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## **PROPOSAL**

### **Draft IECEx OPERATIONAL DOCUMENT**

#### **No. Ex OD0xx/Version 1**

Title: Competencies for working with electrical equipment for hazardous areas

This Draft Operational Document, prepared by the AU National Committee, sets out the requirements for Competencies for working with electrical equipment for hazardous areas. This document is intended to support certification where competency is required, e.g. Repair & Overhaul Service Facilities, and may be considered for Certification of Persons undertaking the work in various aspects of hazardous areas where it may be advantageous to be certified.

This first draft accompanies an AU proposal for a new area of work within IECEx for discussion at the IEC ExMC meeting in Buxton. If accepted AU is prepared to offer a convenor to progress this work.

To facilitate discussions at the ExMC meeting, Members are requested to study this draft prior to the ExMC meeting.

Chris Agius

IECEx Secretariat

**Address:**

IECEx Secretariat  
286 Sussex Street  
Sydney NSW 2000  
Australia

**Tel:** +61 2 8206 6940

**Fax:** +61 2 8206 6272

**Email:** [chris.agius@iecex.com](mailto:chris.agius@iecex.com)

INTERNATIONAL ELECTROTECHNICAL COMMISSION  
IECEX Certification Scheme

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**IEC SCHEME FOR CERTIFICATION TO STANDARDS FOR SAFETY OF  
ELECTRICAL EQUIPMENT FOR EXPLOSIVE ATMOSPHERES  
(IECEX SCHEME)**

**Operational Document No Ex/OD0xx/Version 1**

**TITLE: IECEX COMPETENCIES FOR WORKING WITH EQUIPMENT  
FOR EXPLOSIVE ATMOSPHERES  
Specification for Units of Competency**

Document History

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## INTRODUCTION

The objective of this specification is to set out the generic cross-industry competencies needed for work associated with electrical equipment for hazardous areas; these competencies are intended for use by any industry sector or enterprise with regards to explosion-protection related to the relevant functional areas.

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**COMPETENCIES FOR WORKING WITH EQUIPMENT  
FOR EXPLOSIVE ATMOSPHERES–**

**Specification for Units of Competency**

FOREWORD

Although various International and National Standards and the relevant statutory/regulatory requirements lay down standard criteria for the manufacture, installation, use and maintenance of explosion-protected electrical equipment in hazardous areas, no such reference exists for the competencies needed for work associated with such equipment for hazardous areas.

In the context of this specification, 'hazardous areas' are areas in which an explosive atmosphere may be present. Unless electrical equipment situated in such areas is constructed, installed and maintained in a special way, it may provide the energy and temperature necessary to ignite the atmosphere, usually with devastating results. The special design features of electrical equipment and systems used for these 'hazardous areas' are known as explosion-protection. They form part of the risk management strategies to ensure a safe and healthy working environment.

The development of Competency Standards for electrical equipment for hazardous areas is necessary due to the concern with the variability in skills of electrical workers and others dealing with this equipment. Although training has been available, it was usually confined to the technical aspects and there is generally no strategy to provide this specific training.

The concern over competence is heightened by the trend away from prescriptive regulations towards performance-based regulations. The performance-based approach places the 'duty of care' responsibilities on enterprises and individuals which, in turn, is said to promote self-monitored quality assurance. This results in greater compliance with requirements than is the case with the inspector methods that accompany prescriptive regulations.

Since the early 1990s industries have expressed the need for a set of Competency Standards to be used by any industry sector or enterprise, with regards to explosion-protected equipment for hazardous areas.

To meet this need a set of Competency Standards for Electrical Equipment in Hazardous Areas (EEHA) needs to be developed. Industries (mining and non-mining) concerned with the correct implementation of Competency Standards should ensure representation during the development of the competencies dealing with electrical equipment and installations in hazardous areas, to ensure the appropriateness of and need for a Working Group to overview, endorse and monitor the implementation of such Standards.

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**COMPETENCIES FOR WORKING WITH EQUIPMENT FOR EXPLOSIVE  
ATMOSPHERES—**

**Specification for Units of Competency**

## **1 SCOPE AND GENERAL**

This specification specifies the competencies required for work associated with electrical equipment for hazardous areas (commonly termed 'Ex' equipment) and the standards to which competency is to be assessed and attributed.

The competencies specified in this specification are intended as additional competencies to those previously acquired for the specific type of work in non-hazardous areas.

Note: Annex A summarizes the specific prerequisite Units and recommended general competencies to achieve Units of Competency in this specification.

The principal application of this specification is to personnel dealing with explosion-protected and associated electrical equipment for hazardous areas, covering the following work functions:

- a) Producing, processing or servicing functions in a hazardous area and not directly involved in installing, maintaining or repairing explosion-protected equipment and systems.
- b) Installing and maintaining explosion-protected equipment and systems in the hazardous area.
- c) Overhauling, repairing and modifying explosion-protected equipment.
- d) Developing/designing and maintaining explosion-protection strategies.
- e) Inspecting hazardous area equipment, systems and installations.

The specification sets the minimum requirements for training programs developed by Registered Training Organizations (RTOs) and Certifying Bodies who issue Certificate for the competencies described in this specification. However, this specification may also be referenced by—

- i) bodies certifying overhaul and repair workshops; and
- ii) enterprises in establishing the competency of their personnel.

## **2 NORMATIVE REFERENCES**

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60079 Series, *Electrical apparatus for explosive gas atmospheres*

IEC 61241 Series, *Electrical apparatus for use in the presence of combustible dust*

Note: A definitive list of Standards relevant to these Competency Standards is given in Appendix B.

### 3 TERMS AND DEFINITIONS

For the purposes of this document, the following definitions and explanatory information applies.

For the definitions of any other terms, particularly those of a more general nature, reference should be made to IEC 60050(426) or other appropriate parts of the IEC (International Electrotechnical Vocabulary).

#### 3.1

##### **Actions to limit risk of an explosion**

Organizational arrangements for reporting and rectifying defects, shutting down plant or machinery under emergency conditions, evacuating a hazardous area, reporting defects and conditions of plant and machinery, monitoring the hazardous area for presence of an explosive atmosphere and meeting OH&S obligations.

#### 3.2

##### **Appropriate personnel**

Individuals with responsibilities for design, installation, maintenance, production or servicing activities.

Note: Examples of appropriate personnel are Site Managers, Project Managers, Line Managers, Supervisors and Team Leaders.

#### 3.3

##### **Approved, approval**

With the approval of, acceptable to the authority having jurisdiction.

#### 3.4

##### **Assessment of competence**

The process of checking and confirming the ability to carry out specific work activities and/or functions based on evidence that shows a person can carry out such work safely and to requirements.

#### 3.5

##### **Qualifications Framework**

Qualifications Framework described in terms of levels characterized by the outcomes of vocational education and training.

#### 3.6

##### **Authority, regulatory**

A government agency responsible for relevant legislation and its application.

#### 3.7

##### **Certification**

Procedure by which a third party gives written assurance that a product, process or service conforms to specified requirements.

#### 3.8

##### **Classification of hazardous areas**

A method of analysing and classifying the environment where an explosive atmosphere may occur to allow the proper selection of equipment, particularly electrical equipment, to be installed and used safely in that environment.

#### 3.9

##### **Competency**

Competency comprises the specification of knowledge and skills and the application of that knowledge and skill to the standards of performance required in the workplace.

Competency includes all aspects of work performance and not only narrow skills. The four components of competency are: task skills; task management skills; contingency management skills and job/role environment skills.

Note: The concept of competency focuses on what is expected of an employee in the workplace rather than on the learning process, and embodies the ability to transfer and apply skills and knowledge to new situations and environments.

### 3.10

#### **Competent person**

A person who can demonstrate a combination of knowledge and skills to effectively, efficiently and safely carry out activities in hazardous areas, covered by this specification. Competency in some cases may be limited to one or more specific types of protection technique, e.g. Ex 'd', Ex 'i', and/or activity (e.g. design, selection, installation, maintenance, testing and inspection).

### 3.11

#### **Competency, Unit of**

A Unit of Competency is the competency required for a useful work function and which resides with an individual (Description of Units of Competency is given in Section 2 of this specification).

Notes:

- 1) A single Unit of Competency is not to be confused with a job description which will invariably comprise a number of Units of Competency.
- 2) The fields contained in each Unit of Competency are the following:
  - (a) **Scope** A general description of the work function to which the competency applies and the general abilities needed.
  - (b) **Prerequisites** Specific and general competencies expected to have been achieved prior to undertaking training in the unit.
  - (c) **Elements and performance criteria**
    - (i) **Elements** Outcomes which contribute to a unit.
    - (ii) **Performance criteria** Specify the required levels of performance for each element.
  - (d) **Range statement** Range of context and conditions to which performance criteria apply.
  - (e) **Evidence guide** Assists with the interpretation and assessment of the unit.
  - (i) **Critical aspects of evidence** Particular knowledge and skills essential to effective performance.
    - (i) **Concurrent assessment and relationship with other units** Identifies where benefits may be derived by assessing two or more units sequentially.
    - (ii) **Essential knowledge and associated skills** Knowledge that is either explicit or implicit to effective performance.

### 3.12

#### **Competency Standards**

Competency Standards are the collection of units of competency for a particular industry sector and are an integral part of a Training Package.

### 3.13

#### **Defects**

Visual damage or corrosion of the explosion-protection aspect of the installation or apparatus.

### 3.14

#### Endorsement

The explosion-protection techniques, or in the case of classification of hazardous areas, the types of hazardous areas (gases/vapours and/or dusts), in which an individual demonstrates competence relevant to a Unit of Competency. An endorsement of a Unit of Competency is shown by a suffix to the unit title. The available endorsements are as follows:

Unit endorsement suffix	Explosion-protection technique or type of hazardous areas for which competency has been demonstrated
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
Ex 'pD'	Pressurization–Dusts
Ex 'mD'	Encapsulation–Dusts
Ex 'iD'	Intrinsic safety–Dusts
Gases	Classification of hazardous areas
Dusts	Classification of hazardous areas

Notes:

- 1) Other explosion-protection techniques such as encapsulation 'm', oil-immersion 'o', powder filling 'q', ventilation 'v' and special protection 's', may be relevant to a particular workplace.
- 2) Ex 'tD' is equivalent to 'DIP'.
- 3) While the Standards addressing the technique 'pD', tD & mD have already been published, the other Standard covering the technique 'iD' are still being completed and publication is expected during 2006.

Annex C sets out the requirements for limiting endorsements that may be applied to some Units of Competency for persons whose work is confined to explosion-protected equipment for coal mining.

### 3.15

#### Equipment marking

Information with regards to certification that is required to be marked on each item of equipment incorporating an explosion-protection technique.

### 3.16

#### Established procedures

Formal arrangements of an organization, enterprise or statutory authority of how work is to be done and by whom.

Note: Examples of established procedures are documented in quality management systems, safety management systems, work clearance systems, work instructions, reporting systems and arrangements for dealing with emergencies.

### 3.17

#### Explosion properties of hazardous materials

There are two sets of properties—

for gases, vapours, flammable liquids and mists—vapour pressure; boiling point; flashpoint; ignition temperature; explosive limits; relative vapour density; minimum ignition energy

for dusts—layer ignition temperature; cloud ignition temperature; minimum ignition energy.

Notes:

- 1) Explosive limits (lower/LEL and upper/UFL) and flammability limits (lower/LFL and upper/UFL) are deemed to be synonymous. It should be recognized that some particular authorities having jurisdiction may have overriding requirements that dictate the use of one of these sets of terms and not the other.
- 2) Explosion severity is another relevant property for dusts.

**3.18****Explosion-protected equipment**

Electrical equipment to which specific measures are applied to avoid ignition of a surrounding explosive atmosphere.

Note: The word 'equipment' includes 'apparatus', as mentioned in many relevant Standards.

**3.19****Explosion-protection techniques**

Techniques applied to the design of electrical equipment, 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 hazardous areas.

**3.20****Group (of an electrical equipment for explosive atmospheres)**

Classification of electrical equipment related to the explosive atmosphere for which it is to be used.

Notes:

- 1) Electrical equipment for use in explosive gas atmospheres is divided into two groups—
  - a) Group I: Electrical equipment for mines susceptible to firedamp; and
  - b) Group II (which can be divided into subgroups IIA, IIB, IIC): Electrical apparatus for places with an explosive gas atmosphere, other than mines susceptible to firedamp.
- 2) This has also been known as 'gas grouping'.

**3.21****Hazard and risk assessment**

Any recognized methodology of identifying hazards and assessing risks such as 'hazard and operability study' (HAZOP) and 'fault tree analysis' (HAZAN).

**3.22****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 electrical equipment.

Note: Hazardous areas may include a variety of adverse environmental conditions such as those encountered in coal mines, shipping, oil/gas platforms and the like, which commonly require further specifications stated in legislation or regulatory requirements.

**3.23****Hazardous materials**

In the context of this specification hazardous materials are flammable gases and vapours and combustible dusts.

Note: All vapours of flammable liquids are flammable vapours.

**3.24****Inspection, close**

An inspection which encompasses those aspects covered by a visual inspection and, in addition, identifies those defects, such as loose bolts, which will be apparent only by the use of access equipment, such as steps (where necessary) and tools. Close inspections do not normally require the enclosure to be opened or the equipment to be de-energized.

**3.25****Inspection, detailed**

An inspection which encompasses those aspects covered by a close inspection and, in addition, identifies those defects, such as loose terminations, which will only be apparent by opening the enclosure, and using (where necessary) tools and test equipment.

**3.26 Inspection, initial**

An inspection of all electrical equipment, systems and installations before they are brought into service.

**3.27****Inspection, periodic**

An inspection of all electrical equipment, systems and installations carried out on routine basis.

**3.28****Inspection, sample**

An inspection of a proportion of the electrical equipment, systems and installations.

**3.29****Inspection, schedule**

A formal arrangement for conducting inspections which details the extent, grade and frequency of the inspections and the explosion-protected characteristics and compliances to be checked.

**3.30****Inspection, visual**

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

**3.31****Inspector, actions taken by an**

Actions taken by an inspector in relation to defects, non-conformities, faults in a hazardous area installation.

Note: Examples of such actions are: disconnection or non-connection of supply until a defect or fault or non-conformity is rectified, notice of period in which it has to be rectified, other actions within the scope of statutory regulations.

**3.32****Installation**

In the context of this specification installation includes explosion-protected equipment, wiring and other required items as they are fixed in place and connected as necessary, to operate as intended.

**3.33****Integrity (of explosion-protected equipment )**

Aspects of the equipment design and use that afford explosion-protection.

**3.34****Key competencies**

Generic competencies enabling effective participation in work and their incorporation in the Units of Competency (see Appendix D).

**3.35****Load and duty requirements (of wiring)**

Wiring systems that comply with IEC 60364 and/or National Standards.

**3.36****Non-conformance**

Equipment that does not satisfy the applicable Standards or requirements.



**3.37****O H & S policies and procedures**

Arrangements of an organization or enterprise to meet its legal and ethical obligations of ensuring the workplace is safe and without risk to health.

