

<b>Title</b>	<b>Install explosion-protected equipment and associated equipment and wiring systems</b>		
<b>Level</b>	<b>4</b>	<b>Credits</b>	<b>9</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. This unit standard covers the aspects relating to the installation of explosion-protected and associated equipment and wiring systems. It requires the ability to match equipment with that specified for a given location, to work safely in accordance with Standards, and to complete the necessary installation documentation.</p> <p>People credited with this unit standard are able to:</p> <ul style="list-style-type: none"> <li>– prepare for installation of explosion-protected equipment and wiring;</li> <li>– install equipment and wiring systems; and</li> <li>– confirm completion of the installation.</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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<b>Entry information</b>	
<b>Critical health and safety prerequisites</b>	Unit 26741, <i>Demonstrate underpinning knowledge of gas detection 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 is directly equivalent to Clause 2.5, *Install explosion-protected equipment and associated apparatus and wiring systems*, in the Australian/New Zealand Standard AS/NZS 4761:2017 *Competencies for working with electrical equipment in hazardous areas (EEHA)*.

- 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 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:

<b>Unit endorsement suffix</b>	<b>Competence demonstrated</b>
Ex 'd'	Flameproof
Ex 'e'	Increased safety
Ex 'n'	Non-sparking
Ex 'i'	Intrinsic safety
Ex 'p'	Pressurization
Ex 'tD'	Protection by enclosure – dusts
'I'	Group I equipment only
'Gases'	Gas hazards only
'Dusts'	Dust hazards only
'ELV'	For equipment and systems operating at extra-low voltage.

- 5 Competence is to be demonstrated in relation to any classified explosive atmospheres and explosion-protection techniques. Where the competency is demonstrated on wiring/cabling and equipment that operate at extra low voltage and low voltage, registration with the Electrical Workers Registration Board is required. For work on wiring and equipment operating above 1000 V a.c. or 1500 V d.c., and for underground mines 1200 V a.c. or 1500 V d.c, competency in high voltage work must be held.
- 6 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;  
*New Zealand Electrical Codes of Practice (NZECP)*, ISSN 0114-0663 (available from the Ministry of Economic Development);  
 Standards Australia HB13-2007, *Electrical equipment for hazardous areas; Workplace Exposure Standards and Biological Exposure Indices*, June 2016, (available from WorkSafe New Zealand at <http://www.worksafe.govt.nz/worksafe/information-guidance/all-guidance-items/workplace-exposure-standards-and-biological-exposure-indices/workplace-exposure-standards-and-biological-indices-2016.pdf>), and associated regulations;

and all subsequent amendments and replacements.

## 7 Definitions

*ANZEx* – Australian/New Zealand Certification Scheme for explosion-protected electrical apparatus (ANZEx Scheme).

*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.

*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)*.

*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.

*Visual inspection* – inspection which identifies, without the use of access equipment or tools, those defects, such as missing bolts, which will be apparent to the eye.

*Wiring system* – permitted wiring and accessories for power, measurement, control or communications purposes.

*Work permit* – permit allowing tools to be taken into, and work to be carried out in, a hazardous area.

- 8 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.
- 9 On-job assessment  
For on-job assessment each candidate shall have access to:
  - a verification dossier for the site
  - b planning and/or design documentation specifying
  - c Ex d, Ex e, Ex i and Ex 't' equipment to be installed
  - d cables and cable enclosures to be installed
  - e cable glands, seals and conductor terminations
  - f serviceable and safe tools and testing devices
  - g an assessor.
- 10 Off-job simulated work environment assessment  
For a simulated work environment each candidate shall have access to:
  - a an area designated as a explosive atmosphere area which is a close facsimile of a real work environment
  - b an area entry point
  - c delineation of the area into zones for both gas and dust
  - e a person to act as the authorised person for the site
  - f a qualified supervisor

g an assessor.

#### 11 Range

- a The application of contingency management skills must be demonstrated for all outcomes and evidence requirements.
- c Established maintenance procedures must be followed.
- d Candidates must refer to current legislation and Standards during assessment.
- e Demonstration of safe working practices and installation in accordance with *safe and sound practice* are essential components of assessment of this unit standard.
- f 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

Prepare for installation of explosion-protected equipment and wiring.

#### Evidence requirements

- 1.1 Explain the requirements for installing electrical equipment and wiring for a hazardous area and describe the preparation required.
- 1.2 Verify the types of explosion-protected equipment and wiring systems to be installed from design documents.
 

Range equipment checked against certification documentation, including conditions of certification relating to the safe use.
- 1.3 Establish the location in which specific items of equipment and circuits are to be installed from design documents.
 

Range equipment checked against certification documentation, including conditions of certification relating to the safe use.
- 1.4 Check the explosion-protected equipment markings to ensure they conform to the design specifications and certification documentation.
 

Range equipment checked against certification documentation, including conditions of certification relating to the safe use.
- 1.5 Collect and add certification documentation supplied with each item of equipment to the verification dossier and forward the dossier to the appropriate person.

- 1.6 Check cables and cable enclosures to be installed to ensure they conform to planning and/or design documentation.
- 1.7 Check cable glands, seals, and conductor terminations to ensure they are compatible with the cable types and equipment specified in the planning and/or design documentation.
- 1.8 Obtain compliant tools, equipment, and testing devices needed to carry out the installation work and check them for correct operation and safety.

## **Outcome 2**

Install equipment and wiring systems.

### **Evidence requirements**

- 2.1 Describe the requirements for installing electrical equipment and wiring systems for explosive atmospheres.
- 2.2 Remove equipment enclosure covers and internal components, where needed, to enable installation and store them and their fixing devices to protect them against loss or damage.
- 2.3 Install equipment to conform with the requirements of the planning and/or design documentation, Standards, the limits specified by the equipment certification, and manufacturers' instructions.
- 2.4 Install equipment in a manner that maintains the integrity of protection afforded by the equipment type.
- 2.5 Install cables and conduits to conform with Standards, planning and/or design documentation.
- 2.6 Terminate cables and conduits to conform with Standards, equipment certification, and manufacturers' instructions.
- 2.7 Test circuits before connecting them to devices to ensure protective earth resistance meets Standards, insulation resistance is safe, polarity and connections are correct, and each circuit complies with Standards.
- 2.8 Terminate and connect conductors to conform with the planning and/or design documentation, Standards, equipment certification, and manufacturers' instructions.
- 2.9 Replace equipment covers and internal components removed to enable installation ensuring the integrity of the equipment type is not compromised.

**Outcome 3**

Confirm completion of the installation.

**Evidence requirements**

- 3.1 Make arrangements in accordance with requirements for an initial inspection to be carried out on the installation.
- 3.2 Verify equipment has been installed in accordance with installation design specifications and take appropriate action to rectify any non-conformances found during the initial inspection to ensure the installation complies with requirements.
- 3.3 Document the completed installation in accordance with requirements and forward the documentation to personnel responsible for compiling the verification dossier.

<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	29 August 2000	30 June 2012
Review	2	20 May 2011	31 December 2021
Review	3	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.