



**Australian Government**

# **UEEHA0003 Determine the explosion-protection requirements to meet a specified classified hazardous area**

**Release: 1**

## **UEEHA0003 Determine the explosion-protection requirements to meet a specified classified hazardous area**

### **Modification History**

Release 1. This is the first release of this unit of competency in the UEE Electrotechnology Training Package.

### **Application**

This unit involves the skills and knowledge required to determine the explosion-protection requirements to meet a specified classified hazardous area. It includes determining the type of explosion-protected equipment for a given explosive atmosphere. It also includes reading and interpreting the explosion-protection fundamentals in explosive atmosphere technical standards; understanding the information given in certification documents, verification dossiers and equipment marking; identifying the design features of each type of explosion-protected equipment; understanding actions and conditions that would void the explosion-protection afforded by each equipment type; and understanding where each equipment type may be used. It is adopted from clause 2.4 of AS/NZS 4761.1:2018 Competencies for working with electrical equipment for hazardous areas (EEHA).

This unit applies to design, installation, maintenance, inspection, auditing, and repair and overhaul functions.

Site-specific work permits maybe required to work in the hazardous environment. In addition, other permits may be required, such as confined space and to operate specific pieces of equipment such as elevated work platforms (EWPs) in various jurisdictions.

Additional and/or other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to work health and safety (WHS)/occupational health and safety (OHS) regulations.

### **Pre-requisite Unit**

UEEHA0004 Enter a classified hazardous area to undertake work related to electrical equipment and

UEEEL0039 Design, install and verify compliance and functionality of general electrical installations

or

UEEEL0028 Conduct compliance and functional verification of electrical apparatus and existing circuits

or

UEEIC0048 Verify compliance and functionality of instrumentation and control installations

## Competency Field

Hazardous

## Unit Sector

Electrotechnology

## Elements and Performance Criteria

### ELEMENTS

Elements describe the essential outcomes.

#### **1 Prepare to review explosion-protection technical standards**

#### **2 Ascertain the requirements for each explosion-protection type**

### PERFORMANCE CRITERIA

Performance criteria describe the performance needed to demonstrate achievement of the element.

- 1.1** Technical standards specifying the requirements to which each type of explosion-protected equipment is required to comply are identified
- 1.2** A verification dossier for a site that has gas hazards is reviewed and requirements for the explosive atmospheres are established
- 1.3** A verification dossier for a site that has dust hazards is reviewed and requirements for the explosive atmospheres are established
- 2.1** Protective features of each equipment type are identified through application of knowledge of explosion-protection methods
- 2.2** Equipment standards are reviewed to establish the compliance requirements for each equipment type
- 2.3** Aspects that are vulnerable to voiding the protection due to defective installation or poor maintenance are determined from knowledge of equipment types and equipment standards
- 2.4** Items of explosion-protected equipment are examined to identify any condition that would void the protection
- 2.5** Where particular explosion-protected equipment types may be used, relevant technical standards, equipment certification and the verification dossier for a given site are established

### **3 Identify acceptable equipment certification**

- 3.1** Knowledge of the equipment certification process and acceptable standards are applied
- 3.2** The required marking on certified equipment is obtained from relevant technical standards
- 3.3** The suitability of explosion-protection equipment items for a given application and location is ascertained from relevant technical standards, certification documents, equipment marking and the verification dossier for a given site

## **Foundation Skills**

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

## **Range of Conditions**

Range is restricted to essential operating conditions and any other variables essential to the work environment.

Non-essential conditions may be found in the UEE Electrotechnology Training Package Companion Volume Implementation Guide.

Determining the explosion-protection requirements to meet a specified classified hazardous area must include:

- using standards, equipment certification and installation design documentation and site-specific verification dossiers for any application in which explosion-protected equipment is used

## **Unit Mapping Information**

No equivalent unit.