Note: Ensuring a workplace is safe will include hazard identification and risk assessment mechanisms, implementation of safety regulations, safety training, safety systems incorporating work clearance procedures, isolation procedures, use of protective equipment and clothing and use of codes of practice.

**3.38****Other items**

Items that are not in themselves explosion-protected but have an influence on the integrity of the explosion-protection technique used. For example, an overload device for a motor or associated equipment in the case of intrinsic safety technique.

**3.39****Pre-commission testing**

Tests specified, such as, performance and setting of protection devices and systems, earth loop impedance, insulation resistance, and earth continuity equipment connection and operation tests.

**3.40****Process specialist personnel**

Responsible persons with expertise in the technical aspects of the activities that produce the explosive hazard and include chemical engineers, process engineers, mining engineers, safety managers, and the like.

**3.41****Re-certification/ Supplementary approval**

Submission of previously certified/approved equipment to accredited certifying body or authority, to determine whether the equipment complies with the relevant Standards after modification or where original certification/approval is not fully known.

**3.42****Requirements**

Those to which equipment and procedures and their outcomes shall conform and include statutory obligations and regulations and Standards called-up by legislation or regulations.

Note: Requirements may include codes of practice, job specifications, Standards called up in specifications, procedures and work instructions and quality management systems.

**3.43****Servicing**

Maintaining, fault finding and repair of equipment, plant machinery and installations.

**3.44****Special tools, equipment and testing devices**

Tools for the removal of enclosure covers and connecting conductors, measuring devices such as feeler gauges and micrometer, gas and vapour sensors, electrical testing devices approved for use in a particular hazardous area.

**3.45****Specifications**

All those attributes that define accurately the nature of the involved hazards, materials/products, processes, equipment and installation design.

Note: Examples of specifications are design and manufacturer specifications defining all the necessary parameters and tolerances, process flow diagrams, explosive characteristics and technical data sheets for hazardous materials and products, and the like.

**3.46****Standards**

Technical documents which set out specifications and other criteria for equipment, materials and methods, to ensure they consistently perform as intended. The Standards referred to in this specification are those published by International Electrotechnical Commission.

Notes:

- 1) Competency in the use of other technical Standards may be required in industries not restricted to IEC requirements. For example, shipping and off-shore petroleum industries are subject to Standards agreed to by underwriters and enterprises or some other international conventions.
- 2) A list containing Standards available relevant to these Competency Standards is given in Annex B.

**3.47****Temperature classification**

System of classification by which electrical equipment is allocated one of six temperature classes according to its maximum surface temperature.

**3.48****Training Package**

A Training Package is a set of nationally endorsed specifications and qualification for recognizing and assessing peoples skills.

Note: A training package specifies the outcome of training and does not prescribe how an individual should be trained.

**3.49****Verification dossier**

A set of documents showing the compliance of electrical equipment and installations.

Note: The information in a 'Verification Dossier' is subject to audit under a formal inspection process.

**3.50****Wiring system**

Permitted wiring and accessories for power, measurement, control or communications purposes.

**3.51****Zones, hazardous**

The zones into which hazardous areas are classified based upon the frequency of the appearance and duration of an explosive atmosphere.

**3.52****Zones in explosive gas atmospheres**

See IEC 60079-10 for the definitions of Zones 0, 1 and 2.

**3.53****Zones in explosive dusts atmospheres**

See IEC 61241-10 for the definitions of Zones 20, 21 and 22.

## 4 UNITS OF COMPETENCY

### 4.1 SCOPE

This Section describes the Units of Competency for working with electrical equipment for hazardous areas and to ensure the risk of any explosion hazard in such areas has been minimized. The specific Units of Competency are described in detail in Clauses 4.2 to 4.19 and a list of such Units is shown in Table 4.1.

Note: An outline of the coding systems is given in Annex E.

The list of the eighteen Units of Competency that have been developed is shown in Table 4.1:

**TABLE 4.1**  
**LIST OF UNITS OF COMPETENCY**

Reference	Title	Endorsement <sup>a)</sup>
IECEx 010 A	Report on the integrity of explosion-protected equipment in hazardous areas	Not applicable
IECEx 012 A	Attend to breakdowns in hazardous areas	1
IECEx 020 A	Use and maintain integrity of portable gas detection devices	Not applicable
IECEx 107 A	Install explosion-protected equipment and wiring systems	1
IECEx 116 A	Install and maintain integrity of fixed gas detection equipment	Not applicable
IECEx 214 A	Maintain equipment in hazardous areas	1
IECEx 215 A	Overhaul and repair explosion-protected equipment	1
IECEx 407 A	Assess explosion-protected equipment for compliance with Standards	1
IECEx 408 A	Test installations in hazardous areas	1
IECEx 409 A	Conduct close inspection of existing hazardous areas installations	1
IECEx 410 A	Conduct detailed inspection of hazardous areas installations	1
IECEx 609 A	Develop and manage maintenance programs for hazardous areas electrical equipment	1
IECEx 610 A	Ensure the safety of hazardous areas	Not applicable
IECEx 705 A	Design and develop modifications to explosion-protected equipment	1
IECEx 706 A	Classify hazardous areas	2
IECEx 707 A	Design electrical installations in hazardous areas	1
IECEx 708 A	Design explosion-protected electrical systems	1
IECEx 711 A	Design gas detection systems	Not applicable

- a) Endorsement by:
1. Explosion-protection technique or
  2. Hazardous areas classification

## 4.2 IECEx 010 A - Report On The Integrity Of Explosion-Protected Equipment In Hazardous Areas

### 4.2.1 Scope

This competency standard unit covers the explosion-protection aspects of plant and machinery operation or maintenance. It requires the ability to visually identify any damage or deterioration of explosion-protected equipment, monitor equipment and plant in relation to changes in the explosion hazard and to follow procedures to limit the risk of an explosion.

### 4.2.2 Application

Typically this unit would apply to job function including management, plant operation, plant maintenance, engineering, **TO COMPLETED**

### 4.2.3 Prerequisites

Competence in this unit shall be assessed in combination with or after the gaining of other competencies required by a given industry or enterprise for plant or machinery operation or installations, maintenance or service functions (see Annex A).

Note: Annex A sets out the specific prerequisite Units and the recommended general competencies and level assumed to be held by a person before undertaking training/assessment to achieve a Unit of Competency.

### 4.2.4 Elements and performance criteria

Elements		Performance criteria	
010.1	Prepare to work in hazardous area	010.1.1	Nature of the explosion hazard in the area and risks are known and the status of the explosion hazard is ascertained through established procedures
		010.1.2	Operation and condition of plant and machinery, with regards to explosion-protection, is ascertained through established procedures
		010.1.3	Established procedures for use of the plant and machinery, with regards to explosion-protection techniques used in the area, are followed
010.2	Observe condition of explosion-protection system area	010.2.1	OH&S policies and procedures, with regards to explosion-protection, are followed
		010.2.2	Performance of plant and machinery is monitored to identify faults that may affect the integrity of the explosion-protected equipment and wiring system
		010.2.3	Observations of explosion-protected equipment and wiring are made during normal operations and visual non-conformances that may affect the integrity of the explosion-protection technique are identified
		010.2.4	Explosion hazard monitoring equipment is observed and a dangerous state of the hazard is identified (e.g. by using gas detectors)
010.3	Take actions to limit risk of an explosion	010.3.1	Variations outside normal operating conditions are reported and documented in accordance with established procedures
		010.3.2	Established procedures are followed in the event of a potential or immediate hazardous condition arising from any non-conformance identified in equipment/wiring or changes in the explosion hazard to a dangerous state.

### 4.2.5 Range statement

Competency shall be demonstrated in relation to any classified hazardous area.

## **4.2.6 Evidence guide**

### **4.2.6.1 Critical aspects of evidence**

Evidence of competency in this unit shall show—

- f) proficient performance associated with each element of competence by employing the techniques, procedures, information and resources available in the workplace and encompassing the following aspects:
  - i) Following work permits and clearance procedures.
  - ii) Monitoring hazards and following evacuation procedures.
  - iii) Correctly operating plant and machinery.
  - iv) Following plant and electrical isolation procedures.
  - v) Identifying visual damage or deterioration of explosion-protected equipment.
  - vi) Reporting visual defects.
- g) an understanding of the knowledge and associated skills essential to performance as outlined in Clause 4.2.6.3.

### **4.2.6.2 Concurrent assessment and relationship with other units**

For optimization of training and assessment effort reference should be made to Annex A and Annex F.

### **4.2.6.3 Essential knowledge and associated skills**

Evidence shall show that knowledge has been acquired of hazardous areas and the explosion-protection techniques of Flameproof (Ex 'd'); Increased safety (Ex 'e'); Non-sparking (Ex 'n'); Intrinsic safety (Ex 'i'); Pressurization (Ex 'p'); Protection by enclosures—Dusts (Ex 'tD'); Pressurization—Dusts (Ex 'pD'); Encapsulation—Dusts (Ex 'mD'); and Intrinsic safety—Dusts (Ex 'iD'). The extent of the essential knowledge and skills required is given in Clauses 5.2.1, 5.2.2 and 5.2.23.

### 4.3 IECEx 012 A - Attend To Breakdowns In Hazardous Areas

Note: This unit is endorsed for each of the explosion-protection techniques in which competency is demonstrated. Designation for each endorsement is given in Clause 4.3.5.

#### 4.3.1 Scope

This competency standard unit covers the explosion-protection aspects of attending to a breakdown in a hazardous area or of explosion-protected and associated equipment. It requires the ability to ascertain the nature of a breakdown, the extent of repairs required and the personnel needed to repair the breakdown.

#### 4.3.2 Application

Typically this unit applies to electrical, instrumentation or plant servicing job functions.

#### 4.3.3 Prerequisites

Competence in this unit shall be assessed either concurrently with or after Unit IECEx 010 A Report on the integrity of explosion-protected equipment in hazardous areas and competencies in attending to breakdowns in general plant and equipment, have been achieved (see Annex A).

#### 4.3.4 Elements and performance criteria

Element		Performance criteria	
012.1	Prepare to attend breakdown	012.1.1	Nature of the breakdown is confirmed with appropriate personnel to establish the need to enter the hazardous area
		012.1.2	Maintenance records of equipment related to the reported breakdown are review for possible causes.
		012.1.3	Safety to enter the hazardous area is established in accordance with established procedures and relevant clearance to do the work is obtained
		012.1.4	Testing devices and tools, anticipated as being needed for the work, are obtained and checked for correct operation and safety
012.2	Evaluate extent of work	012.2.1	OH&S policies and procedures for working in a hazardous area are followed.
		012.2.2	Extent of breakdown is evaluated and confirmed with appropriate personnel.
		012.2.3	Other personnel required to determine cause and rectify breakdown is ascertained from available evidence and arrangements made for their attendance where applicable.
		012.2.4	Extent of repair work is ascertained from available evidence and confirmed with appropriate personnel.
		012.2.5	Limits of repair work that can be carried out in-situ are established with regards to explosion risk and in accordance with established procedures and requirements.
012.3	Arrange repair work	012.3.1	Equipment is isolated in accordance with established procedures
		012.3.2	Circuits of equipment being withdrawn from service are terminated or isolated safely and in manner approved for the classification of the area
		012.3.3	Certification documentation for replacement equipment is sighted to ensure that it is identical with the equipment it replaces and is in accordance with the explosion-protection system design

Element		Performance criteria	
		012.3.4	Repair work carried out in-situ is done in accordance with established procedures and requirements
012.4	Confirm completion of work	012.4.1	Explosion-protected equipment and systems are inspected and tested after repairs are completed to ensure the integrity of the system
		012.4.2	Appropriate personnel are notified of the completion of the repair work and details are documented in accordance with established procedures and requirements

#### 4.3.5 Range statement

Competency shall be demonstrated in relation to any classified hazardous area and explosion-protection techniques. This unit shall be endorsed for each technique in which competency is demonstrated. The endorsements shall be shown by the Ex designation for each explosion-protection technique as a suffix to the unit title. The unit endorsements are given in 3.14

#### 4.3.6 Evidence guide

##### 4.3.6.1 Critical aspects of evidence

Evidence of competency in this unit shall show—

- a) proficient performance associated with each element of competence by employing the techniques, procedures, information and resources available in the workplace and encompassing the following aspects in relation to each explosion-protection technique for which competency is sought:

Following work permits and clearance procedures.

- i) Monitoring hazards and following evacuation procedures.
- ii) Following plant and electrical isolation procedures.
- iii) Correctly evaluating extent of breakdowns.
- iv) Interpreting certification documentation in relation to repair and replacement.
- v) Following established breakdown procedures.

- b) an understanding of the knowledge and associated skills essential to performance as outlined in Clause 4.3.6.3.

##### 4.3.6.2 Concurrent assessment and relationship with other units

For optimization of training and assessment effort reference should be made to Annex A and Annex F

##### 4.3.6.3 Essential knowledge and associated skills

Evidence shall show that knowledge has been acquired of hazardous areas and the explosion-protection techniques of Flameproof (Ex 'd'), Increased safety (Ex 'e'), Non-sparking (Ex 'n'), Intrinsic safety (Ex 'i'), Pressurization (Ex 'p'), Protection by enclosures—Dusts (Ex 'tD'), Pressurization—Dusts (Ex 'pD'), Encapsulation—Dusts (Ex 'mD'), and Intrinsic safety—Dusts (Ex 'iD'). The extent of the essential knowledge and skills required is given in Clauses 5.2.1 to 5.2.9.

#### 4.4 IECEx 020 A - Use And Maintain The Integrity Of Portable Gas Detection Devices

##### 4.4.1 Scope

This competency standard unit covers the gas detection aspects of ensuring a work place is safe from explosive and toxic gases and vapours. It requires the ability to use measuring instruments accurately, follow written instructions and to write instructions for others.

##### 4.4.2 Application

Typically this unit applies to any job function that requires entry to designated hazardous area.

##### 4.4.3 Prerequisites

Competency in this unit shall be assessed concurrently with or after other competencies required by a given industry or enterprise for plant or machinery operation, installation, maintenance or service functions (see Annex A).

##### 4.4.4 Elements and performance criteria

Element		Performance criteria	
020.1	Prepare to use portable gas detection device	020.1.1	The need to initiate gas detection is identified by OH&S requirements and established procedures
		020.1.2	The gas or vapour to be detected is established from plant/site records or consultation with relevant personnel
		020.1.3	Gas detection device(s) for the gas/vapour to be detected is/are checked for calibration and response in accordance with manufacturer's instructions
020.2	Establish safety of the area with regards to the presence of gases or vapours	020.2.1	OH&S policies and procedures, with regards to gas/vapour detection, are followed
		020.2.2	Gas detection device is used in accordance with manufacturer's instructions and with regards to environmental conditions
		020.2.3	Observations of gas detection readings are recorded in accordance with established procedures
		020.2.4	Safe-to-work is determined from gas detection reading and then clearance to work is issued in accordance with established procedures
020.3	Monitor gas detection devices for the presence of gases/vapours	020.3.1	The frequency of monitoring is determined from the nature of gas/vapour and the effect of environmental conditions (e.g. ambient temperature rise)
		020.3.2	Others are instructed in procedures to carry out monitoring and these instructions are documented
020.4	Follow procedures to maintain gas detection devices	020.4.1	Gas detection devices are stored in accordance with manufacturer's recommendations
		020.4.2	Gas detection devices are formally checked and calibrated periodically as recommended by the manufacturer
		020.4.3	Storage, use and calibration record of the gas detection devices is maintained, in accordance with the established procedures

##### 4.4.5 Range statement

Competency shall be demonstrated in relation to any classified hazardous area or confined space.



