

<b>Title</b>	<b>Demonstrate and apply intermediate underpinning knowledge of electrical equipment in explosive atmospheres</b>		
<b>Level</b>	<b>4</b>	<b>Credits</b>	<b>5</b>

<b>Purpose</b>	<p>This unit standard is intended for use in the training and assessment of people who work with electrical equipment in explosive atmospheres and covers the essential underpinning knowledge for people working with or intending to work with such equipment.</p> <p>People credited with this unit standard are able to demonstrate:</p> <ul style="list-style-type: none"> <li>– knowledge of hazardous areas installation and maintenance preparation techniques;</li> <li>– knowledge of the relationship between explosion-protected equipment, certification documentation, and required equipment installation locations for the installation as given in specifications and layout drawings and/or written instructions;</li> <li>– knowledge of Standards and requirements applicable to explosive atmospheres;</li> <li>– knowledge of maintenance procedures required in hazardous areas that ensure the integrity of the explosion-protection technique;</li> <li>– knowledge of cable termination types suitable for use in hazardous areas;</li> <li>– cable terminating methods suitable for use with various explosion-protection techniques in hazardous areas;</li> <li>– knowledge of documents that show the classification of a hazardous area;</li> <li>– knowledge of selection and checking of equipment, wiring, and accessories suitable for use in explosive atmospheres;</li> <li>– knowledge of cables and cable selection suitable for use in explosive atmospheres;</li> <li>– knowledge of hazardous areas installation design documentation; and</li> <li>– knowledge of common and specific hazardous areas for which classification examples are given in Standards.</li> </ul>
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<b>Classification</b>	Explosive Atmospheres > Electrical Apparatus in Explosive Atmospheres - Operations
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<b>Available grade</b>	Achieved
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Entry information	
<b>Critical health and safety prerequisites</b>	Unit 26739, <i>Demonstrate introductory underpinning knowledge of electrical equipment in explosive atmospheres</i> , or demonstrate equivalent knowledge and skills.

### Explanatory notes

- 1 This unit standard has been designed for training and assessment on-job or off-job in a simulated environment, which includes explosion-protected equipment and wiring systems similar to those encountered in a real workplace.
- 2 This unit standard covers the theoretical component of various clauses in the Australian/New Zealand Standard AS/NZS 4761:2017 *Competencies for working with electrical equipment in hazardous areas (EEHA)*. Please refer to unit standard 30069, *Determine the explosion-protection requirements specified for a classified hazardous area*, for the practice component.
- 3 Achievement of this unit standard alone does not entitle trainees to legally perform prescribed electrical work without supervision. Until registered and licensed under the Electricity Act 1992, trainees are assisting, and must work under supervision when carrying out prescribed electrical work.
- 4 References  
AS/NZS 1768:2007, *Lightning protection*;  
AS/NZS 3000:2007 *Electrical installations (known as the Australian/New Zealand Wiring Rules)*;  
AS/NZS 4761:2017 *Competencies for working with electrical equipment in hazardous areas (EEHA)* – pending publication;  
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*;  
Electricity Act 1992;  
Electricity (Safety) Regulations 2010;  
Hazardous Substances and New Organisms Act 1996;  
Health and Safety at Work Act 2015, and associated regulations;  
and their subsequent amendments and replacements.
- 5 Definitions  
ANZEx – Australian/New Zealand Certification Scheme for explosion-protected electrical apparatus (ANZEx Scheme).  
ATEX – Appareils destinés à être utilisés en Atmosphères Explosibles, comprises two European Union directives (Directive 94/9/EC) that describe what apparatus, protective systems, and work that is permitted in potentially explosive atmospheres.  
*Certification documentation* – document(s) that assure(s) the conformity of a product, process, system, person, or organisation with specified requirements.  
EPL – equipment protection levels.  
*Equipment group* – Group I is for equipment for underground 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 equipment and on Certificates of Compliance.

*Explosion-protected equipment* – electrical equipment to which one or more explosion-protection techniques are applied to avoid ignition of a surrounding explosive atmosphere.

*Explosion-protection techniques* – techniques applied to the design of electrical equipment, components, and systems to prevent electrical energy from becoming an ignition source in the presence of a surrounding explosive atmosphere, as follows:

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 with levels of protection Ex nA, Ex nC, Ex nL, Ex nR, and

Ex nZ;

For dust

Ex iD – intrinsic safety (dusts);

Ex tD – enclosed;

Others, less common

Ex p – Pressurisation, with levels of protection Ex pX, Ex pY, and Ex pZ, 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; for example; Ex s (Zone 0);

Ex o – oil immersion;

Ex op – optical radiation;

Ex q – sand filled;

Ex v – ventilation.

*Explosive atmosphere* – mixture with air, under atmospheric conditions, of flammable substances in the form of gas, vapour, dust, fibres, or flyings which, after ignition, permits self-sustaining propagation.

