

<b>Title</b>	<b>Design explosion-protected electrical systems and installations</b>		
<b>Level</b>	<b>6</b>	<b>Credits</b>	<b>12</b>

<b>Purpose</b>	<p>This unit standard covers the explosion-protection aspects of designing electrical power, control and instrumentation systems and installations. It requires the ability to establish design briefs and to pursue economical and effective explosion-protection design solutions.</p> <p>This unit standard is for engineering associates who are responsible for the design of electrical power, control, and instrumentation systems and installations.</p> <p>People credited with this unit standard are able to:</p> <ul style="list-style-type: none"> <li>– demonstrate knowledge of explosion-protected electrical system design;</li> <li>– establish design brief;</li> <li>– design system and installation; and</li> <li>– check and finalise design.</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 26742, <i>Demonstrate underpinning knowledge of permanently-installed gas detection apparatus 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 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:

<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' (DIP)	Protection by enclosure – dusts
'I'	Group I apparatus only
'Gases'	Gas hazards only
'Dusts'	Dust hazards only
'ELV'	For apparatus and systems operating at extra-low voltage.

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 2.18 *Design explosion-protected electrical 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 Standards *UEENEEM057A*, *UEENEEM058A*, *UEENEEM059A* and *UEENEEM075A* 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 at NZQF Level 6 or above.
- 5 Competence shall be demonstrated in relation to any classified hazardous areas and explosion-protection techniques.
- 6 References  
 AS/NZS 1768:2007, *Lightning protection*;  
 AS/NZS 3000:2007, *Electrical installations (known as the Australian/New Zealand Wiring Rules)*;  
 AS/NZS 4761.1:2008, *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 60079.10.1:2009, *Explosive atmospheres – Classification of areas – Explosive gas atmospheres*;  
 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 60079.29.2:2008, *Explosive atmospheres – Gas detectors – Selection, installation, use and maintenance of detectors for flammable gases and oxygen*;

AS/NZS 61241.0:2005, *Electrical apparatus for use in the presence of combustible dust – General requirements*;  
AS/NZS 61241.14:2005, *Electrical apparatus for use in the presence of combustible dust – Selection and installation*;  
AS/NZS 61241.2.1:2000, *Electrical apparatus for use in the presence of combustible dust – Test methods – Methods for determining the minimum ignition temperature of dust*;  
Electricity Act 1992;  
Electricity (Safety) Regulations 2010;  
Hazardous Substances and New Organisms Act 1996;  
Health and Safety in Employment Act 1992, 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*, available from the Department of Labour, <http://www.osh.govt.nz/order/catalogue/329.shtml>; and associated regulations;  
and all 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.

*Explosive atmosphere* – an atmosphere comprising volatile substances mixed with air under atmospheric conditions in the form of gases, vapours, mist, or dust 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 quantities such as to require special precautions for the construction, installation, and use of apparatus.

*Verification dossier* – a set of documents showing the complete compliance history of electrical apparatus and installations within hazardous areas, as defined in Standards.

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

## 8 Range

- a Assessment is to 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 evidence requirements 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.

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## Outcomes and evidence requirements

### Outcome 1

Demonstrate knowledge of explosion-protected electrical system design.

### Evidence requirements

- 1.1 Process for establishing a design brief for an explosion-protected electrical system is described.

Range consultation processes for establishing client requirements; system requirements using site and plant specifications, hazardous areas classifications, and organisation requirements.

- 1.2 System design for an explosion-protected electrical system is described in terms of the major considerations influencing the design, the requirements in Standards and regulations, and typical design process incorporating explosion-protection.

1.3 Design documentation required for a hazardous area are described.

Range procedures for checking and approval of explosion-protected system design; requirements for documenting a final design, including documents to be included in a verification dossier.

## **Outcome 2**

Establish design brief.

### **Evidence requirements**

- 2.1 Site and plant specifications are obtained and reviewed to establish the system requirements.
- 2.2 Classification of the area is obtained from the hazardous areas layout drawings or other classification documents.
- 2.3 Organisational policies and specifications for hazardous areas electrical systems are obtained or established with the appropriate personnel.

## **Outcome 3**

Design system and installation.

Range design options and justifications, hazard risk, functionality, and economic considerations.

### **Evidence requirements**

- 3.1 Safety, functional and economic considerations are incorporated in system design.
- 3.2 Design complies with all hazardous areas requirements and includes specifications and all other necessary documentation for explosion-protected apparatus, accessories, and wiring systems.

## **Outcome 4**

Check and finalise design.

### **Evidence requirements**

- 4.1 Design is checked by means of established procedures for compliance with all relevant requirements.
- 4.2 Design is submitted for appropriate organisational approval and, where applicable, endorsed and submitted for statutory or regulatory approval.
- 4.3 Approved copies of design documents are issued for retention in the verification dossier in accordance with established procedures and requirements.

<b>Planned review date</b>	31 December 2016
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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	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 (CMRs). 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.

#### Comments on this unit standard

Please contact the ElectroTechnology Industry Training Organisation (ETITO) [reviewcomments@etito.co.nz](mailto:reviewcomments@etito.co.nz) if you wish to suggest changes to the content of this unit standard.