#### **4.4.6 Evidence guide**

##### **4.4.6.1 Critical aspects of evidence**

Evidence of competency in this unit shall show—

- a) proficient performance associated with each element of competence by employing the techniques, procedures, information and resources available in the workplace and encompassing the following aspects:
  - i) Following work permits and clearance procedures.
  - ii) Monitoring hazards and following evacuation procedures.
  - iii) Determining whether the gas/vapour level in a work area is safe.
  - iv) Following procedures to maintain the integrity of gas detection devices.
- b) an understanding of the knowledge and associated skills essential to performance as outlined in Clause 4.4.6.3.

##### **4.4.6.2 Concurrent assessment and relationship with other units**

For optimization of training and assessment effort reference should be made to Annex A and Annex F

##### **4.4.6.3 Essential knowledge and associated skills**

Evidence shall show that knowledge has been acquired of hazardous areas, explosion-protection techniques and gas detection. The extent of the essential knowledge and skills required is given in Clauses 5.2.1 and 5.2.24.

## 4.5 IECEx 107 A - Install Explosion-Protected Equipment And Wiring Systems

Note: This unit is endorsed for each of the explosion-protection techniques in which competency is demonstrated. Designation for each endorsement is given in Clause 4.5.5.

### 4.5.1 Scope

This competency standard unit covers the explosion-protection aspects for installing explosion-protected and associated equipment and wiring systems. It requires the ability to match equipment with that specified for a given location, work safely, and to installation Standards and complete the necessary installation documentation.

### 4.5.2 Application

Typically this unit applies to electrical, instrumentation, electronics and data communication job functions.

### 4.5.3 Prerequisites

Competence in this unit shall be assessed either concurrently with or after Unit IECEx 010 A Report on the integrity of explosion-protected equipment in hazardous areas and competencies in the installation of general low-voltage or extra-low-voltage electrical/electronic equipment and wiring systems have been achieved (see Annex A).

Note.

Practice of this unit in the workplace in relation to low-voltage wiring and equipment is subject to regulation for undertaking electrical work.

### 4.5.4 Elements and performance criteria

Elements		Performance criteria	
107.1	Prepare for installation of equipment and wiring	107.1.1	OH&S policies and procedures for preparing to work in a hazardous area are followed
		107.1.2	Types of explosion-protected equipment and wiring systems to be installed are verified from design documents.
		107.1.3	Location in which specific items of equipment and circuits are to be installed is determined from design documents
		107.1.4	Explosion-protected equipment markings are checked to ensure they conform to design specifications and certification documents
		107.1.5	Certification document supplied with each item of equipment is collected for forwarding to appropriate personnel.
		107.1.6	Special tools, equipment and testing devices needed to carry out the installation work are obtained and checked for correct operation and safety
107.2	Install the equipment and wiring systems	107.2.1	OH&S policies and procedures for working in a hazardous area are followed
		107.2.2	Equipment is installed to conform with design specifications, Standards and within the limits specified by the equipment certification
		107.2.3	Equipment and wiring system components are dismantled where necessary and parts stored to protect them against loss or damage
		107.2.4	Equipment and wiring are installed in a manner that does not reduce the type of protection afforded by the equipment design
		107.2.5	Circuits are tested prior to connection to devices to ensure resistance of earthing is sufficiently low, installation resistance is safe, and polarity and connections are correct and each circuit complies with requirements

Elements		Performance criteria	
107.3	Confirm that the installation is completed	107.3.1	Arrangements are made, in accordance with requirements, for an initial inspection to be carried out on the installation
		107.3.2	Appropriate action is taken to rectify non-conformances found during the initial inspection to ensure the installation complies with requirements
		107.3.3	The completed installation is documented in accordance with requirements and forwarded to personnel responsible for compiling the verification dossier.

#### 4.5.5 Range statement

Competency shall be demonstrated in relation to any classified hazardous area and explosion-protection techniques. This unit shall be endorsed for each technique in which competency is demonstrated. The endorsements shall be shown by the Ex designation for each explosion-protection technique as a suffix to the unit title. The unit endorsements are given in 3.14

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#### 4.5.6 Evidence guide

##### 4.5.6.1 Critical aspects of evidence

Evidence of competency in this unit shall show—

- a) proficient performance associated with each element of competence by employing the techniques, procedures, information and resources available in the workplace and encompassing the following aspects in relation to each explosion-protection technique for which competency is sought:
  - i) Working safely in a hazardous area including, the use of work permits and clearances, hazard monitoring and evacuation procedures, and plant and electrical isolation.
  - ii) Handling and installing equipment and wiring in a manner that does not reduce the type of protection afforded by the equipment design.
  - iii) Checking equipment against certification documents including conditions of certification relating to the safe use.
  - iv) Verifying equipment has been installed according to installation design specifications
  - v) Test installed cables/circuits to ensure they are safe
  - vi) Documenting installation completion.
- b) an understanding of the knowledge and associated skills essential to performance as outlined in Clause 4.5.6.3.

##### 4.5.6.2 Concurrent assessment and relationship with other units

For optimization of training and assessment effort reference should be made to Annex A and Annex F

##### 4.5.6.3 Essential knowledge and associated skills

Evidence shall show that knowledge has been acquired of hazardous areas and the explosion-protection techniques of Flameproof (Ex 'd'), Increased safety (Ex 'e'), Non-sparking (Ex 'n'), Intrinsic safety (Ex 'i'), Pressurization (Ex 'p'), Protection by enclosures—Dusts (Ex 'tD'), Pressurization—Dusts (Ex 'pD'), Encapsulation—Dusts (Ex 'mD'), and Intrinsic safety—Dusts (Ex 'iD'). The extent of the essential knowledge and skills required is given in Clauses 5.2.1 to 5.2.11.

## 4.6 IECEx 116 A - Install And Maintain Integrity Of Fixed Gas Detection Equipment

### 4.6.1 Scope

This competency standard unit covers the installation, calibration and response checking of permanent gas detection equipment. It requires the ability to match equipment with that specified for a given location and to use manufacturer's manuals to maintain accuracy of gas monitoring devices.

### 4.6.2 Application

Typically this unit applies to electrical, instrumentation, electronics and data communication job functions.

### 4.6.3 Prerequisites

Competence in this unit shall be assessed either concurrently with or after Units IECEx 107 A—Install explosion-protected equipment and wiring systems or IECEx 214 A—Maintain equipment in hazardous areas *have been achieved* (see Annex A).

### 4.6.4 Elements and performance criteria

Elements		Performance criteria	
116.1	Prepare for installation gas detection equipment	116.1.1	OH&S policies and procedures for preparing to work in a hazardous area are followed
		116.1.2	Location in which gas detection of equipment is to be installed is determined from design documents
		116.1.3	Gas detection equipment markings are checked to ensure they conform to design specifications and certification documents
		116.1.4	Certification document supplied with each item of gas detection equipment is collected for inclusion in site records
116.2	Install gas detection equipment	116.2.1	OH&S policies and procedures are followed
		116.2.2	Gas detection equipment is installed in appropriate locations and in conformance with design specifications, Standards and within the limits specified by the equipment certification and manufacturer
		116.2.3	Gas detection is installed in a manner that does not reduce the type of protection afforded by any associated explosion-equipment design
116.3	Response checking and calibration of gas detection equipment	116.3.1	OH&S policies and procedures are followed
		116.3.2	Gas detection equipment is formally checked and calibrated periodically as specified by the manufacturer
		116.3.3	Installation and maintenance of gas detection equipment is documented in accordance with requirements and forwarded to personnel responsible for compiling verification dossier

### 4.6.5 Range statement

Competency shall be demonstrated in relation to any classified hazardous area.

### 4.6.6 Evidence guide

#### 4.6.6.1 Critical aspects of evidence

Evidence of competency in this unit shall show—

- a) proficient performance associated with each element of competency by employing the techniques, procedures, information and resources available in the workplace and encompassing the following aspects:
- i) Working safely in a hazardous area or confined space including the use of work permits and clearances, hazard monitoring and evacuation procedures and plant and electrical isolation.
  - ii) Handling and installing equipment and wiring in a manner that does not reduce the integrity afforded by the equipment design.
  - iii) Checking equipment against certification documents and design specifications.
  - iv) Documenting installation and maintenance activities.
  - v) Following procedures to maintain the integrity of gas detection.
- b) an understanding of the knowledge and associated skills essential to performance as outlined in Clause 4.6.6.3.

#### **4.6.6.2 Concurrent assessment and relationship with other units**

For optimization of training and assessment effort reference should be made to Annex A and Annex F

#### **4.6.6.3 Essential knowledge and associated skills**

Evidence shall show that knowledge has been acquired of hazardous areas and the explosion-protection techniques of Flameproof (Ex 'd'), Increased safety (Ex 'e'), Non-sparking (Ex 'n'), Intrinsic safety (Ex 'i'), Pressurization (Ex 'p'). The extent of the essential knowledge and skills required is given in Clauses 5.2.1 to 5.2.10 and 5.2.25.

## 4.7 IECEx 214 A - Maintain Equipment In Hazardous Areas

Note: This unit is endorsed for each of the explosion-protection techniques in which competency is demonstrated. Designation for each endorsement is given in Clause 4.7.5.

### 4.7.1 Scope

This competency standard unit covers the explosion-protection aspects for maintaining explosion-protected and associated equipment and wiring systems. It requires the ability to follow a maintenance program, work safely, carry out maintenance to Standards and manufacturer's instructions and complete the necessary maintenance documentation.

### 4.7.2 Application

Typically this unit applies to electrical, instrumentation, electronics and data communication job functions.

### 4.7.3 Prerequisites

Competence in this unit shall be assessed either concurrently with or after Unit IECEx 010 A Report on the integrity of explosion-protected equipment in hazardous areas and competencies in the maintenance of general low-voltage or extra-low-voltage electrical/electronic equipment and wiring systems have been achieved (see Annex A).

Note.

Practice of this unit in the workplace in relation to low-voltage wiring and equipment is subject to regulation for undertaking electrical work.

### 4.7.4 Elements and performance criteria

Elements		Performance criteria	
214.1	Prepare to carry out maintenance	214.1.1	OH&S policies and procedures for preparing to work in a hazardous area are followed
		214.1.2	Area classification and details of explosion-protected equipment and wiring are ascertained from hazardous area layout drawings and equipment certification documents held in the verification dossier
		214.1.3	Extent of maintenance to be conducted is established from the maintenance schedule and reports held in the verification dossier
		214.1.4	Special tools, equipment and testing devices needed to carry out the maintenance work are obtained and checked for correct operation and safety
214.2	Carry out maintenance	214.2.1	OH&S policies and procedures for working in a hazardous area are followed
		214.2.2	Work is carried out to planned schedule to ensure all items are correctly maintained
		214.2.3	Equipment is checked and tested in accordance with established procedures to determine whether it functions correctly, complies with approval documentation and is not subject to deterioration or damage
		214.2.4	Equipment is adjusted or repaired within the limits permitted by the equipment certification and in accordance with manufacturers' instructions
		214.2.5	Certification documentation for replacement equipment is sighted to ensure that it is identical to the equipment it replaces and is in accordance with the explosion-protection system design
		214.2.6	Circuits of equipment being withdrawn from service are terminated or isolated safely and in the manner approved for the classification of the area

Elements		Performance criteria	
214.3		214.2.7	Flexible cables and cords are examined and removed from service if they are not in immediate use or are found to be defective or damaged
		214.2.8	Spare equipment, flexible cables and cords are maintained and suitably stored where they are not likely to suffer deterioration or damage
	Complete maintenance work inspections and documentation	214.3.1	Detailed inspection of explosion-protected equipment and systems subject to the maintenance work is arranged in accordance with established procedures and requirements
		214.3.2	Results of inspections and maintenance activities are recorded in accordance with established procedures and requirements
		214.3.3	Appropriate personnel are notified of the completion of maintenance and details are documented in accordance with established procedures and requirements

#### 4.7.5 Range statement

Competency shall be demonstrated in relation to any classified hazardous area and explosion-protection techniques. This unit shall be endorsed for each technique in which competency is demonstrated. The endorsements shall be shown by the Ex designation for each explosion-protection technique as a suffix to the unit title. The unit endorsements are given in 3.14

#### 4.7.6 Evidence guide

##### 4.7.6.1 Critical aspects of evidence

Evidence of competency in this unit shall show—

- a) proficient performance associated with each element of competence by employing the techniques, procedures, information and resources available in the workplace and encompassing the following aspects in relation to each explosion-protection technique for which competency is sought:
  - i) Working safely in a hazardous area in relation to, work permits and clearances, hazard monitoring and evacuation procedures, and plant and electrical isolation.
  - ii) Identifying defects and faults.
  - iii) Interpreting certification documentation in relation to maintenance, repair and replacement.
  - iv) Following established maintenance procedures.
  - v) Documenting maintenance details.
- b) an understanding of the knowledge and associated skills essential to performance as outlined in Clause 4.7.6.3.

##### 4.7.6.2 Concurrent assessment and relationship with other units

For optimization of training/assessment effort see Annex A and Annex F

##### 4.7.6.3 Essential knowledge and associated skills

Evidence shall show that knowledge has been acquired of hazardous areas and the explosion-protection techniques of Flameproof (Ex 'd'), Increased safety (Ex 'e'), Non-sparking (Ex 'n'), Intrinsic safety (Ex 'i'), Pressurization (Ex 'p'), Protection by enclosures—Dusts (Ex 'tD'), Pressurization—Dusts (Ex 'pD'), Encapsulation—Dusts (Ex 'mD'), and Intrinsic safety—Dusts (Ex 'iD'). The extent of the essential knowledge and skills required is given in Clauses 5.2.1 to 5.2.11.

## 4.8 IECEx 215 A - Overhaul And Repair Explosion-Protected Equipment

Note: This unit is endorsed for each of the explosion-protection techniques in which competency is demonstrated. Designation for each endorsement is given in Clause 4.8.5.

### 4.8.1 Scope

This competency standard unit covers the explosion-protection aspects of overhauling and repairing explosion-protected equipment. It requires the ability to establish and document the level of work required, arranging for the overhaul/repair to be carried out, verify compliance of overhauled/repared equipment and complete the necessary documentation.

### 4.8.2 Application

Typically this unit applies to workshop job functions

### 4.8.3 Prerequisite units

Competence in this unit shall be assessed only after competencies in the overhaul and repair of general low-voltage or extra-low-voltage electrical/electronic equipment have been achieved (see Annex A).

