Title	**Demonstrate underpinning knowledge of permanently-installed gas detection apparatus in explosive atmospheres**		
Level	**4**	**Credits**	**4**

Purpose	This unit standard is for people working with or intending to work with fixed gas detection apparatus in explosive atmospheres. People credited with this unit standard are able to demonstrate knowledge of: – requirements and techniques for installation and maintenance specific to fixed gas detection apparatus – the factors to consider in establishing the operating requirements for fixed gas and vapour detection apparatus, and – the use of published data in terms of selecting and installing gas detection apparatus.

Classification	Explosive Atmospheres > Electrical Apparatus in Explosive Atmospheres - Operations

Available grade	Achieved

Guidance Information

1 This unit standard has been designed for training and assessment off-job. It is recommended candidates achieve Unit 26741, *Demonstrate underpinning knowledge of gas detection apparatus in explosive atmospheres*, or demonstrate equivalent skills and knowledge, prior to enrolment in this unit standard.

2 References
- AS/NZS 1826:2008, *Electrical equipment for explosive gas atmospheres – Special protection – Type of protection 's'*
- AS/NZS 3000 (version as cited in the Electricity (Safety) Regulations), *Electrical installations (known as the Australian/New Zealand Wiring Rules)*
- AS/NZS 4641:2018, *Electrical apparatus for detection of oxygen and other gases and vapours at toxic levels – General requirements and test methods*
- AS/NZS 4761.1 (version as cited in the Electricity (Safety) Regulations), *Competencies for working with electrical equipment for hazardous areas (EEHA) - Competency Standards*
- AS/NZS 60079.0 (version as cited in the Electricity (Safety) Regulations), *Explosive atmospheres – Part 0: Equipment – General requirements*
- AS/NZS 60079.1:2015, *Explosive atmospheres – Part 1: Equipment protection by flameproof enclosures 'd'*

- AS/NZS IEC 60079.10.1:2022, *Explosive atmospheres, Part 10.1: Classification of areas – Explosive gas atmospheres*
- AS/NZS 60079.11 (version as cited in the Electricity (Safety) Regulations), *Explosive atmospheres – Part 11: Equipment protection by intrinsic safety 'i'*
- AS/NZS 60079.14 (version as cited in the Electricity (Safety) Regulations), *Explosive atmospheres – Part 14: Electrical installations design, selection and erection*
- AS/NZS 60079.17 (version as cited in the Electricity (Safety) Regulations), *Explosive atmospheres – Part 17: Electrical installations inspection and maintenance*
- AS/NZS 60079.20.1:2012, *Explosive atmospheres – Part 20.1: Material characteristics for gas and vapour classification - Test methods and data*
- AS/NZS 60079.29.1:2017*, Explosive atmospheres – Part 29.1: Gas detectors – Performance requirements of detectors for flammable gases*
- AS/NZS 60079.29.2 (version as cited in the Electricity (Safety) Regulations*), Explosive atmospheres – Gas detectors – Selection, installation, use and maintenance of detectors for flammable gases and oxygen*
- Electricity Act 1992
- Electricity (Safety) Regulations 2010
- *Workplace Exposure Standards and Biological Exposure Indices Edition 13*, available from WorkSafe New Zealand www.worksafe.govt.nz
- Health and Safety at Work Act 2015, and associated regulations

and their subsequent amendments and replacements.

3 Definitions

Apparatus group – Group I is for apparatus for coal mines. Group II is for gases and vapours in surface industries, and is divided into Groups IIA, IIB and IIC for substances with increasing ease of ignition. Group III is for dusts in surface industries, and is similarly divided into Groups IIIA, IIIB and IIIC. These are added as roman number suffixes to explosion protection technique markings on apparatus and on Certificates of Compliance.

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.

Explosive atmosphere – an atmosphere comprising ignitable substances mixed with air under atmospheric conditions in the form of gases, vapours, mist, dust or flyings in which, after ignition has occurred, combustion spreads to the entire unburned mixture.

Hazardous area – area in which an explosive atmosphere is present, or may be expected to be present, in duration and/or frequency such as to require special precautions for the construction, installation, and use of apparatus.

Integrity of explosion-protected apparatus – the condition of being unified, complete or sound in construction of the apparatus design and use that ensures explosion-protection, for example, the structural integrity of the apparatus.

4 Range

a For assessment against this unit standard it is expected that AS/NZS 60079.29.2 and other reference material may be used ‘open book’, provided candidates can demonstrate they can use it accurately and efficiently, as they would use it in the workplace.

b 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, workplace policies and procedures, Standards, safe and sound practice, and industry practice; and, where appropriate, manufacturers’ instructions, specifications, and data sheets.

