

Title	Plan electrical installations for explosive atmospheres		
Level	5	Credits	8

Purpose	<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 of planning electrical installations for explosive atmospheres. It requires the ability to identify explosive atmospheres zones from classification diagrams, or from examples of previously classified areas such as those given in Standards, and to select and locate explosion-protected equipment and wiring systems and other items that may influence the explosion-protection technique.</p> <p>People credited with this unit standard are able to:</p> <ul style="list-style-type: none"> – determine the extent of the installation; – select and check equipment, wiring components, and accessories; and – document installation plan.
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Classification	Explosive Atmospheres > Electrical Apparatus in Explosive Atmospheres - Operations
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Available grade	Achieved
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Entry information	
Critical health and safety prerequisites	Unit 17056, <i>Install explosion-protected equipment and associated equipment and wiring systems</i> , or demonstrate equivalent knowledge and skills.
Recommended skills and knowledge	Unit 4993, <i>Plan implementation of, manage, and review small to medium sized electrotechnology projects</i> .

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 2.8, *Plan electrical installations for hazardous areas*, 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:

Unit endorsement suffix	Competence demonstrated
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.

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.

- 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 Range
- a The application of contingency management skills must be demonstrated for all outcomes and evidence requirements.
 - b Established maintenance procedures must be followed.
 - c Candidates must refer to current legislation and Standards during assessment.
 - d Demonstration of safe working practices and installation in accordance with *safe and sound practice* are essential components of assessment of this unit standard.
 - e 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 enterprise, and industry practice; and,
 - vi manufacturers' instructions, specifications, and data sheets.
 - f Evidence for the number and type of installations chosen is left to the discretion of the assessor, however to ensure the candidate's competency it is expected that evidence of a minimum of three plans be presented as evidence, covering small, medium and large explosive atmosphere installations.

Outcomes and evidence requirements

Outcome 1

Determine the extent of the installation.

Evidence requirements

- 1.1 Identify the nature and characteristics of explosion hazards in the area from area classification and plant specifications.
- 1.2 In the absence of classification documentation, make arrangements to ensure the explosion hazard in the area is assessed, the area is classified, and the classification is documented.
- 1.3 Identify the extent of gas zones, the gas groups, and temperature classes or ignition temperatures from the classification documents and any regulatory requirements.
- 1.4 Identify the extent of dust zones, minimum cloud ignition temperatures, and layer ignition energy from the classification documents and any regulatory requirements.
- 1.5 Determine the arrangements for the supply protection and/or control for the hazardous area installation from plant design, electrical specifications, and existing installation arrangement.
- 1.6 Establish the location of the electrical and control equipment items and the system wiring routes for the hazardous area from the plant design and electrical specifications.

Outcome 2

Select and check equipment, wiring components, and accessories.

Evidence requirements

- 2.1 Select equipment, wiring components, and accessories based on extent of installation information obtained.
- 2.2 Select equipment and accessories for their compliance with requirements of the relevant Standards for the explosive atmosphere and zone in which they are to be installed and allow for EPL specified in the area classification documents.
- 2.3 Ensure that the selected equipment and wiring systems will handle the adverse effects of external influences as required by relevant Standards.
- 2.4 Select electrical overload and short-circuit protection devices for the selected equipment to meet the additional requirements for explosive atmospheres as required by relevant Standards.

- 2.5 Use manufacturers' data to confirm that the selected equipment is certified for the area classification zonings, groups, and temperature limitations for the location in which it is to be installed.
- 2.6 Select wiring systems, cables, glands, and terminations to comply with the associated protection types and installation requirements.
- 2.7 Use the certification documents to confirm that the received equipment is consistent with the equipment marking and installation requirements.
- 2.8 Confirm that cables and accessories received are consistent with the markings and installation requirements.

Outcome 3

Document installation plan.

Evidence requirements

- 3.1 Include equipment location, circuit arrangement diagrams, and certification details for each item of equipment and the installation schedules in the planning documentation.
- 3.2 Forward installation planning documentation to the appropriate person for acceptance.

Planned review date	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

Consent and Moderation Requirements (CMR) reference	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.

Comments on this unit standard

Please contact The Skills Organisation reviewcomments@skills.org.nz if you wish to suggest changes to the content of this unit standard.