### 4.8.4 Elements and performance criteria

Elements		Performance criteria	
215.1	Prepare for overhaul/repair of equipment	215.1.1	Instructions on overhaul and/or repair are received and expected outcomes of the work confirmed with appropriate personnel
		215.1.2	Certification documents for the equipment are sought and received in order to check that the equipment complies with the certification
215.2	Establish the level of overhaul required	215.2.1	Measurements, tests and inspections are carried out on the equipment in accordance with OH&S and other established procedures
		215.2.2	The extent of work to be done is determined from measurement, test and inspection results and their correspondence with original certification and the requirements of Standards
		215.2.3	Specifications and instructions for the overhaul/repair work are documented in accordance with requirements
215.3	Arrange overhaul/repair work	215.3.1	Arrangements are made for the overhaul/repair work to be done in accordance with established procedures
		215.3.2	A copy of overhaul/repair specifications and instructions is provided to personnel responsible for carrying out the work
215.4	Verify that equipment complies with original certification	215.4.1	Level of testing required to verify that overhauled/repared equipment complies with original certification specifications is determined in accordance with requirements
		215.4.2	Verification tests are conducted in accordance with established procedures
215.5	Document overhaul/repair work	215.5.1	Equipment marking is checked and marked where applicable, in accordance with original certification
		215.5.2	Overhaul/repair work is documented in accordance with requirements stating that the equipment complies with the original certification
		215.5.3	Documentation of the repair work is filed in verification dossier and a copy is issued with the equipment



#### **4.8.5 Range statement**

Competency shall be demonstrated in relation to any classified hazardous area and explosion-protection techniques. This unit shall be endorsed for each technique in which competency is demonstrated. The endorsements shall be shown by the Ex designation for each explosion-protection technique as a suffix to the unit title. The unit endorsements are given in 3.14

#### **4.8.6 Evidence guide**

##### **4.8.6.1 Critical aspects of evidence**

Evidence of competency in this unit shall show—

- a) proficient performance associated with each element of competence by employing the techniques, procedures, information and resources available in the workplace and encompassing the following aspects in relation to each explosion-protection technique for which competency is sought:
  - i) Following OH&S procedures.
  - ii) Interpreting certification documentation and Standards.
  - iii) Measuring, testing and inspecting equipment for compliance with certification and Standards.
  - iv) Specifying overhaul/repair work.
  - v) Documenting overhaul/repair work.
  - vi) Using quality systems.
- b) an understanding of the knowledge and associated skills essential to performance as outlined in Clause 4.8.6.3.

##### **4.8.6.2 Concurrent assessment and relationship with other units**

For optimization of training and assessment effort reference should be made to Annex A and Annex F

##### **4.8.6.3 Essential knowledge and associated skills**

Evidence shall show that knowledge has been acquired of hazardous areas and the explosion-protection techniques of Flameproof (Ex 'd'); Increased safety (Ex 'e'); Non-sparking (Ex 'n'); Intrinsic safety (Ex 'i'); Pressurization (Ex 'p'); Protection by enclosures—Dusts (Ex 'tD'); Pressurization—Dusts (Ex 'pD'); Encapsulation—Dusts (Ex 'mD'); and Intrinsic safety—Dusts (Ex 'iD'). The extent of the essential knowledge and skills required is given in Clauses 5.2.1 to 5.2.9 and 5.2.13.

#### 4.9 IECEX 407 A - Verify Assurance Of Conformity Of Explosion-Protected Apparatus

Note: This unit is endorsed for each of the explosion-protection techniques in which competency is demonstrated. Designation for each endorsement is given in Clause 4.9.4.

##### 4.9.1 Scope

This competency standard unit covers verifying that explosion-protected apparatus that does not carry acceptable certification provides level of safety equivalent to accepted standards. It encompasses;

Verification of documentation

Conformance of apparatus to documentation

Notes:

- 1) This competency standard unit is intended to assist, but in no way to supplant, the process of certification of compliance to explosion-protection (Ex) Standards (refer to Publications IECEx 02 and Operational Documents, containing the Certification Rules of the IECEx Scheme).
- 2) This competency standard unit may be useful for —
  - a) manufacturers when preparing submissions for certification; and
  - b) users when selecting repaired or existing equipment (as outlined in IEC 60079-14).
- 3) This competency standard unit is not intended to cover staff employed in accredited certification or testing bodies.

##### 4.9.2 Prerequisites

To achieve is units participants should have Competences in general technical evaluation and report writing. (see Annex A).

##### 4.9.3 Elements and performance criteria

Elements		Performance criteria	
407.1	Prepare for examination of certified equipment	407.1.1	Documentation in accordance with established procedures is obtained and read to determine the certification specifications for which the equipment is to be assessed
		407.1.2	Tools and measuring devices needed for examination are obtained and checked for correct, accurate and safe operation
		407.1.3	Examination area is checked to ensure it is safe to conduct examinations in accordance with established procedures
407.2	Conduct equipment examination	407.2.1	Examination is set up in accordance with established procedures
		407.2.2	Examination is carried out in accordance with OH&S and other established procedures
		407.2.3	Any tests required to establish conformity are determined
		407.2.4	Arrangements are made for an accredited testing body to conduct and report on conformity tests
407.3	Document and submit examination and test results	407.3.1	Assessment results reporting on the integrity of explosion-protected electrical equipment are documented in accordance with requirements and established procedures
		407.3.2	Assessment and test documentation, and where appropriate, issued documentation from accredited testing bodies, are recorded in accordance with requirements and established procedures

Elements		Performance criteria	
		407.3.3	Assessment and test documentation is forwarded to appropriate personnel, or accredited certification bodies, responsible for issuing certificates of conformity in accordance with requirements and established procedures

#### 4.9.4 Range statement

Competency shall be demonstrated in relation to any classified hazardous area and explosion-protection techniques. This unit shall be endorsed for each technique in which competency is demonstrated. The endorsements shall be shown by the Ex designation for each explosion-protection technique as a suffix to the unit title. The unit endorsements are given in 3.14

#### 4.9.5 Evidence guide

##### 4.9.5.1 Critical aspects of evidence

Evidence of competency in this unit shall show—

- a) proficient performance associated with each element of competence by employing the techniques, procedures, information and resources available in the workplace and encompassing the following aspects in relation to each explosion-protection technique for which competency is sought:
  - i) Following OH&S procedures.
  - ii) Interpreting certification documentation and Standards.
  - iii) Examining equipment for compliance with specifications.
  - iv) Determining conformity tests required, in association with certification and testing bodies.
  - v) Interpreting results.
  - vi) Reporting examination and test outcomes to an accredited certification body.
- b) an understanding of the knowledge and associated skills essential to performance as outlined in Clause 4.9.5.3.

##### 4.9.5.2 Concurrent assessment and relationship with other units

For optimization of training and assessment effort reference should be made to Annex A and Annex F

##### 4.9.5.3 Essential knowledge and associated skills

Evidence shall show that knowledge has been acquired of hazardous areas and the explosion-protection techniques of Flameproof (Ex 'd'); Increased safety (Ex 'e'); Non-sparking (Ex 'n'); Intrinsic safety (Ex 'i'); Pressurization (Ex 'p'); Protection by enclosures—Dusts (Ex 'tD'); Pressurization—Dusts (Ex 'pD'); Encapsulation—Dusts (Ex 'mD'); and Intrinsic safety—Dusts (Ex 'iD'). The extent of the essential knowledge and skills required is given in Clauses 5.2.1 to 5.2.9 and 5.2.21.

#### 4.10 IECEx 408 A - Test Installations In Hazardous Areas

Note: This unit is endorsed for each of the explosion-protection techniques in which competency is demonstrated. Designation for each endorsement is given in Clause 4.10.4.

##### 4.10.1 Scope

This competency standard unit covers testing electrical installations for hazardous areas. It requires the ability to select, prepare and use appropriate testing devices, work safely and to Standards and to interpret and record test results.

##### 4.10.2 Prerequisites

Competence in this unit shall be assessed either concurrently with or after units IECEx 107 A Install explosion-protected equipment and wiring systems or IECEx 214 A Maintain equipment in hazardous areas have been achieved (see Annex A).

ADD LOW VOLTAGE ENDORSEMENT??

##### 4.10.3 Elements and performance criteria

Elements		Performance criteria	
408.1	Prepare to conduct testing	408.1.1	OH&S policies and procedures for preparing to work in an area where a explosive atmosphere may be present are followed
		408.1.2	Area classification is ascertained from the hazardous area layout drawings or other classification documents
		408.1.3	Location of each item of equipment and of circuits subject to testing are determined from design drawings and documentation
		408.1.4	Special tools, equipment and testing devices needed for the testing work are obtained and checked for correct operation and safety
408.2	Conduct testing	408.2.1	OH&S policies and procedures for working in a hazardous area are followed
		408.2.2	Parts of equipment that are dismantled in order to conduct testing are stored to protect them against loss or damage
		408.2.3	Certified and approved low energy testing devices are selected and used to test into areas where explosive hazard may be present
		408.2.4	Sensitive circuit components required to be tested, which are likely to be damaged by high test voltages, are tested by an appropriate testing method
		408.2.5	Tests necessary to determine whether the electrical system complies with requirements for the explosion-protection techniques to be used and for electrical safety are conducted in accordance with established procedures
		408.2.6	When testing has been completed, equipment parts and circuit connections are replaced in a manner that ensures the integrity of the explosion-protection system
408.3	Confirm and document test results	408.3.1	Non-conformances and faults revealed by the testing and the resulting recommended actions are documented and reported to appropriate personnel
		408.3.2	Completion of testing is verified and a copy of the testing documentation submitted to the appropriate personnel for inclusion in the verification dossier in accordance with established procedures

#### **4.10.4 Range statement**

Competency shall be demonstrated in relation to any classified hazardous area and explosion-protection techniques. This unit shall be endorsed for each technique in which competency is demonstrated. The endorsements shall be shown by the Ex designation for each explosion-protection technique as a suffix to the unit title. The unit endorsements are given in 3.14

#### **4.10.5 Evidence guide**

##### **4.10.5.1 Critical aspects of evidence**

Evidence of competency in this unit shall show—

- a) proficient performance associated with each element of competence by employing the techniques, procedures, information and resources available in the workplace and encompassing the following aspects in relation to each explosion-protection technique for which competency is sought:
  - i) Working safely in a hazardous area in relation to, work permits and clearances, hazard monitoring and evacuation procedures, and plant and electrical isolation.
  - ii) Handling and installing equipment and wiring in a manner that does not reduce the type of protection afforded by the equipment design.
  - iii) Conducting tests.
  - iv) Documenting testing outcomes.
- b) an understanding of the knowledge and associated skills essential to performance as outlined in Clause 4.10.5.3.

##### **4.10.5.2 Concurrent assessment and relationship with other units**

For optimization of training and assessment effort reference should be made to Annex A and Annex F

##### **4.10.5.3 Essential knowledge and associated skills**

Evidence shall show that knowledge has been acquired of hazardous areas and the explosion-protection techniques of Flameproof (Ex 'd'); Increased safety (Ex 'e'); Non-sparking (Ex 'n'); Intrinsic safety (Ex 'i'); Pressurization (Ex 'p'); Protection by enclosures—Dusts (Ex 'tD'); Pressurization—Dusts (Ex 'pD'); Encapsulation—Dusts (Ex 'mD'); and Intrinsic safety—Dusts (Ex 'iD'). The extent of the essential knowledge and skills required is given in Clauses 5.2.1 to 5.2.11 and 5.2.22.

#### 4.11 IECEX 409 A - Conduct Close Inspection Of Existing Hazardous Areas Installations

Note: This unit is endorsed for each of the explosion-protection techniques in which competency is demonstrated. Designation for each endorsement is given in Clause 4.11.4.

##### 4.11.1 Scope

This competency standard unit covers the explosion-protection aspects for conducting visual and close inspections and continuous supervision of electrical installations for hazardous areas. It requires the ability to follow inspection programs, work safely, and identify conditions that affect the integrity of explosion-protection and document inspection findings.

##### 4.11.2 Prerequisites

Competence in this unit shall be assessed either concurrently with or after units IECEX 012 A Attend to breakdowns in hazardous areas or IECEX 107 A Install explosion-protected equipment and wiring systems or IECEX 214 A Maintain equipment in hazardous areas or IECEX 707 A Design electrical installations in hazardous areas have been achieved. Alternatively, competencies in general electrical inspection will satisfy the prerequisite (see Annex A).

##### 4.11.3 Elements and performance criteria

Elements		Performance criteria	
409.1	Prepare for inspection	409.1.1	Type of inspection is ascertained from the inspection schedule retained in the verification dossier
		409.1.2	Areas classification is ascertained from hazardous area layout drawings retained in the verification dossier
409.2	Conduct inspection	409.1.3	Safety to enter and conduct inspections in the area is ascertained in accordance with established procedures
		409.2.1	OH&S policies and procedures are followed
		409.2.2	Equipment and installation is checked for damage or deterioration in accordance with the inspection schedule
409.3	Report inspection results	409.3.1	Non-conformances and result of the inspection documented and reported to appropriate personnel in accordance with established procedures
		409.3.2	Completion of inspection is verified and a copy of the inspection documentation submitted to the appropriate personnel for inclusion in the verification dossier in accordance with established procedures

##### 4.11.4 Range statement

Competency shall be demonstrated in relation to any classified hazardous area and explosion-protection techniques. This unit shall be endorsed for each technique in which competency is demonstrated. The endorsements shall be shown by the Ex designation for each explosion-protection technique as a suffix to the unit title. The unit endorsements are given in 3.14

##### 4.11.5 Evidence guide

###### 4.11.5.1 Critical aspects of evidence

Evidence of competency in this unit shall show—

- proficient performance associated with each element of competence by employing the techniques, procedures, information and resources available in the workplace and

encompassing the following aspects in relation to each explosion-protection technique for which competency is sought:

- i) Working safely in a hazardous area in relation to, work permits and clearances, hazard monitoring and evacuation procedures, and plant and electrical isolation.
  - ii) Inspecting equipment and wiring in a manner that does not reduce the type of protection afforded by the equipment design.
  - iii) Conducting close inspections.
  - iv) Documenting inspection outcomes.
- b) an understanding of the knowledge and associated skills essential to performance as outlined in Clause 4.11.5.3.

#### **4.11.5.2 Concurrent assessment and relationship with other units**

For optimization of training and assessment effort reference should be made to Annex A and Annex F

#### **4.11.5.3 Essential knowledge and associated skills**

Evidence shall show that knowledge has been acquired of hazardous areas and the explosion-protection techniques of Flameproof (Ex 'd'); Increased safety (Ex 'e'); Non-sparking (Ex 'n'); Intrinsic safety (Ex 'i'); Pressurization (Ex 'p'); Protection by enclosures—Dusts (Ex 'tD'); Pressurization—Dusts (Ex 'pD'); Encapsulation—Dusts (Ex 'mD'); and Intrinsic safety—Dusts (Ex 'iD'). The extent of the essential knowledge and skills required is given in Clauses 5.2.1 to 5.2.10 and 5.2.18.

