

Title	Develop and manage electrical inspection and maintenance programmes 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 development and management of maintenance programmes and incorporates strategies for inspections, repair, overhaul, replacement of components, and recording of maintenance outcomes.</p> <p>People credited with this unit standard are able to:</p> <ul style="list-style-type: none"> – demonstrate knowledge of the management responsibilities related to explosive atmospheres, the strategies used to maintain the safety of explosive atmospheres, and the maintenance requirements; – demonstrate knowledge of visible conditions of explosion-protected equipment that indicate the protection is void, and changes in the nature of the explosion hazard that may render the explosion-protection unsafe; – establish inspection and maintenance requirements; – develop inspection programmes for a given explosive atmosphere area; and – implement and evaluate inspection and maintenance programmes to identify the maintenance that is required.
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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 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 2.9, *Develop and manage periodic electrical inspection and maintenance programs for hazardous areas*, 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.

Defects – visual damage or corrosion of the explosion-protection aspect of the installation or equipment.

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 On-job assessment
For on-job assessment each candidate shall have access to:
 - a verification dossier for the site including
 - i area classification documents
 - ii plant design specifications
 - iii as-built electrical equipment location and distribution drawing
 - iv process diagrams
 - v certification documents for all installed equipment
 - vi relevant technical standards
 - vii inspection reports and maintenance records
 - b 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
 - d a person to act as the authorised person for the site

- e a qualified supervisor
- f an assessor.

11 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 applicable site, enterprise, and industry practice; and,
 - vi manufacturers' instructions, specifications, and data sheets.

Outcomes and evidence requirements

Outcome 1

Demonstrate knowledge of the management responsibilities related to explosive atmospheres, the strategies used to maintain the safety of explosive atmospheres, and the maintenance requirements.

Evidence requirements

- 1.1 Describe the responsibilities of a person managing explosive atmospheres area activities on a site related to a hazardous area.
- Range workplace health and safety procedures to be established, responsibilities for ensuring that an explosive atmosphere area is safe, responsibilities and processes for establishing and maintaining a verification dossier.
- 1.2 Describe explosion-protection strategies in relation to explosive atmospheres.
- Range the process of classifying an explosive atmosphere area, ways in which electrical systems/equipment can be treated to prevent them from becoming an ignition source, the cost of the different ways of treating electrical systems/equipment associated with explosive atmospheres.

- 1.3 Describe the requirements for the maintenance of electrical systems associated with explosive atmospheres.

Range the types and grades of inspection of explosive atmospheres, maintenance programmes for electrical explosion-protected systems/equipment, documentation requirements associated with maintenance procedures.

Outcome 2

Demonstrate knowledge of visible conditions of explosion-protected equipment that indicate the protection is void, and changes in the nature of the explosion hazard that may render the explosion-protection unsafe.

Evidence requirements

- 2.1 Describe visible defects that can be expected in explosion-protected equipment and wiring.
- 2.2 Identify conditions that may indicate a change in a given explosion hazard.
- 2.3 Explain procedures to be followed in the event of a change in the explosion hazard.

Outcome 3

Establish inspection and maintenance requirements.

Evidence requirements

- 3.1 Describe the provisions of explosive atmospheres Standards applicable to area classification, electrical installation design, selection and installation, repair, and reclamation of explosion-protected electrical equipment as they apply to establishing an inspection and maintenance programme.
- Range sources and grades of release, type and extent of zones, dust layer hazards, application of equipment protection levels (EPL), area classification documentation.
- 3.2 Develop or review the verification dossier documentation to ascertain the extent of explosive atmospheres, the area classifications, and the electrical installation details, and for an existing site, check previous inspection schedules and maintenance programme records.
- 3.3 Assess the impact of external factors that may influence equipment integrity and use this information to establish the types, grades, and frequency of inspections.

Outcome 4

Develop inspection programmes for a given explosive atmosphere area.

Evidence requirements

- 4.1 Develop inspection schedules based on the extent of the explosive atmosphere area and the electrical installation, the assessment of factors influencing equipment integrity, and the requirements and recommendations of Standards and equipment manufacturers.
- 4.2 Develop inspection procedures for each grade of inspection using recommendations given in Standards, equipment manufacturers' specifications, and site specific conditions.
- 4.3 Develop a documentation system for reporting inspection activities, identifying non-compliance defects, and maintenance recommendations.

Outcome 5

Implement and evaluate inspection and maintenance programmes to identify the maintenance that is required.

Evidence requirements

- 5.1 Review the credentials of inspection and maintenance persons to ensure they are currently competent to do the work.
- 5.2 Develop maintenance programmes from periodic and sample inspection reports including procedures for dealing with equipment that may require repair or overhaul.
- 5.3 Use periodic and sample inspection reports to develop maintenance programmes and to identify the need to revise the extent and frequency of inspections.
- 5.4 Establish maintenance programmes within the limits permitted for remedial maintenance in explosive atmospheres.
- 5.5 Establish procedures to remove equipment that has been identified as requiring repair or overhaul from service and sending it to an accredited repair facility.
- 5.6 Retain reports and other documentation related to the inspection and maintenance programme activities in the site verification dossier.

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.