Outcomes and performance criteria

Outcome 1

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

Performance criteria

1.1 Describe gas and vapour releases and propagation in relation to a given site.

Range the nature of the site, likely emission sources, containment in high or low spots depending on density, effect of openings in buildings, natural and mechanical ventilation.

1.2 Explain positioning of fixed sample points or sensors in terms of the ideal locations and most practical locations.

Range compromise between gas orvapour propagation, coverage of site, speed of response, access for maintenance and calibration, protection against environment and mechanical damage, purpose of alarms.

1.3 Describe the use of manufacturers’ instruction manuals.

Range operating instructions, adjustment procedures, operational limitations, storage.

1.4 Identify installation and maintenance Standards and Codes of Practice for gas detection apparatus.

1.5 Identify common problems associated with fixed gas detection apparatus.

Range includes but is not limited to – contamination, poisoning, saturation, inadequate maintenance.

1.6 Describe the need and procedures for maintenance and calibration of fixed gas detection apparatus.

1.7 Describe the need and procedures for integrity and response checking of fixed gas detection apparatus.

Outcome 2

Demonstrate knowledge of the factors to consider in establishing the operating requirements for fixed gas and vapour detection apparatus.

Range factors are to be consistent with AS/NZS 60079.29.2, AS/NZS 60079.20, Workplace Exposure Standards, and promote the integrity of explosion-protected apparatus.

Performance criteria

2.1 Describe requirements for gas detection for a given situation in terms of sources for obtaining data on the physical chemistry of the gas or vapour to be detected and the conditions under which the gas or vapour may be present.

2.2 Describe processes of assessing the specifications of permanently installed gas detection apparatus against established requirements in relation to a typical manufacturer's specification or data sheet.

Range possible sensor technology in terms of compounds expected, required sensitivity; possible limiting technology options in terms of expected concentrations; required integrity of explosion-protected apparatus in terms of expected compounds (apparatus group and temperature class); required integrity of explosion-protected apparatus in terms of Zone of operation; required outputs for recording, alarms and other ancillary apparatus; system integrity requirements where applicable.

Outcome 3

Demonstrate knowledge of the use of published data in terms of selecting and installing gas detection apparatus.

Performance criteria

3.1 Evaluate the measuring principles used by all nine detection techniques documented in AS/NZS 60079.29.2 and select techniques for common applications.

Range common applications may include but are not limited to – sensitivity, limitations and interferences caused by other gases, sensor poisoning.

3.2 Explain techniques for obtaining representative gas detection results in terms of electrical explosion protection and single tube and multi tube sampling systems.

Range electrical explosion protection – single point sensors, multipoint sensors, transportable sensors, open path sensors;
single tube and multi tube sampling systems – with hazardous area sampling points used with safe area gas analysers.

3.3 Evaluate the benefits of the different methods for obtaining representative gas detection results with respect to sampling requirements, instrument maintenance and calibration requirements, and environmental protection.

Range sampling requirements – zone of use, speed of response, sampling delays;
environmental protection – temperature extremes, precipitation, condensation, airborne mists, dusts, oil, adhesive and corrosive materials, vibration, mechanical damage, electromagnetic radiation, plant maintenance and cleaning.

3.4 Describe the requirements for and process of selecting fixed gas detection apparatus.

Range environment, gas or vapour to be detected, likely interfering gases or vapours, measuring principles and techniques, methods for obtaining representative results with regard to establishing the operating requirements, system response delay.

3.5 Describe the behaviour of gas and vapour releases.

Range mechanism and rate of release; gas and vapour density; effects of temperature, pressure, and dilution.

3.6 Describe installation design and installation procedures for gas detection apparatus in terms of sample point locations using the requirements of performance criterion 1.2.

Range includes but is not limited to – open path apparatus, point sensors and/or sample tubes where contaminants or condensation could be present.

3.7 Describe the integrity and safety of gas and vapour sampling apparatus.

Range redundancy, integrity of power supply, planned maintenance.

3.8 Describe commissioning and scheduled maintenance of gas and vapour sampling apparatus.

Range integrity of sample lines, porosity of diffusion sensor screens, initial gas calibration, adjustment of alarm set points, maintenance of plans and records, verification dossier.

Planned review date	31 December 2027

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	20 May 2011	31 December 2025
Review	2	2 March 2023	N/A

Consent and Moderation Requirements (CMR) reference	0003

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

Comments on this unit standard

Please contact the Waihanga Ara Rau Construction and Infrastructure Workforce Development Council qualifications@WaihangaAraRau.nz if you wish to suggest changes to the content of this unit standard.