## 4.12 IECEx 410 A - Conduct Detailed Inspection Of Hazardous Areas Installations

Note: This unit is endorsed for each of the explosion-protection techniques in which competency is demonstrated. Designation for each endorsement is given in Clause 4.12.4.

### 4.12.1 Scope

This competency standard unit covers the explosion-protection aspects of conducting initial, periodic and sample audit inspections of explosion-protected equipment and installations. It requires the ability to audit a verification dossier, work safely in a hazardous area, inspect against Standards and report and act on inspection results.

### 4.12.2 Prerequisites

Competence in this unit shall be assessed either concurrently with or after competencies in IECEx 107 A Install explosion-protected equipment and wiring systems or IECEx 214 A Maintain equipment in hazardous areas have been achieved (see Annex A).

**ADD LOW VOLTAGE ENDORSEMENT where low voltage is involved**

### 4.12.3 Elements and performance criteria

Elements		Performance criteria	
410.1	Audit records system	410.1.1	Records system is reviewed to verify that essential hazardous area documentation is retained and procedures for maintaining records are established
		410.1.2	Hazardous area classification and design drawings and documentation are checked to verify that appropriate procedures have been followed in assuring the area is safe
410.2	Prepare for inspection	410.2.1	Type and intended location of each item of equipment and circuits subject to inspection are determined from design drawings and documentation
		410.2.2	OH&S policies and procedures for preparing to work in a hazardous area are followed
		410.2.3	Special tools, equipment and devices needed for the inspection are obtained and checked for correct operation and safety
410.3	Conduct inspection	410.3.1	OH&S policies and procedure for working in a hazardous area are followed
		410.3.2	Parts of equipment that are dismantled in order to conduct inspection are stored to protect them against loss or damage
		410.3.3	Equipment, systems and installation are inspected for compliance with the design specifications retained in the verification dossier and in accordance with requirements
		410.3.4	Where applicable, after the inspection of each item, equipment parts and circuit connections are replaced in a manner that ensures the integrity of the explosion-protection system
410.4	Report inspection results	410.4.1	Any non-conformances, faults or unauthorized modifications are documented in accordance with established procedures
		410.4.2	Where applicable, a non-conformance report, including the actions taken and a statement on whether circuits have been re-energized, is made and forwarded to the appropriate personnel
		410.4.3	Documentation in relation to all aspects of the inspection forwarded to the appropriate personnel for inclusion in the verification dossier in accordance with requirements



#### **4.12.4 Range statement**

Competency shall be demonstrated in relation to any classified hazardous area and explosion-protection techniques. This unit shall be endorsed for each technique in which competency is demonstrated. The endorsements shall be shown by the Ex designation for each explosion-protection technique as a suffix to the unit title. The unit endorsements are given in 3.14

#### **4.12.5 Evidence guide**

##### **4.12.5.1 Critical aspects of evidence**

Evidence of competency in this unit shall show—

- a) proficient performance associated with each element of competence by employing the techniques, procedures, information and resources available in the workplace and encompassing the following aspects in relation to each explosion-protection technique for which competency is sought:
  - i) Working safely in a hazardous area in relation to, work permits and clearances, hazard monitoring and evacuation procedures, and plant and electrical isolation.
  - ii) Handling and installing equipment and wiring in a manner that does not reduce the type of protection afforded by the equipment design.
  - iii) Conducting detailed inspections.
  - iv) Documenting inspection outcomes.
- b) an understanding of the knowledge and associated skills essential to performance as outlined in Clause 4.12.5.3.

##### **4.12.5.2 Concurrent assessment and relationship with other units**

For optimization of training and assessment effort reference should be made to Annex A and Annex F

##### **4.12.5.3 Essential knowledge and associated skills**

Evidence shall show that knowledge has been acquired of hazardous areas and the explosion-protection techniques of Flameproof (Ex 'd'); Increased safety (Ex 'e'); Non-sparking (Ex 'n'); Intrinsic safety (Ex 'i'); Pressurization (Ex 'p'); Protection by enclosures—Dusts (Ex 'tD'); Pressurization—Dusts (Ex 'pD'); Encapsulation—Dusts (Ex 'mD'); and Intrinsic safety—Dusts (Ex 'iD'). The extent of the essential knowledge and skills required is given in Clauses 5.2.1 to 5.2.10, 5.2.12 and 5.2.18.

### 4.13 IECEx 609 A - Develop And Manage Maintenance Programs For Hazardous Areas Electrical Equipment

Note: This unit is endorsed for each of the explosion-protection techniques in which competency is demonstrated. Designation for each endorsement is given in Clause 4.13.4.

#### 4.13.1 Scope

This competency standard unit covers the explosion-protection aspects of plant maintenance schemes. It requires the ability to develop and manage maintenance programs incorporating strategies for inspections, repair/overhaul/replacement of components and recording of maintenance outcomes.

#### 4.13.2 Prerequisites

Competence in this unit shall be assessed either concurrently with or after unit IECEx 214 A Maintain equipment in hazardous areas has been achieved. Alternatively, the achievement of competencies in developing and managing general electrical/instrumentation maintenance programs will satisfy the prerequisite (see Annex A).

#### 4.13.3 Elements and performance criteria

Elements		Performance criteria	
609.1	Establish maintenance requirements	609.1.1	Policies and procedures are developed to include OH&S practices, skills required and frequency and level of maintenance work
		609.1.2	Systems are established to manage and record maintenance work and up-to-date verification dossier, in accordance with requirements
		609.1.3	Level of repair to be done under maintenance work is established in accordance with requirements
		609.1.4	Arrangements are made to check that the hazardous area, explosion-protected equipment and installation comply with the verification dossier
		609.1.5	Discrepancies between the hazardous area, explosion-protected equipment and installation and the verification dossier are documented and arrangements made to ensure the area is appropriately classified and explosion-protection systems are adequate
609.2	Develop and implement maintenance schedule	609.2.1	Maintenance schedules are developed from recommendations of Standards and equipment manufacturers and in accordance with requirements
		609.2.2	Procedures are developed and implemented to ensure the maintenance program is followed in accordance with the planned schedule and requirements
		609.2.3	Procedures are developed and implemented to ensure the verification dossier is maintained in accordance with planned schedule and requirements
609.3	Evaluate maintenance program	609.3.1	Periodic and sample inspection reports are used to ascertain maintenance quality and the need for revision of maintenance schedule and frequency
		609.3.2	Maintenance schedule is periodically reviewed and revised to maintain the integrity of the explosion-protection system

#### 4.13.4 Range statement

Competency shall be demonstrated in relation to any classified hazardous area and explosion-protection techniques. This unit shall be endorsed for each technique in which

competency is demonstrated. The endorsements shall be shown by the Ex designation for each explosion-protection technique as a suffix to the unit title. The unit endorsements are given in 3.14

#### **4.13.5 Evidence guide**

##### **4.13.5.1 Critical aspects of evidence**

Evidence of competency in this unit shall show—

- a) proficient performance associated with each element of competence by employing the techniques, procedures, information and resources available in the workplace and encompassing the following aspects in relation to each explosion-protection technique for which competency is sought:
  - i) Establishing maintenance policies and procedures that encompass OH&S responsibilities.
  - ii) Establishing management maintenance systems that address the special requirements for explosion-protected equipment and installations.
  - iii) Ensuring a hazardous area is appropriately classified and explosion-protection strategies are adequate.
  - iv) Developing and implementing maintenance plans and schedules in relation to explosion-protected equipment and installations.
  - v) Evaluating maintenance programs in relation to explosion-protected equipment and installations.
- b) an understanding of the knowledge and associated skills essential to performance as outlined in Clause 4.13.5.3.

##### **4.13.5.2 Concurrent assessment and relationship with other units**

For optimization of training and assessment effort reference should be made to Annex A and Annex F

##### **4.13.5.3 Essential knowledge and associated skills**

Evidence shall show that knowledge has been acquired of hazardous areas and the explosion-protection techniques of Flameproof (Ex 'd'); Increased safety (Ex 'e'); Non-sparking (Ex 'n'); Intrinsic safety (Ex 'i'); Pressurization (Ex 'p'); Protection by enclosures—Dusts (Ex 'tD'); Pressurization—Dusts (Ex 'pD'); Encapsulation—Dusts (Ex 'mD'); and Intrinsic safety—Dusts (Ex 'iD'). The extent of the essential knowledge and skills required is given in Clauses 5.2.1 to 5.2.10 and 5.2.19.

#### 4.14 IECEX 610 A - Manage Compliance In Hazardous Areas

##### 4.14.1 Scope

This competency standard unit covers the explosion-protection aspects of ensuring that explosive atmospheres, generated by production, processing or servicing activities, do not pose a hazard to persons, property or the environment

##### 4.14.2 Prerequisites

Competence in this unit shall be assessed only after competencies in general plant management have been achieved (see Annex A).

##### 4.14.3 Elements and performance criteria

Elements		Performance criteria	
610.1	Establish possibility of explosive hazard	610.1.1	Competent person or persons are engaged to provide advice on the nature and extent of any explosive hazard on the site
		610.1.2	Measures are taken to ensure explosive hazards are identified and the area classified by competent person or persons in accordance with requirements
		610.1.3	Arrangements are made to establish a verification dossier in accordance with requirements
610.2	Establish explosion-protection strategies for site	610.2.1	Competent person or persons are engaged to design the explosion-protection system and installation
		610.2.2	Where applicable explosion-protection system and installation design is verified with Statutory Authority for compliance with requirements
610.3	Implement explosion-protection strategies	610.3.1	Competent person or persons are engaged to install explosion-protected equipment and wiring system
		610.3.2	Procedures are implemented to ensure the explosion-protected equipment and wiring system installation is tested and inspected in accordance with requirements
610.4	Establish and implement procedures for maintaining explosion-protection	610.4.1	Competent person or persons are engaged to develop inspection/maintenance schedules, including the level and intervals for periodic inspections, for the explosion-protected equipment and wiring system
		610.4.2	Procedures are developed to ensure periodic inspections, testing and maintenance are carried out to documented schedule and in accordance with requirements
		610.4.3	Procedures are established for assuring data related to explosion-protection is filed in the verification dossier in accordance with requirements

##### 4.14.4 Range statement

Competency shall be demonstrated in relation to any classified hazardous area.

##### 4.14.5 Evidence guide

###### 4.14.5.1 Critical aspects of evidence

Evidence of competency in this unit shall show—

- proficient performance associated with each element of competence by employing the techniques, procedures, information and resources available in the workplace and

encompassing the following aspects in relation to the managerial responsibilities for ensuring the workplace is safe:

- i) Application of relevant statutory requirements.
  - ii) Establishing procedures for engaging competent persons.
  - iii) Establishing and maintaining procedures for identifying explosive hazards.
  - iv) Establishing procedures for implementing and maintaining explosion-protection strategies.
- b) an understanding of the knowledge and associated skills essential to performance as outlined in Clause 4.14.5.3.

#### **4.14.5.2 Concurrent assessment and relationship with other units**

For optimization of training and assessment effort reference should be made to Annex A and Annex F

#### **4.14.5.3 Essential knowledge and associated skills**

Evidence shall show that knowledge has been acquired of hazardous areas and related OH&S responsibilities, explosion-protection strategies, maintenance requirements and documentation. The extent of the essential knowledge and skills required is given in Clauses 5.2.1 and 5.2.19.

#### 4.15 IECEx 705 A - Design And Develop Modifications To Explosion-Protected Equipment

Note: This unit is endorsed for each of the explosion-protection techniques in which competency is demonstrated. Designation for each endorsement is given in Clause 4.15.4.

##### 4.15.1 Scope

This competency standard unit covers the explosion-protection aspects of designing and developing modifications to explosion-protected equipment. It requires abilities in technical design and compliance assessments and documentation.

##### 4.15.2 Prerequisites

Competence in this unit shall be assessed only after competency in unit IECEx 215 A Overhaul and repair explosion-protected equipment *has been achieved*. Alternatively, the achievement of competencies in design and developing of general electrical equipment will satisfy the prerequisite (see Annex A).

##### 4.15.3 Elements and performance criteria

Elements		Performance criteria	
705.1	Prepare for modification of equipment	705.1.1	Instructions on modification are received and expected outcomes of the work confirmed with appropriate personnel
		705.1.2	Certification documents for the equipment are sought and received in order to check that the equipment complies with the certification
		705.1.3	Where certification documents for the equipment are not available arrangements are made to seek re-certification in accordance with requirements
		705.1.4	Tools, measuring/testing devices and equipment needed to check compliance with certification and determine the extent of the work are obtained and checked for correct, accurate and safe operation
705.2	Determine the level of modification	705.2.1	Measurements, tests and inspections are carried out on the equipment in accordance with OH&S policies and procedures and other established procedures
		705.2.2	The extent of work to be done is determined from measurement, test and inspection results and the requirements of Standards
705.3	Design modifications	705.3.1	Modifications are designed to comply with the requirements of Standards
		705.3.2	Specifications and instructions for the modification work are documented and processed in accordance with requirements
705.4	Establish the need for re-certification	705.4.1	Need for supplementary certification or re-certification is determined in accordance with requirements
		705.4.2	Level of testing required after equipment is modified is determined in accordance with requirements
705.5	Arrange modification work	705.5.1	Arrangements are made for the modification work to be done in accordance with established procedures
		705.5.2	A copy of modification specifications and instructions is provided to personnel responsible for carrying out the work
705.6	Arrange assessment of modified equipment	705.6.1	Arrangements are made to obtain supplementary approval and/or re-certification for the modified equipment in accordance with requirements

Elements		Performance criteria	
		705.6.2	Arrangements are made for non-compliance and non-conformances found during testing and the assessment of modified equipment to be rectified in accordance with established procedures
705.7	Document certification of modified equipment	705.7.1	Equipment marking is checked and, where applicable, marked according to certification documentation and requirements
		705.7.2	Modification work is documented in accordance with established procedures and requirements
		705.7.3	Documentation of the modification work is filed in the verification dossier and a copy issued with the equipment

#### 4.15.4 Range statement

Competency shall be demonstrated in relation to any classified hazardous area and explosion-protection techniques. This unit shall be endorsed for each technique in which competency is demonstrated. The endorsements shall be shown by the Ex designation for each explosion-protection technique as a suffix to the unit title. The unit endorsements are given in 3.14

#### 4.15.5 Evidence guide

##### 4.15.5.1 Critical aspects of evidence

Evidence of competency in this unit shall show—

- a) proficient performance associated with each element of competence by employing the techniques, procedures, information and resources available in the workplace and encompassing the following aspects in relation to each explosion-protection technique for which competency is sought:
  - i) Following OH&S procedures.
  - ii) Interpreting certification documentation and Standards.
  - iii) Checking equipment for compliance with certification and Standards.
  - iv) Specifying modification design.
  - v) Establishing need for re-certification.
  - vi) Documenting modification design.
  - vii) Using quality management systems.
- b) an understanding of the knowledge and associated skills essential to performance as outlined in Clause 4.15.5.3.