*Hazardous area* – a three-dimensional region or space in which an explosive atmosphere is present, or may be expected to be present, in quantities such as to require special precautions for the construction, installation, and use of equipment.

*IECEx* – International Electrotechnical Commission certification scheme covering product that meets the requirements of International Standards.

*Integrity of explosion-protected equipment* – the condition of being unified, complete or sound in construction of the equipment design and use that ensures explosion-protection, e.g. the structural integrity of the equipment.

*LEL* – lower explosive limit – the concentration of flammable gas, vapour, or dust in air below which, an explosive atmosphere will not be formed.

*Mixed explosion-protection* – equipment that comprises several components, each with its own explosion-protection technique, contained within the one enclosure.

*Safe and sound practice* – as it relates to the installation of electrical equipment is defined in AS/NZS 3000:2007, *Electrical Installations (known as the Australian/New Zealand Wiring Rules)*.

*SWA* – steel-wire armoured.

*Temperature class* – classification system of electrical equipment, based on its maximum surface temperature, related to the specific explosive atmosphere for which it is intended to be used.

*UEL* – upper explosive limit – the concentration of flammable gas, vapour, or dust in air above which, an explosive atmosphere will not be formed.

*Verification dossier* – a set of documents showing the complete compliance history of electrical equipment and installations within explosive atmospheres, as defined in Standards.

- 6 Assessment is to take account of variations between the industry sectors and enterprises. For example, equipment used in underground mining will be different in some respects from that used in a petrochemical plant.
- 7 Range
- a Candidates must refer to current legislation and Standards during assessment.
  - b Demonstration of safe working practices and installation in accordance with *safe and sound practice* are essential components of assessment of this unit standard.
  - c All activities and evidence presented for all outcomes and evidence requirements in this unit standard must be in accordance with:
    - i legislation;
    - ii policies and procedures;
    - iii ethical codes;
    - iv Standards – may include but are not limited to those listed in Schedule 2 of the Electricity (Safety) Regulations 2010;
    - v applicable site, enterprise, and industry practice; and,
    - vi manufacturers' instructions, specifications, and data sheets.

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## Outcomes and evidence requirements

### Outcome 1

Demonstrate knowledge of hazardous areas installation and maintenance preparation techniques.

#### Evidence requirements

- 1.1 Identify workplace health and safety procedures to be followed when working in a hazardous area.
- 1.2 Describe the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment.
- 1.3 Describe the purpose of a verification dossier and the documentation that it should contain.
- 1.4 Explain the limitations that apply to the use of tools and testing devices in hazardous areas.

### Outcome 2

Demonstrate knowledge of the relationship between explosion-protected equipment, certification documentation, and required equipment installation locations for the installation as given in specifications and layout drawings and/or written instructions.

**Evidence requirements**

- 2.1 Explain the purpose of markings on the compliance plate and certification documentation for a given item of explosion-protected equipment.
- 2.2 Explain procedures required for matching explosion-protected equipment with certification documentation and the equipment specified for an installation.
- 2.3 Identify the location of the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.
- 2.4 Describe methods of identifying explosion-protected equipment from the Ex symbol marked on the equipment, including old equipment and equipment certified in other countries.

**Outcome 3**

Demonstrate knowledge of Standards and requirements applicable to explosive atmospheres.

**Evidence requirements**

- 3.1 Explain the use of Standards in determining the requirements with which the design of explosion-protected equipment shall comply.
- 3.2 Identify wiring systems permitted and not permitted in or above explosive atmospheres.
- 3.3 Identify equipment types not permitted in or above explosive atmospheres.
- 3.4 Explain regulations and Standards to which explosion-protected equipment and wiring installed in hazardous areas must comply in terms of their application.
- 3.5 Describe installation documentation and records including certification.

**Outcome 4**

Demonstrate knowledge of maintenance procedures required in hazardous areas that ensure the integrity of the explosion-protection technique.

**Evidence requirements**

- 4.1 Describe the purpose of a maintenance schedule in accordance with relevant Standards.
- 4.2 Describe the purpose of an inspection schedule in accordance with relevant Standards.
- 4.3 Explain the purpose and extent of the different types and grades of inspections.  
  
Range            types – initial, periodic, sample;  
                      grades – visual, close, detailed.

- 4.4 Describe the significance of information provided in a maintenance schedule.
- 4.5 Explain the impact of environmental conditions on explosion-protected equipment.
- Range includes but is not limited to – corrosion, frequency of maintenance.
- 4.6 Explain the documentation requirements for recording the maintenance process and results.

### **Outcome 5**

Demonstrate knowledge of cable termination types suitable for use in explosive atmospheres.

#### **Evidence requirements**

- 5.1 Describe explosion-protection features of cable termination devices.
- 5.2 Describe the selection of compliant cable termination devices for given situations and environment.