## **Links**

Companion Volume implementation guides are found in VETNet - -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b8a8f136-5421-4ce1-92e0-2b50341431b6>

## **Assessment Requirements for UEEHA0003 Determine the explosion-protection requirements to meet a specified classified hazardous area**

### **Modification History**

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### **Performance Evidence**

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements, performance criteria and range of conditions on at least two separate occasions and include:

- selecting the correct standard/s relevant to each equipment type
- establishing the requirement for explosive atmospheres from a verification dossier
- examining flameproof Ex ‘d’, increased safety Ex ‘e’ and intrinsic safety Ex ‘i’ items of explosion-protected equipment and identifying any condition that would void the protection
- ascertaining the suitability of items of explosion-protected equipment for a given application and location from equipment standards, certification documents, equipment marking and the verification dossier.

### **Knowledge Evidence**

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements, performance criteria and range of conditions and include knowledge of:

- methods for preventing ignition of a explosive atmosphere by an electrical source including:
  - exclusion method, including:
    - dust ignition protection type ‘tD’ or ‘t’
    - pressurisation ‘p’
    - encapsulated ‘m’
    - oil-immersed ‘o’
    - powder filling ‘q’
  - explosion containment method - flameproof ‘d’ enclosure type
  - energy limitation, including:
    - intrinsic safety ‘i’
    - protection type ‘n’ (e.g. non-sparking, hermetically sealed and enclosed break)
  - avoidance of ignition source, including:
    - increased safety ‘e’

- protection type ‘n’
  - dilution-ventilation
- equipment and circuits protected by the flameproof (Ex ‘d’) enclosure type, including:
  - how flameproof-type enclosures work to provide explosion protection
  - features of flameproof enclosures and their function, including:
    - enclosure materials
    - flame paths
    - fasteners
    - gaskets
    - enclosure entries
    - breathing and drain devices
  - attributes of flameproof enclosures, including:
    - integrity under pressure
    - suitability for power switching equipment
    - situations where this type can be used
- aspects that are vulnerable to voiding the protection due to defective installation or poor maintenance, including:
  - installed location
  - cable/conduit entries
  - flame paths
  - gaskets
  - fasteners
  - pressure piling
- equipment and circuits protected by the increased safety (Ex ‘e’) method, including:
  - how increased safety ‘e’ type works to provide explosion protection
  - features of increased safety and their function, including:
    - electrical connections
    - length of conductors within an enclosure
    - clearances between bare conductive parts
    - creepage distances
    - enclosure entries
    - ingress protection (IP) rating of enclosures
    - temperature limitation
    - certified components
  - attributes of increased safety including:
    - absence of sparking contacts
    - situations where this type can be used
  - aspects that are vulnerable to voiding the protection due to poor installation or maintenance, including:
    - installed location

- electrical connections
- clearances
- preservation of temperature limitations
- components
- purpose and characteristics of the design features of equipment and circuits protected by the intrinsic safety (Ex ‘i’) type, including:
  - how the intrinsic safety type works to provide explosion protection
  - features of intrinsic safety and their function, including:
    - associated equipment
    - simple devices
    - dependant components
    - infallible components, assemblies and connections
    - external wiring
    - safety barrier
  - attributes of intrinsic safety including:
    - levels of protection
    - ignition energy limiting
    - entity versus integrated system concept
    - situations where this type can be used
  - aspects that are vulnerable to voiding the protection due to poor installation or maintenance, including:
    - installed location
    - stored energy sources
    - insulation ratings
    - external wiring
    - methods of earthing/bonding
- purpose and characteristics of the design features of equipment and circuits protected by the type of protection ‘n’ (Ex ‘n’) technique, including:
  - how type of protection ‘n’ works to provide explosion protection
  - features of type of protection ‘n’ and their application, including:
    - non-sparking device ‘nA’
    - range of devices and components designated ‘nC’
    - energy-limited equipment ‘nL’
    - associated energy-limited equipment ‘[nL]’ or ‘[Ex nL]’
    - self-protected energy-limited equipment ‘nA nL’
    - restricted-breathing enclosure ‘nR’
  - aspects that are vulnerable to voiding the protection due to poor installation or maintenance, including:
    - installed location
    - enclosures