##### 4.15.5.2 Concurrent assessment and relationship with other units

For optimization of training and assessment effort reference should be made to Annex A and Annex F

##### 4.15.5.3 Essential knowledge and associated skills

Evidence shall show that knowledge has been acquired of hazardous areas and the explosion-protection techniques of Flameproof (Ex 'd'); Increased safety (Ex 'e'); Non-sparking (Ex 'n'); Intrinsic safety (Ex 'i'); Pressurization (Ex 'p'); Protection by enclosures—Dusts (Ex 'tD'); Pressurization—Dusts (Ex 'pD'); Encapsulation—Dusts (Ex 'mD'); and Intrinsic safety—Dusts (Ex 'iD'). The extent of the essential knowledge and skills required is given in Clauses 5.2.1 to 5.2.9, 5.2.13 and 5.2.14.

## 4.16 IECEx 706 A - Classify Hazardous Areas

### 4.16.1 Scope

This competency standard unit covers knowledge and skills to classify areas where explosive materials may exist. It requires the ability to gather and analyse data relative to explosion hazards, determine the extent of risk and establish and document zones.

### 4.16.2 Prerequisites

Competency in this unit shall be assessed only after the competencies have been achieved in relation to gathering and analysing technical data (see Annex A).

### 4.16.3 Elements and performance criteria

Elements		Performance criteria	
706.1	Determine the type and extent of explosion hazard	706.1.1	Functions and process equipment in the area are determined and hazardous materials identified from specifications, hazard and risk and/or written consultation with process specialist personnel
		706.1.2	Explosion and physical properties of hazardous materials are listed, together with the title of the authority from which the data is obtained
		706.1.3	Gas groupings and temperature class of flammable gases, vapours and/or dusts that may be present in the area are established from collected data
		706.1.4	Potential sources of release and/or dusts layering are identified from specifications, and/or written consultation with process specialist personnel
		706.1.5	Likely impact of any risk of an explosion affecting the environment is assessed in accordance with requirements and established procedures
706.2	Establish the type and extent of zones	706.2.1	Zones are determined by similarity to examples in Standards or from first principles
		706.2.2	Where first principles are used, grades, sources and magnitude of release and dusts layering are established from specifications and diagrams and reviewed with process specialist personnel
706.3	Document classification and delineation of zones	706.3.1	Area classification documentation is completed in accordance with requirements and submitted to appropriate personnel
		706.3.2	Classification documentation records are filed for future reference and for incorporation in the verification dossier

### 4.16.4 Range statement

Competency shall be demonstrated in relation to any hazardous areas in which the classification cannot be directly identified by common situations or specific examples. This unit shall be endorsed for each type of hazardous area in which competency is demonstrated. The endorsements shall be shown by the words 'Gases' and/or 'Dusts' as a suffix to the unit title.

### 4.16.5 Evidence guide

#### 4.16.5.1 Critical aspects of evidence

Evidence of competency in this unit shall show—



- a) proficient performance associated with each element of competence by employing the techniques, procedures, information and resources available in the workplace and encompassing the following aspects in relation to each explosion-protection technique for which competency is sought:
  - i) Accessing necessary information and identifying hazardous products involved in a given process, explosive properties of materials involved in a given process, and potential sources and characteristics of release of hazardous products.
  - ii) Analysing data in the context of explosion risk.
  - iii) Determining area delineation and documenting area classifications.
- b) an understanding of the knowledge and associated skills essential to performance as outlined in Clause 4.16.5.3.

#### **4.16.5.2 Concurrent assessment and relationship with other units**

For optimization of training and assessment effort reference should be made to Annex A and Annex F

#### **4.16.5.3 Essential knowledge and associated skills**

Evidence shall show that knowledge has been acquired of hazardous areas classification Standards and processes, assessment of explosion risk and area delineation. The extent of the essential knowledge and skills required is given in Clauses 5.2.1, 5.2.16 and 5.2.17.

Note: Essential knowledge and associated skills may focus on gases/vapours and/or dusts depending on the endorsement sought.

#### 4.17 IECEx 707 A - Plan Electrical Installations For Hazardous Areas

Note: This unit is endorsed for each of the explosion-protection techniques in which competency is demonstrated. Designation for each endorsement is given in Clause 4.17.4.

##### 4.17.1 Scope

This competency standard unit covers the explosion-protection aspects of planning electrical installations for hazardous areas. It requires the ability to identify hazardous area 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.

##### 4.17.2 Prerequisites

Competence in this unit shall be assessed only after competency in has been achieved. Alternatively, the achievement of competencies in designing electrical installations will satisfy the prerequisite (see Annex A).

##### 4.17.3 Elements and performance criteria

Elements		Performance criteria	
707.1	Verify hazardous classification for the area	707.1.1	Nature and characteristics of explosion hazards in the area are identified from plant specifications
		707.1.2	In the absence of classification documentation, arrangements are made to ensure the explosion hazard in the area is assessed and the area classified
		707.1.3	Classification, extent of zonings of the area, gas groups and temperature class are verified by reference to classification documents or Standards in which the explosion hazard, area classification and zonings are clearly identified
707.2	Select and check equipment, wiring and accessories	707.2.1	Equipment and accessories are selected to suit area activities and comply with explosion-protection requirements
		707.2.2	Wiring systems are selected to suit area activities, and comply with explosion-protection, load and duty requirements
		707.2.3	Equipment compliance certification is checked for suitability for the area classification and zonings
		707.2.4	Cables and accessories are checked for suitability for the area classification and zonings and load and duty requirements
707.3	Document installation	707.3.1	Installation specifications are documented in accordance with established procedures and requirements
		707.3.2	Arrangements are made to file as-built installation documentation in the verification dossier in accordance with established procedures and requirements

##### 4.17.4 Range statement

Competency shall be demonstrated in relation to any classified hazardous area and explosion-protection techniques. This unit shall be endorsed for each technique in which competency is demonstrated. The endorsements shall be shown by the Ex designation for each explosion-protection technique as a suffix to the unit title. The unit endorsements are given in 3.14

#### **4.17.5 Evidence guide**

##### **4.17.5.1 Critical aspects of evidence**

Evidence of competency in this unit shall show—

- a) proficient performance associated with each element of competence by employing the techniques, procedures, information and resources available in the workplace and encompassing the following aspects in relation to each explosion-protection technique for which competency is sought:
  - i) Interpreting area classification documentation or standards.
  - ii) Documenting area classification.
  - iii) Selecting equipment for a given classified area.
  - iv) Selecting wiring systems for a given classified area.
  - v) Checking equipment certification for suitability for a given classified area.
  - vi) Documenting as-built installation
- b) an understanding of the knowledge and associated skills essential to performance as outlined in Clause 4.17.5.3.

##### **4.17.5.2 Concurrent assessment and relationship with other units**

For optimization of training and assessment effort reference should be made to Annex A and Annex F

##### **4.17.5.3 Essential knowledge and associated skills**

Evidence shall show that knowledge has been acquired of hazardous areas and the explosion-protection techniques of Flameproof (Ex 'd'); Increased safety (Ex 'e'); Non-sparking (Ex 'n'); Intrinsic safety (Ex 'i'); Pressurization (Ex 'p'); Protection by enclosures—Dusts (Ex 'tD'); Pressurization—Dusts (Ex 'pD'); Encapsulation—Dusts (Ex 'mD'); and Intrinsic safety—Dusts (Ex 'iD'). The extent of the essential knowledge and skills required is given in Clauses 5.2.1 to 5.2.10, 5.2.15 and 5.2.16.

#### 4.18 IECEx 708 A - Design Explosion-Protected Electrical Systems And Installations

Note: This unit is endorsed for each of the explosion-protection techniques in which competency is demonstrated. Designation for each endorsement is given in Clause 4.18.4.

##### 4.18.1 Scope

This competency standard unit covers the explosion-protection aspects of design electrical systems. It requires the ability to establish design briefs and to pursue economical and effective design solutions.

##### 4.18.2 Prerequisites

Competency in this unit shall be assessed only after the competencies have been achieved in designing electrical systems and installations (see Annex A).

##### 4.18.3 Elements and performance criteria

Elements		Performance criteria	
708.1	Establish design brief	708.1.1	Site and plant specifications are obtained and reviewed to establish the system requirements
		708.1.2	Classification of the area is obtained from the hazardous area layout drawings or other classification documents
		708.1.3	Organizational policies and specifications for hazardous area electrical systems are obtained or established with the appropriate personnel
708.2	Design system and installation	708.2.1	Safety, functional and economic considerations are incorporated in system design
		708.2.2	Design complies with all hazardous area requirements and includes specifications and all other necessary documentation for explosion-protected equipment, accessories and wiring systems
708.3	Check and finalise design	708.3.1	Design is checked under established procedures for compliance with all relevant requirements
		708.3.2	Design is submitted for appropriate organizational approval and, where applicable, statutory or regulatory approval
		708.3.3	Approved copies of design documents are issued for retention in the verification dossier, in accordance with established procedures and requirements

##### 4.18.4 Range statement

Competency shall be demonstrated in relation to any classified hazardous area and explosion-protection techniques. This unit shall be endorsed for each technique in which competency is demonstrated. The endorsements shall be shown by the Ex designation for each explosion-protection technique as a suffix to the unit title. The unit endorsements are given in 3.14

##### 4.18.5 Evidence guide

###### 4.18.5.1 Critical aspects of evidence

- a) proficient performance associated with each element of competence by employing the techniques, procedures, information and resources available in the workplace and encompassing the following aspects in relation to each explosion-protection technique for which competency is sought:
  - i) Accessing and interpreting relevant information.

- ii) Providing design options and justifications including hazard risk, functionality and economic considerations.
  - iii) Following checking and documentation procedures.
- b) an understanding of the knowledge and associated skills essential to performance as outlined in Clause 4.18.5.3.

#### **4.18.5.2 Concurrent assessment and relationship with other units**

For optimization of training and assessment effort reference should be made to Annex A and Annex F

#### **4.18.5.3 Essential knowledge and associated skills**

Evidence shall show that knowledge has been acquired of hazardous areas and the explosion-protection techniques of Flameproof (Ex 'd'); Increased safety (Ex 'e'); Non-sparking (Ex 'n'); Intrinsic safety (Ex 'i'); Pressurization (Ex 'p'); Protection by enclosures—Dusts (Ex 'tD'); Pressurization—Dusts (Ex 'pD'); Encapsulation—Dusts (Ex 'mD'); and Intrinsic safety—Dusts (Ex 'iD'). The extent of the essential knowledge and skills required is given in Clauses 5.2.1 to 5.2.10, 5.2.15, 5.2.16, 5.2.20 and 5.2.25.

## 4.19 IECEx 711 A - Design Gas Detection Systems And Installations

### 4.19.1 Scope

This competency standard unit covers the selection aspects of gas detection equipment for the design of gas detection systems for hazardous areas. It requires the ability to establish equipment parameters, to evaluate these against manufacturer's specifications specified their installation.

### 4.19.2 Prerequisites

Competency in this unit shall be assessed either concurrently with or after Unit IECEx 708 A—*Design explosion-protected electrical systems* has been achieved (see Annex A).

### 4.19.3 Elements and performance criteria

Elements		Performance criteria	
711.1	Establish gas detection parameters	711.1.1	Requirements for gas detection are obtained or established with the appropriate personnel
		711.1.2	The parameters for gas detection are obtained and documented from consultation with appropriate personnel
		711.1.3	Explosion-protection requirements for gas detection equipment is established from area classification documents
711.2	Select gas detection equipment	711.2.1	Manufacturer's specification and limitations of appropriate gas equipment are sought.
		711.2.2	Manufacturer's specification and limitations are compared with the established parameters for gas detection
		711.2.3	Gas detection equipment is selected on compatibility with the established parameters and economic considerations
711.3	Document details of gas detection equipment to be used	711.3.1	Proposed gas detection equipment is checked under established procedures for compliance with all relevant requirements
		711.3.2	Complete specifications for gas detection equipment to be used is documented in accordance with established procedures

### 4.19.4 Range statement

Competency shall be demonstrated in relation to the design of electrical systems for any classified hazardous area.

### 4.19.5 Evidence guide

#### 4.19.5.1 Critical aspects of evidence

Evidence of competency in this unit shall show—

- a) proficient performance associated with each element of competency by employing the techniques, procedures, information and resources available in the workplace and encompassing the following:
  - i) Accessing and interpreting gas detection needs and parameters.
  - ii) Providing selection options based on parameters and economic considerations.
  - iii) Following checking and documentation procedures.
- b) an understanding of the knowledge and associated skills essential to performance as outlined in Clause 4.19.5.3.

#### **4.19.5.2 Concurrent assessment and relationship with other units**

For optimization of training and assessment effort reference should be made to Annex A and Annex F.

#### **4.19.5.3 Essential knowledge and associated skills**

Evidence shall show that knowledge has been acquired of hazardous areas and the explosion-protection techniques of Flameproof (Ex 'd'); Increased safety (Ex 'e'); Non-sparking (Ex 'n'); Intrinsic safety (Ex 'i'); Pressurization (Ex 'p'). The extent of the essential knowledge and skills required is given in Clauses 5.2.1 to 5.2.10, 5.2.15, 5.2.16, 5.2.20 and 5.2.26.

## 5 ESSENTIAL KNOWLEDGE AND ASSOCIATED SKILLS

### 5.1 GENERAL

Knowledge and understanding are essential to competent performance. Critical aspects of knowledge required by each unit of competency are detailed in Clauses 5.2.1 to 5.2.26.

A summary of essential knowledge and associated skills for each Unit of Competency is set out in Annex F.

### 5.2 DESCRIPTION OF ESSENTIAL KNOWLEDGE AND ASSOCIATED SKILLS

#### 5.2.1 Hazardous areas and explosion-protection principles

Evidence shall show an understanding of hazardous areas and explosion-protection principles to an extent indicated by the following aspects:

- a) Properties of combustible substances and their potential to create an explosive hazard encompassing—
  - i) condition in the workplace that will lead to an explosion;
  - ii) the terms 'combustion', 'ignition' and 'propagation';
  - iii) explosive range of substances encountered in the workplace i.e. LEL/UEL;
  - iv) explosive parameters of substances as given in tables of substance characteristics, i.e., properties of combustible materials - gases, vapours (from liquids), and Dusts; flash point.
  - v) the difference between gases and vapours; and
  - vi) the toxic nature of gases and vapours and potential harmful consequences.
- b) The nature of hazardous areas encompassing—
  - i) the Standards definition of a 'hazardous area';
  - ii) the recommended methods for classifying the type and degree of explosion hazard in an area;
  - iii) hazardous area classifications as defined by Standards; and
  - iv) factors that are considered when a hazardous area is classified.
- c) The basics of how explosion-protection is achieved by the methods of exclusion, containment, energy limitation, dilution, avoidance of ignition source.
- d) Occupational Health and Safety responsibilities related to hazardous areas encompassing—
  - i) the main features and purpose of a 'clearance to work' system;
  - ii) typical safety procedures that should be followed before entering a hazardous area;
  - iii) the purpose of gas detectors and their limitations;
  - iv) effects of temperature on gas and vapour detection;
  - v) frequency of monitoring for presence of gas or vapours, i.e. effects of temperature rise;
  - vi) factors affecting the accuracy of gas detectors, for example, contamination, condensation, temperature;
  - vii) safety in use of gas detectors, for example, 'read and run concept';
  - viii) the safety precautions to be taken when working in a hazardous area.
- e) The roles of the parties involved in the safety of hazardous areas encompassing—



- i) common Acts and Regulations related to the safety of hazardous areas and the Authorities responsible for their implementation;
- ii) where assistance and further information can be obtained to assist persons with hazardous area responsibilities, for example, Standard bodies, experienced consultants; and
- iii) the hazardous area responsibilities of the owner of premises in which a hazardous area exists; the occupier of premises in which a hazardous area exists; enterprises and personnel engaged in installation and/or maintenance of explosion-protection systems; enterprises and personnel engaged in the classification of hazardous areas and/or design of explosion-protection systems; enterprises and personnel engaged in the overhaul, modification and/or assessment of explosion-protected equipment; enterprises and personnel engaged in the inspection of explosion-protection installations; manufacturers of explosion-protected equipment; designated authorities; insurers.