### **Outcome 6**

Demonstrate cable terminating methods suitable for use with various explosion-protection techniques in hazardous areas.

#### **Evidence requirements**

- 6.1 Install conduit systems including seals to meet explosive atmospheres requirements.
- 6.2 Terminate a cable with a barrier gland.
- 6.3 Terminate a multipair, SWA, overall screened cable and an individual screened cable into an enclosure.
- 6.4 Test the termination and connections of installed cables/circuits.

### **Outcome 7**

Demonstrate knowledge of documents that show the classification of a hazardous area.

#### **Evidence requirements**

- 7.1 Describe methods used for classifying hazardous areas.
- 7.2 Interpret the delineation of zones, temperature classes, and gas and dust groups of a given hazardous areas from classification documents.

- 7.3 Interpret the delineation of zones, temperature classes, and gas and dust groups of a given hazardous area from similar situations previously classified such as those given in Standards.
- 7.4 Identify situations where classification needs to be undertaken and documented by a person competent in non-specific area classification.

### **Outcome 8**

Demonstrate knowledge of selection and checking of equipment, wiring, and accessories suitable for use in explosive atmospheres.

#### **Evidence requirements**

- 8.1 Identify explosion-protected equipment and accessories to suit the requirements of given explosive atmospheres.
- Range three of – Zone 0, Zone 1, Zone 2, Zone 20, Zone 21, Zone 22.
- 8.2 Describe wiring systems to suit the requirements of explosive atmospheres.
- Range load and duty requirements, capacitive/inductive effects, inductance/resistance ratio.
- 8.3 Explain earthing and equipotential bonding requirements for an explosive atmospheres installation.
- 8.4 Describe procedures used to check the compliance certification of equipment used in explosive atmospheres.
- 8.5 Identify electrical protection systems and devices appropriate to an explosion-protection technique.
- Range may include but is not limited to – overloads, earth fault protection; evidence of two is required.
- 8.6 Describe cable termination devices, including glands, used in explosive atmospheres.

### **Outcome 9**

Demonstrate knowledge of cables and cable selection suitable for use in explosive atmospheres.

#### **Evidence requirements**

- 9.1 Describe wiring systems and their applications within hazardous areas.
- 9.2 Describe the selection and use of cable glands, reducers, and blanking elements for hazardous areas.

- 9.3 Describe cables in terms of their construction, the materials they are made of, their characteristics, and the environments in which they are to be used.  
  
Range includes but is not limited to – fireproof, chemical resistant, impact resistant, flexible, fixed.
- 9.4 Outline potential problems resulting from incorrect cable selection.
- 9.5 Describe procedures to make up an SWA cable and gland assembly for a given explosive environment.
- 9.6 Make up an SWA cable and gland assembly in accordance with manufacturers' specifications.

**Outcome 10**

Demonstrate knowledge of hazardous areas installation design documentation.

**Evidence requirements**

- 10.1 Identify items to be included in the design documentation for explosive atmospheres.
- 10.2 Describe installation layout, specification, work schedule, and other documentation required for inclusion in a verification dossier.
- 10.3 Identify essential documentation to be supplied by manufacturers with explosion-protected equipment and/or accessories.

**Outcome 11**

Demonstrate knowledge of common and specific hazardous areas for which classification examples are given in Standards.

**Evidence requirements**

- 11.1 Explain examples of hazardous areas classifications given in Standards.
- 11.2 Describe the application of hazardous areas classifications given in Standards to similar situations for the purpose of planning electrical installations in hazardous areas.

<b>Planned review date</b>	31 December 2021
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**Status information and last date for assessment for superseded versions**

Process	Version	Date	Last Date for Assessment
Registration	1	20 May 2011	31 December 2021
Review	2	16 March 2017	N/A



<b>Consent and Moderation Requirements (CMR) reference</b>	0003
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This CMR can be accessed at <http://www.nzqa.govt.nz/framework/search/index.do>.

**Please note**

Providers must be granted consent to assess against standards (accredited) by NZQA, before they can report credits from assessment against unit standards or deliver courses of study leading to that assessment.

Industry Training Organisations must be granted consent to assess against standards by NZQA before they can register credits from assessment against unit standards.

Providers and Industry Training Organisations, which have been granted consent and which are assessing against unit standards must engage with the moderation system that applies to those standards.

Requirements for consent to assess and an outline of the moderation system that applies to this standard are outlined in the Consent and Moderation Requirements (CMR). The CMR also includes useful information about special requirements for organisations wishing to develop education and training programmes, such as minimum qualifications for tutors and assessors, and special resource requirements.

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**Comments on this unit standard**

Please contact The Skills Organisation [reviewcomments@skills.org.nz](mailto:reviewcomments@skills.org.nz) if you wish to suggest changes to the content of this unit standard.