- 3 This unit standard is directly equivalent to Unit 2.19 *Design gas detection systems and installations* in the Australian/New Zealand Standard AS/NZS 4761.1:2008 *Competencies for working with electrical equipment in hazardous areas (EEHA) Part 1: Competency standards* and includes essential skills and knowledge as specified in the relevant clauses. It aligns with Australian Competency Standard *UEENEEM079A* from UEE07 Electrotechnology Training Package Version 3.1 (copyright Australian National Training Information Service).
- 4 This unit standard is intended to be assessed against in conjunction with other work skills related to designing electrical systems and installations.
- 5 Competence shall be demonstrated in relation to the design of electrical systems for any classified explosive gas atmosphere and explosive protection techniques, as well as sampling systems.
- 6 References
AS/NZS 1826:2008, *Electrical equipment for explosive gas atmospheres – Special protection – Type of protection 's'*;
AS/NZS 3000:2007, *Electrical installations (known as the Australian/New Zealand Wiring Rules)*;
AS/NZS 4641:2007, *Electrical apparatus for detection of oxygen and other gases and vapours at toxic levels – General requirements and test methods*;
AS/NZS 4761.1:2008, *Competencies for working with electrical equipment for hazardous areas (EEHA) Part 1 – Competency standards*;
AS/NZS 4761.2:2008, *Competencies for working with electrical equipment for hazardous areas (EEHA) Part 2 – Guide to assessing competency*;
AS/NZS 60079.0:2008, *Explosive atmospheres – Equipment – General requirements*;
AS/NZS 60079.1:2007, *Explosive atmospheres – Equipment protection by flameproof enclosures 'd'*;
AS/NZS 60079.10.1:2009, *Explosive atmospheres – Classification of areas – Explosive gas atmospheres*;
AS/NZS 60079.11:2006, *Explosive atmospheres – Equipment protection by intrinsic safety 'i'*;
AS/NZS 60079.14:2009, *Explosive atmospheres – Electrical installations design, selection and erection*;
AS/NZS 60079.17:2009, *Explosive atmospheres – Electrical installations inspection and maintenance*;
AS/NZS 60079.20:2000, *Explosive atmospheres – Data for flammable gases and vapours, relating to the use of electrical apparatus*;
AS/NZS 60079.29.1:2008, *Explosive atmospheres – Gas detectors – Performance requirements of detectors for flammable gases*;

AS/NZS 60079.29.2.2008, *Explosive atmospheres – Gas detectors – Selection, installation, use and maintenance of detectors for flammable gases and oxygen*;
Standards Australia HB13-2007, *Electrical equipment for hazardous areas*;
Electricity Act 1992;
Electricity (Safety) Regulations 2010;
Hazardous Substances and New Organisms Act 1996;
Health and Safety in Employment Act 1992;
Workplace Exposure Standards and Biological Exposure Indices, available from the Department of Labour, <http://www.osh.govt.nz/order/catalogue/329.shtml>, and associated regulations;
and their subsequent amendments and replacements.

7 Definitions

Appropriate personnel – individuals with responsibilities for co-ordination, design, installation, maintenance, production, or servicing activities. This can include: site managers, project managers, engineers and technicians, technical experts, line managers or supervisors, regulatory personnel, team leaders, other personnel designated by an organisation or enterprise.

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

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

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

For gas and vapour atmospheres

Ex d – flameproof;

Ex e – increased safety;

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

Ex n – non-sparking;

For dusts

Ex iD – intrinsic safety (dusts);

Ex tD – enclosed;

Others, less common

Ex p – pressurisation; Ex pD (dust);

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

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

Ex o – oil immersion;

Ex q – sand filled;

Ex v – ventilation.

8 Range

- a Assessment is take account of variations between the industry sectors and enterprises. For example, apparatus used in underground coal mining will be different in some respects from that used in a petrochemical plant.

- b Occupational Safety and Health (OSH) policies and procedures may include but are not limited to – work permits and clearances, hazard monitoring, evacuation procedures, plant and electrical isolation.
 - c The application of contingency management skills must be demonstrated for all outcomes and evidence requirements.
 - d Established maintenance procedures must be followed.
 - e All activities and evidence presented for all outcomes and performance criteria in this unit standard must be in accordance with safe working principles and practices, legislation, policies, procedures, ethical codes and Standards, safe and sound practice, and industry practice; and, where appropriate, manufacturers' instructions, specifications, and data sheets.
- 9 Recommended skills and knowledge:
Unit 24976, *Use and maintain the integrity of portable gas detection devices in hazardous areas*, and 24977, *Install fixed gas detection apparatus in hazardous areas*.

Outcomes and performance criteria

Outcome 1

Demonstrate knowledge of requirements and techniques for the installation and maintenance of fixed gas detection apparatus.

Performance criteria

- 1.1 Use of manufacturers' instruction manual is described.
- Range operating instructions, adjustment procedures, operational limitations, storage.
- 1.2 Procedures for installing and maintaining fixed gas detection apparatus in accordance with standards is described.
- Range installation – AS/NZS 60079.14;
maintenance – AS/NZS 60079.17.
- 1.3 Location of fixed sample points or sensors is explained.
- Range optimal sensing, maintainability and ease of calibration, protection against environmental and mechanical damage.
- 1.4 Gas and vapour releases are described in terms of the nature of a site and the natural and mechanical ventilation.
- 1.5 Common problems with fixed gas detectors are identified.
- 1.6 Calibration and response checking procedures are described.

Outcome 2

Establish gas detection parameters.

Performance criteria

- 2.1 Requirements for gas detection are obtained or established with the appropriate personnel.
- Range gases or vapours to be detected, purpose of detection; explosion-protection for plant, personnel protection, toxic level detection; likely leakage sources, plant layout, establishing likely propagation, establishing likely location and number of sensor/sampling points, establishing environmental factors and ease of access at these points; selecting basic technology; sampling, sensor or open path, single point or multipoint, desired detection principle.
- 2.2 Explosion-protection requirements for gas detection apparatus are established from area classification documents.
- 2.3 Parameters for gas detection are obtained through consultation with appropriate personnel and documented.
- Range range of gas and/or vapour to be detected, alarm and/or warning levels, alarm location, alarm function.
- 2.4 Sampling and/or sensor locations are established in terms of sampling line lengths and materials with respect to temperature and condensation.
- Range range of gas and/or vapour to be detected, alarm and/or warning levels, alarm location, alarm function.

Outcome 3

Select gas detection apparatus.

Performance criteria

- 3.1 Manufacturers' specification and limitations of appropriate gas apparatus are identified.
- 3.2 Manufacturers' specification and limitations are compared with the established parameters for gas detection.
- 3.3 Gas detection apparatus is selected on compatibility with the established parameters and economic considerations.

Outcome 4

Document details of gas detection apparatus to be used.

Performance criteria

- 4.1 Proposed gas detection apparatus is checked in accordance with established procedures for compliance with all relevant requirements.
- 4.2 Complete specifications for gas detection apparatus to be used are documented in accordance with established procedures.

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

Status information and last date for assessment for superseded versions

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

Consent and Moderation Requirements (CMR) reference

0003

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