### 5.2.2 Explosion-protected equipment

Evidence shall show an understanding of the principles of the following explosion-protection techniques: Flameproof (Ex 'd'); Increased safety (Ex 'e'); Non-sparking (Ex 'n'); Intrinsic safety (Ex 'i') and Pressurization (Ex 'p') for gas atmospheres and Protection by enclosures-Dusts (Ex 'tD'); Pressurization-Dusts (Ex 'pD'); Encapsulation-Dusts (Ex 'mD'); and Intrinsic safety-Dusts (Ex 'iD'). The following aspects indicate the extent of understanding required:

- a) The principles of each explosion-protection technique, the methods used and how each technique works.
- b) How explosion-protected equipment is identified by the 'Ex' symbol marked on the equipment, including old equipment and equipment certified in another country.
- c) Visible conditions or actions that would void the explosion-protection provided by a particular technique.

### 5.2.3 Flameproof (Ex'd') explosion-protection technique

Evidence shall show an understanding of the characteristics and application of Flameproof (Ex 'd') explosion-protection technique to an extent indicated by the following aspects:

- a) The purpose and characteristics of the design features of apparatus and circuits protected by the flameproof (Ex 'd') technique.
- b) Examples of characteristics and design features are flame paths, integrity under pressure, pressure piling, and enclosure entries.
- c) Typical situations where the flameproof explosion-protection technique is used.
- d) Actions or conditions that would void the protection provided by the Flameproof technique.
- e) The use of Standards in determining the requirements to which the design of the flameproof explosion-protected apparatus shall comply.

### 5.2.4 Increased safety (Ex'e') explosion-protection technique

Evidence shall show an understanding of the characteristics and application of Increased safety (Ex 'e') explosion-protection technique to an extent indicated by the following aspects:

- a) The purpose and characteristics of the design features of apparatus and circuits protected by the Increased safety (Ex 'e') technique.

Note: Examples of characteristics and design features are temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance distances, absence of sparking contacts and enclosure entries.

- b) Typical situations where the Increased safety explosion-protection technique is used.
- c) Actions or conditions that would void the protection provided by the Increased safety technique.

- d) The use of Standards in determining the requirements to which the design of the Increased safety explosion-protected apparatus shall comply.

#### **5.2.5 Non-sparking (Ex'n') explosion-protection technique**

Evidence shall show an understanding of the characteristics and application of Non-sparking (Ex 'n') explosion-protection technique to an extent indicated by the following aspects:

- a) The purpose and characteristics of the design features of apparatus and circuits protected by the Non-sparking (Ex 'n') technique.
- b) Examples of characteristics and design features are creepage and clearance distances and restricted breathing.
- c) Typical situations where the Non-sparking explosion-protection technique is used.
- d) Actions or conditions that would void the protection provided by the Non-sparking technique.
- e) The use of Standards in determining the requirements to which the design of the Non-sparking explosion-protected apparatus shall comply.

#### **5.2.6 Intrinsic safety (Ex'i') explosion-protection technique**

Evidence shall show an understanding of the characteristics and application of Intrinsic safety (Ex 'i') explosion-protection technique to an extent indicated by the following aspects:

- a) The purpose and characteristics of the design features of apparatus and circuits protected by the Intrinsic safety (Ex 'i') technique.
- b) Examples of characteristics and design features are field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances.
- c) Typical situations where the Intrinsic safety explosion-protection technique is used.
- d) Actions or conditions that would void the protection provided by Intrinsic safety.
- e) The use of Standards in determining the requirements to which the design of the Intrinsic safety explosion-protected apparatus shall comply.

#### **5.2.7 Pressurization (Ex'p') explosion-protection technique**

Evidence shall show an understanding of the characteristics and application of Pressurization (Ex 'p') explosion-protection technique to an extent indicated by the following aspects:

- a) The purpose and characteristics of the design features of apparatus and circuits protected by the Pressurization (Ex 'p') technique.

Note: Examples of characteristics and design features are exclusion and dilution, purge periods, controlled shut down, monitoring and sources of internal release.

- b) Typical situations where the pressurization explosion-protection technique is used.
- c) Actions or conditions that would void the protection provided by the pressurization technique.
- d) The use of Standards in determining the requirements to which the design of the pressurization explosion-protected apparatus shall comply.

#### **5.2.8 Explosion-protection techniques for dusts**

Evidence shall show an understanding of the characteristics and application of Enclosures (Ex 'tD'), Pressurization (Ex 'pD'), Encapsulation (Ex 'mD'), and Intrinsic safety (Ex 'iD') (for Dusts) explosion-protection technique. The following aspects indicate the extent of understanding required:

- a) The purpose and characteristics of the design features of apparatus and circuits protected by the techniques for dusts.

Note: Examples of characteristics and design features are for Enclosures; Pressurization; Encapsulation; and Intrinsic safety.

- b) Typical situations where each dust explosion-protection technique is used.
- c) Actions or conditions that would void the protection provided by each dust technique.
- d) The use of Standards in determining the requirements to which the design of the dust explosion-protected apparatus shall comply.

### 5.2.9 Common characteristics of explosion-protection techniques

Evidence shall show an understanding of the common characteristics of explosion-protection techniques to an extent indicated by the following aspects:

- a) The purposes of 'temperature classification' and 'gas grouping/apparatus grouping'.
- b) Compliance plate markings.
- c) Limitations of non-metallic or specific alloy enclosures.
- d) The purpose and use of conformity and certification/approval for equipment used in hazardous areas.
- e) Environmental conditions that may impact on explosion-protection techniques.
- f) The principles and applications of other and mixed explosion-protection techniques.

Note: Other techniques include encapsulation Ex 'm'; oil-immersion Ex 'o'; powder-filling Ex 'q'; ventilation Ex 'v' and special protection Ex 's'.

### 5.2.10 Hazardous areas installation and maintenance requirements

Evidence shall show an understanding of hazardous area installation principles and maintenance techniques to an extent indicated by the following aspects:

- a) Preparation to install and maintain explosion-protected equipment in hazardous areas encompassing—
  - i) OH&S procedures to be followed when working in a hazardous area;
  - ii) the significance of information provided on the certification documentation and schedules for a given item of explosion-protected equipment;
  - iii) the typical contents of a verification dossier and its purpose; and
  - iv) limitations in the use of tools and testing devices in hazardous areas.
- b) The relationship between explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions encompassing—
  - i) the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment;
  - ii) matching explosion-protected equipment with certification documents and the equipment specified for an installation; and
  - iii) the location of the items of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.
- c) Installation Standards and requirements applicable to hazardous encompassing—
  - i) the wiring systems permitted and not permitted in or above hazardous areas;
  - ii) equipment not permitted in or above hazardous areas;
  - iii) the regulations and Standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied; and
  - iv) the documentation required as a record of the installation process, including certification documentation.
- d) Maintenance procedures in hazardous areas that will ensure the integrity of the explosion-protection technique encompassing—
  - i) the purpose of a maintenance schedule;

- ii) the purpose and extent of 'visual', 'close', 'sample' and 'periodic' inspections;
- iii) the features of each explosion-protection technique that should be included in a maintenance schedule;
- iv) the impact of environmental conditions on explosion-protected equipment, including corrosion and frequency of maintenance; and
- v) the documentation requirements for recording the maintenance process and results.

#### **5.2.11 Hazardous areas cable termination techniques**

Evidence shall show knowledge and skills in terminating cables suitable for use in hazardous areas to an extent indicated by the following aspects:

- a) Selecting compliant cable termination devices.
- b) Installing conduit systems, where applicable, including seals to meet hazardous area requirements. Gases only.
- c) Terminating a cable with a barrier gland. Gases only
- d) Terminating a multipair, SWA, overall screened, individual screened cable into an enclosure
- e) Testing termination/connections of installed cables/circuits. Note Test include earth continuity, insulation resistance and polarity.

#### **5.2.12 Hazardous areas detailed inspection techniques**

Evidence shall show an understanding of techniques used in auditing of site records and inspecting installations of explosion-protected and associated apparatus and hazardous area wiring. The following aspects indicate the extent of understanding required:

- a) Auditing of site records encompassing—
  - i) the documents that should be filed in a verification dossier; and
  - ii) procedures for auditing a verification dossier.
- b) The relationship between the documentation held in a verification dossier and the installed equipment encompassing—
  - i) consistency between the location and type of equipment with the area classification details in the verification dossier; and
  - ii) equipment certification and any attached conditions that relate to the equipment as it is installed.
- c) Inspecting a hazardous area installation encompassing—
  - i) typical processes for undertaking the inspection of a hazardous area installation;
  - ii) requirements applicable to a given installation; and
  - iii) reporting of an inspection of a hazardous area installation.

#### **5.2.13 Explosion-protected equipment overhaul and repair**

##### **5.2.13.1 General requirements**

Evidence shall show an understanding of overhaul and repair procedures of explosion-protected equipment to an extent indicated by the following aspects:

- a) The scope and limitations for overhaul and repair of explosion-protected equipment encompassing—
  - i) the requirements for registration of a workshop;
  - ii) the requirements of a 'competent person' for a registered workshop engaged in the overhaul/repair of explosion-protected equipment; and

- iii) the scope and limitations of work permitted under workshop registration.
- b) Overhaul and repair (technical) Standard encompassing—
  - i) the documentation/information required to enable overhauls/repairs to be undertaken;
  - ii) categories of work, for example, overhaul; no repair; overhaul-repair;
  - iii) modifications that are, and are not, permitted within the equipment certification; and
  - iv) the requirements for overhaul/repair processes relevant to the type of protection and equipment.
- c) Requirements for documentation and identification of overhauled/repaired explosion-protected encompassing—
  - i) overhaul/repair report document; and
  - ii) requirements for distribution of overhaul/repair reports.
- d) Quality management systems as covered by international Standards encompassing—
  - i) documentation regime of a quality management system;
  - ii) principle of document and data control covering both internally and externally generated documents and data; and
  - iii) principles of process control as applied to the overhaul and repair of explosion-protected equipment.

#### **5.2.13.2 Overhaul and repair requirements specific to each explosion-protection technique**

Evidence shall show an understanding of overhaul and repair for specific explosion-protection techniques to an extent indicated by the following aspects:

- a) The level of overhaul/repair required encompassing—
  - i) Standards and their use for determining the requirement for a specific explosion-protection technique;
  - ii) measurement/tests and equipment required to determine whether an item of equipment meets the certification requirements;
  - iii) requirements for maintaining the accuracy/calibration of measuring/test equipment;
  - iv) measurement/test procedures for determining whether an item of equipment meets the certification requirements;
  - v) level of overhaul/repair required from comparisons of test results and requirements specified in the original certification; and
  - vi) specifying overhaul/repair work required to restore an item of explosion-protected equipment to conform with the original certification.
- b) Measurement/tests procedures to verify that an item of equipment meets the original certification requirements

#### **5.2.14 Explosion-protected equipment modification**

##### **5.2.14.1 General requirements**

Evidence shall show an understanding of modifications to explosion-protected equipment to an extent indicated by the following aspects:

- a) The scope and limitations for design and development of modifications of explosion-protected equipment encompassing—
  - i) the requirements of a 'competent person' for a registered workshop engaged in design and development of modifications to explosion-protected equipment; and

- ii) the scope and limitations of modification work permitted.
- b) The requirements for documenting and identifying modified explosion-protected equipment encompassing—
  - i) modification report document; and
  - ii) requirements for distribution of reports on modifications.

#### **5.2.14.2 Modification requirements specific to each explosion-protection technique**

Evidence shall show an understanding of modifications to specific explosion-protection techniques to an extent indicated by the following aspects:

- a) Design and development of modifications encompassing—
  - i) verification that equipment to be modified complies with its certification;
  - ii) assessing the viability and impact of the requested modification in terms of the explosion-protection properties;
  - iii) documenting specifications of modifications;
  - iv) verification tests that can be carried out within a workshop; and
  - v) assessing modified equipment and test results for conformance with applicable Standards.
- b) Processes and procedures for obtaining certificate of compliance for modified explosion-protected equipment encompassing:
  - i) Requirements for organizations to be recognized as testing/certification bodies for explosion-protected equipment.
  - ii) Processes used in certifying/approving modified explosion-protected equipment.

#### **5.2.15 Hazardous areas installation planning**

Evidence shall show an understanding of hazardous area electrical installations planning and the selection of appropriate explosion-protected equipment and wiring. The following aspects indicate the extent of understanding required:

- a) Interpretation of documents showing the classification of a hazardous area encompassing—
  - i) the methods used for classifying hazardous areas;
  - ii) the delineation of zones, temperature classes and gas groups of a given hazardous area from classification documents;
  - iii) the delineation of zones, temperature classes and gas groups of a given hazardous area from similar situations previously classified, such as those given in Standards; and
  - iv) situations where classification needs to be undertaken by a person competent in non-specific area classification i.e. a person who has attained Unit IECEx 706 A.
- b) Selecting and checking equipment, wiring and accessories encompassing—
  - i) the impact of environmental conditions, such as corrosion and maintenance requirements, on explosion-protected equipment and accessories;
  - ii) explosion-protected equipment and accessories to suit the requirements of given hazardous areas;
  - iii) wiring systems to suit the requirements of a hazardous area, load and duty requirements and consideration of capacitive/inductive effects and inductance/resistance ratio where applicable;
  - iv) earthing and equipotential bonding requirements for a hazardous area installation;

- v) procedures used to check the compliance certification of equipment used in a hazardous area; and
  - vi) electrical protection systems and devices, for example, overloads, earth fault protection) appropriate to an explosion-protection technique.
- c) Documentation of hazardous area installation design encompassing—
- i) the items that should be included in the documentation for the design of a hazardous area installation;
  - ii) installation layout, specification, work schedule and other documentation required for inclusion in a verification dossier; and
  - iii) the essential documentation that needs to be specified/requested from manufacturers when purchasing explosion-protected equipment/accessories.