- cable/conduit entries
  - external connections
- purpose and characteristics of the design features of equipment protected by the encapsulation (Ex ‘m’) technique including:
  - how the encapsulation type works to provide explosion protection
  - features of type of protection ‘m’ and their function, including:
    - levels of protection
    - temperature limitations
    - protective devices
    - situations where this type can be used
  - aspects that are vulnerable to voiding the protection due to poor installation or maintenance
- purpose and characteristics of the design features of equipment by the oil immersion (Ex ‘o’) technique, including:
  - how the oil immersion type works to provide explosion protection
  - features of type of protection ‘o’ and their function, including:
    - protective liquid
    - limiting temperature
    - immersion depth
    - situations where this type can be used
- purpose and characteristics of the design features of equipment protected by the powder filled (Ex ‘q’) technique, including:
  - how the powder-filling type works to provide explosion protection
  - features of the type of powder-filling ‘q’ and their function, including:
    - permanently sealed enclosures
    - enclosures intended to be opened for repair
    - temperature limitation
    - types of devices
    - situations where this type can be used
- purpose and characteristics of the design features of equipment and circuits protected by the pressurisation enclosure (Ex ‘p’) technique including:
  - how the pressurization enclosure type works to provide explosion protection
  - features of the type of pressurization enclosure ‘p’ and their function, including:
    - types of pressurisation
    - pressurisation system
    - purging
    - temperature limitation
    - safety devices
    - containment systems
    - protection types

- situations where this type can be used
- aspects that are vulnerable to voiding the protection due to pressure failure, including:
  - inadequate cable/conduit entries
  - poorly secured doors and covers
  - failed safety devices
  - negating purging requirements after maintenance
- purpose and characteristics of the design features of equipment protected from dust ignition by enclosure (Ex 't'), including:
  - how the dust ignition by enclosure type works to provide explosion protection
  - features of dust ignition by enclosure 't' and their function, including:
    - level of protection
    - protective devices
    - gaskets
    - cable/conduit entries
    - situations where this type can be used
    - type protection 'pD' in legacy systems
  - aspects that are vulnerable to voiding the protection due to poor installation or maintenance, including:
    - cable/conduit entries
    - sealing
    - dust layer accumulation
- common characteristics of explosion-protection types, including:
  - criteria on which equipment protection levels (EPLs) are assigned
  - the purposes of 'temperature classification' and 'equipment grouping'
  - equipment markings (nameplate)
  - limitations of non-metallic or specific alloy enclosures
  - the purpose and use of conformity and certification/approval for equipment used in explosive atmospheres
  - environmental conditions that may impact on explosion-protection techniques
  - the principles and applications of other and mixed explosion-protection techniques
- standards to which explosion-protected equipment is required to comply, including
  - standards to which the protective features of each type of explosion protection are required to comply
  - typical content of equipment (Ex) certificates, including:
    - explosion-protection parameters
    - electrical parameters
    - instruction and limitation of use
  - verification dossiers, including:
    - purpose
    - content

- Ex certification schemes to accepted standards, including
  - purpose and scope of certification schemes
  - accepted certification schemes
  - processes for having equipment certified under the acceptable Ex schemes, including:
    - scheme procedures
    - quality management requirements
    - conformance testing and assessment
    - requirements for ongoing certification.

## Assessment Conditions

Assessors must hold credentials specified within the Standards for Registered Training Organisations current at the time of assessment.

Assessment must satisfy the Principles of Assessment and Rules of Evidence and all regulatory requirements included within the Standards for Registered Training Organisations current at the time of assessment.

Assessment must occur in workplace operational situations where it is appropriate to do so; where this is not appropriate, assessment must occur in simulated workplace operational situations that replicate workplace conditions.

Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Resources for assessment must include access to:

- a range of relevant exercises, case studies and/or other simulations
- relevant and appropriate access equipment, explosive atmosphere equipment, tools and testing devices permitted in a hazardous area, materials and personal protective equipment (PPE) currently used in industry
- applicable documentation and workplace procedures, including:
  - safe work methods
  - technical standards for explosive-protected electrical equipment types and explosive atmospheres
  - verification dossier for a classified gas atmosphere area
  - verification dossier for a classified dust atmosphere area
  - safety procedures for the area
  - equipment certification documents
- defective and non-defective items of Ex ‘d’, Ex ‘e’ and Ex ‘i’ explosion-protected equipment.

## Links

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