#### **5.2.16 Common classified hazardous areas**

Evidence shall show an understanding of common and specific hazardous areas for which classification examples are given in Standards. The following aspects indicate the extent of understanding required:

- a) The example classifications given in Standards.
- b) Applying the classifications given in Standards to similar situations for the purpose of planning of electrical installations.

#### **5.2.17 Hazardous areas classification techniques**

Evidence shall show an understanding of processes involved in gathering and analysing technical data to classify non-specific hazardous areas. The following aspects indicate the extent of understanding required:

- a) The process of classifying hazardous areas encompassing—
  - i) methods by which an area can be classified;
  - ii) the characteristics/attributes of an area that should be considered in the classification process, for example, type of process, nature of plant, source and nature of release;
  - iii) the requirements and Standards for classifying a hazardous area; and
  - iv) the responsibilities of the owner/occupiers for classification of a hazardous area.
- b) The risk of an explosive hazard encompassing—
  - i) ignition properties of materials relevant to determining the risk and extent of an explosive hazard;
  - ii) sources for obtaining data on ignition properties of materials under the conditions in which they could be present in a given process;
  - iii) methods for determining the risk related to hazardous areas and the circumstances appropriate to their use, for example, 'hazard and operability study' (hazop); 'fault tree analyses' (hazan); and
  - iv) means for reducing hazard risk.
- c) The extent of an explosive hazard and classifying an area accordingly encompassing—
  - i) the extent of zones for an area, given data on the explosive hazard risks for that area;
  - ii) requirements for documenting the classification of a hazardous area; and
  - iii) the extent of the zones, temperature classes and gas groups on site drawings in a hazardous area.

### 5.2.18 Hazardous areas close inspection requirements

Evidence shall show an understanding of the purpose and process of close inspections to an extent indicated by the following aspects:

- a) Occupational, health and safety procedures encompassing—
  - i) occupational, health and safety procedures to be followed before entering hazardous areas; and
  - ii) occupational, health and safety procedures to be followed while conducting close inspection.
- b) Purpose, scope and limitations of close inspections.
- c) Documentation requirements resulting from a close inspection.

### 5.2.19 Hazardous areas management

Evidence shall show an understanding of the management responsibilities related to hazardous areas, the strategies used to maintain the safety of hazardous areas and the maintenance requirements. The following aspects indicate the extent of understanding required:

- a) The responsibilities of a person managing activities or a site related to a hazardous area, encompassing—
  - i) OH&S procedures that are to be established;
  - ii) responsibilities for ensuring that a hazardous area is safe; and
  - iii) responsibilities and processes for establishing and maintaining a verification dossier.
- b) Explosion-protection strategies in relation to a hazardous area, encompassing—
  - i) the process of classifying a hazardous area;
  - ii) various ways in which electrical systems /apparatus can be treated to prevent them from becoming an ignition source; and
  - iii) the cost of the different ways of treating electrical systems/apparatus associated with hazardous areas.
- c) Requirements for the maintenance of electrical systems associated with hazardous areas, encompassing—
  - i) the type and grades of inspection of hazardous areas;
  - ii) maintenance programs for electrical explosion-protected systems/apparatus; and
  - iii) documentation requirements associated with maintenance procedures.

### 5.2.20 Explosion-protected electrical systems design

Evidence shall show an understanding of explosion-protected electrical system design to an extent indicated by the following aspects:

- a) Process for establishing a design brief for an explosion-protected electrical system encompassing—
  - i) consultation processes for establishing client requirements and preparing a design brief; and
  - ii) system requirements using site and plant specifications, hazardous area classifications and organization requirements.
- b) System design encompassing—
  - i) major considerations influencing explosion-protected electrical system designs;
  - ii) requirements in Standards and regulations that affect the electrical system design; and



- iii) typical design process incorporating explosion-protection in an electrical system.
- c) Design documentation required for a hazardous area encompassing—
  - i) procedures for checking and approval of explosion-protected system design; and
  - ii) requirements for documenting a final design including documents to be included in a verification dossier.

#### **5.2.21 Explosion-protected equipment conformity assessment**

Evidence shall show an understanding of explosion-protected equipment compliance assessment to an extent indicated by the following aspects:

- a) The compliance certification and the 'Ex' scheme for recognition of certification encompassing—
  - i) the purposes of certification of explosion-protected equipment;
  - ii) the parties involved in the assessment/testing and certification of explosion-protected equipment and their responsibilities; and
  - iii) the scheme for recognition of assessment/testing and certification of explosion-protected equipment from other countries.
- b) The preparation required to assess explosion-protected equipment for compliance with Standards encompassing—
  - i) the special safety measures that should be taken when assessing/testing explosion-protected equipment;
  - ii) documentation required prior to conducting conformity assessment;
  - iii) tests necessary to establish that an item of explosion-protected equipment conforms with relevant Standards; and
  - iv) situations where testing is not applicable or required.
- c) Assessing and testing explosion-protected equipment encompassing—
  - i) assessment and test requirements; and
  - ii) procedures for conducting a conformity assessment.
- d) Recording and reporting requirements of conformity assessment.

#### **5.2.22 Hazardous areas installation testing**

Evidence shall show an understanding of testing installations of explosion-protected equipment, wiring and circuits associated with hazardous areas. The following aspects indicate the extent of understanding required:

- a) Preparation for conducting installation testing in a hazardous area encompassing—
  - i) OH&S procedures to be followed for working in a hazardous area; and
  - ii) procedures for determining whether a given hazardous area is safe to conduct electrical testing.
- b) Characteristics and limitations of testing equipment used to test installation in hazardous areas encompassing—
  - i) testing devices required to test an installation in a hazardous area; and
  - ii) the suitability of testing device for use in a hazardous area.
- c) Test a hazardous area installation at a knowledge/skill level indicated by the following aspects:
  - i) The purpose of each test that is required for an installation in a hazardous area i.e. polarity, insulation resistance, earth loop impedance and injection tests.
  - ii) The preparation required for each test.

- iii) Interpretation of test results.
- d) Documentation of results of hazardous area installation tests encompassing—
  - i) test results that should be recorded in a verification dossier; and
  - ii) procedures and options for dealing with test results that show non-conformance.

#### **5.2.23 Explosion-protection visual checks**

Evidence shall show an understanding of visible conditions of explosion-protection equipment that indicate the protection is void and changes in the nature of the explosion hazard that may render the explosion-protection unsafe. The following aspects indicate the extent of understanding required.

- a) Occupational, health and safety procedures encompassing—
  - i) occupational, health and safety procedures to be followed before entering hazardous areas; and
  - ii) occupational, health and safety procedures to be followed while conducting close inspection.
- b) Visible defects in explosion-protected equipment and wiring.
- c) Conditions that may indicate a change in a given explosion hazard.
- d) Reporting defects in explosion-protected equipment and wiring encompassing—
  - i) the purpose of a verification dossier; and
  - ii) various ways for reporting defects in explosion-protected equipment and wiring.
- e) Procedures to be followed in the event of a change in the explosion hazard.

#### **5.2.24 Gas detection: portable devices**

Evidence shall show an understanding of the principles of gas detection and the use and care of portable gas detection devices to an extent indicated by the following aspects:

- a) Fundamental principles in the use of gas and vapour instruments.
- b) Use of manufacturer's instruction manual, for example, operating instructions, adjustment procedures, operational limitations, storage.
- c) Calibration and response checking.

#### **5.2.25 Gas detection: fixed equipment**

Evidence shall show an understanding of requirements and techniques for the installation and maintenance of fixed gas detection equipment to an extent indicated by the following aspects:

- a) Fundamental principles in the use of fixed gas and vapour instruments.
- b) Use of manufacturer's instruction manual, for example, operating instructions, adjustment procedures and operational limitations.
- c) Installation and maintenance Standards for gas detection equipment.
- d) Appropriate locations for fixed gas detectors.
- e) Common problems with fixed gas detectors.
- f) Calibration and response checking.

#### **5.2.26 Evaluation and selection of gas detection equipment: portable and fixed**

Evidence shall show an understanding of the factors to consider in the evaluation and selection of portable and fixed gas detection equipment to an extent indicated by the following aspects:

- a) Requirements for gas detection for a given situation encompassing—
  - i) sources for obtaining data on physical chemistry of the gas to be detected; and
  - ii) sources for obtaining data on the conditions under which the gas may be present.
- b) Processes of assessing the specifications of gas detection equipment against established requirements.

## **6 ASSESSMENT**

### **6.1 GENERAL**

#### **6.1.1 Attributing competency**

Competencies shall be attributed on evidence showing that the person, so deemed competent, is able to undertake the responsibilities for all safety measures, care of plant and equipment, and care of the environment, directly related to the work function for which such competencies are required.

Note: Sufficient sources of evidence of competency will be required where the consequences of unjustifiably or mistakenly deeming a person competent carries a risk of injury to persons, or damage to property and/or the Environment.

#### **6.1.2 Sufficiency of evidence**

In all instances competency shall be attributed on evidence sufficient to show that a person—

- a) has the necessary skills required for the scope of work;
- b) can act competently across the specified range of activities; and
- c) has the knowledge and understanding underpinning competency.

#### **6.1.3 Currency of evidence**

Evidence shall be appropriately recent being suitable for making decisions about what a person knows and can do now and in the immediate future.

Note: The deeming of competence at a point in time does not mean that competence exists for all time; competency must be maintained by use and/or retraining.

#### **6.1.4 Authenticity**

Evidence shall be genuine and relate to the person being assessed, and no one else.

### **6.2 SOURCES OF EVIDENCE**

#### **6.2.1 General**

Competency shall be judged on evidence of essential knowledge underpinning performance and from evidence gathered across the whole range of performance activities relevant to the unit for which competency is to be attributed.

#### **6.2.2 Evidence of essential knowledge**

##### **6.2.2.1 Assessment methods**

Structured assessment methods, such as written, practical and oral tests/technical interviews shall be used to gather evidence that a person has the knowledge necessary to support competent performance.

##### **6.2.2.2 Assessment criteria**

Assessment of essential knowledge shall be based on the extent of subject matter specified by Clauses 5.2.1 to 5.2.26, for each Unit of Competency.

##### **6.2.2.3 Recognition of prior learning/current competencies**

Evidence of essential knowledge gained through prior learning shall comply with the requirements of Clause 6.2.3.4.

Minimum requirements for assessment of existing workers are given in Appendix G.

### **6.2.3 Evidence of competent performance**

Evidence of competent performance shall be gathered by one or more of the methods described in Clauses 6.2.3.1 to 6.2.3.4. The criteria against which the work performance shall be assessed is given in Clauses 4.2.6.1 to 4.19.5.1, as applicable to each Unit of Competency.

Note: Assessment should take into account variations between particular industry sectors and different enterprises. For example equipment used in underground coal mining will be different in some respects from that used in a petrochemical plant.

#### **6.2.3.1 Gathering evidence of performance in a simulated work environment**

In this method the simulated work environment shall include equipment relevant to the competencies to be assessed and arrangement in a manner similar to a real work place. Assessment activities shall be as close as practicable to real work situations and include real work decisions by the person being assessed.

#### **6.2.3.2 Gathering evidence of performance directly in the workplace**

In this method a qualified assessor shall gather the evidence through direct observation of relevant work activities on multiple occasions and situations.

Note: Direct assessment of work activities may not be acceptable in some work places as it is disruptive to productivity and may require further safety measures.

#### **6.2.3.3 Gathering evidence of performance, from indicators in relevant work experience**

In this method evidence shall be gathered through a daily or weekly log of work experience indicators, relevant to the unit(s) of competency being assessed; this shall be verified by a qualified responsible person. Such evidence shall be used to form a profile of competency development showing sufficient exposure to work activities and indicating when a final decision about competency can be made.

Note: Assessors will need to analyse log entries to evaluate the evidence when making assessment decisions. Computerized log systems provide automated analysis of entries that assists assessors in making consistent assessment decisions. In addition computerized log systems can provide progress reports that assist in managing the work experience to which a learner should be exposed.

#### **6.2.3.4 Recognition of prior learning/current competencies**

Evidence of competent performance gained through prior work experience and formal or informal learning, shall comply with Clauses 4.2.6.1 to 4.19.5.1, as applicable to each Unit of Competency.

## **6.3 ASSESSMENT PROCESSES**

### **6.3.1 Conducting and managing assessment**

Assessment shall be conducted and managed in accordance with .....  
..... [to be established] for Registered Training  
Organisations (RTOs).

### **6.3.2 Qualification of assessors**

Persons undertaking assessment of competency as specified in this specification shall be qualified in accordance with .... [to be established] for Registered Training  
Organisations (RTOs).

## 7 TRAINING / LEARNING STRUCTURE

### 7.1 GENERAL

This part of the specification provides a consolidation of the knowledge and skills that define the Competency Standard Units previously described. The knowledge and skills, which have been derived from the Competency Standard Units are in learning descriptors form, to assist in the development of structured training/learning and assessment programs.

This Standard may be use by Training Providers to develop structured training/learning and assessment programs and by learners as a guide to the extent of knowledge and skills required to be deemed competent.

The modular structure has been adopted because it is educationally sound and provides a high degree of success for learners and a cost effective framework for training providers. This approach also ensures a consistency of training and assessment outcomes that is not achievable if each training provider interprets the depth and breadth of learning and the rigour of assessment necessary.

There are two type of modules used in the training structure-

- a) modules providing the knowledge and associated skills essential to competent performance (curriculum modules); and
- b) modules specifying the method and criteria for gathering evidence of competent work performance relevant to a unit (work performance modules).

Details of the curriculum modules are outlined in Clause 8 and Clause 9 contains the details of the work performance modules.

### 7.2 TRAINING/LEARNING STRUCTURE

Modules supporting the achievement of each Unit of Competency and which provide the basis for a structured training program are shown in Table 7.1.

**TABLE 7.1**  
**TRAINING/LEARNING STRUCTURE**

Unit of Competency	Competencies and modules required to achieve each Unit of Competency	
IECEX 010 A Report on the integrity of explosion-protected equipment in hazardous areas.	Competencies	
	General	Plant operation or maintenance at Qualification Level III or higher
	Modules	
	ModTL001	Explosion-protection principles.
	ModTL014	Explosion-protection visual checks.
	ModWP014	Hazardous area operations reporting work performance.
IECEX 012 A	Competencies	

Unit of Competency	Competencies and modules required to achieve each Unit of Competency	
Attend to breakdowns in hazardous areas. (Endorsement1)	General  IECEx 010 A  <b>Modules</b> ModTL002 A to G ModTL003  ModWP015	Attending-to-breakdowns in general plant or machinery breakdown at AQF Certificate III or higher, either as a tradesperson or plant operator.  Report on the integrity of explosion-protected equipment in hazardous areas.  Explosion-protected equipment. Hazardous area installation and maintenance techniques. Hazardous areas attend-to-breakdown work performance.
IECEx 107 A Install explosion-protected equipment and wiring systems. (Endorsement1)	<b>Competencies</b> General  <b>Modules</b> ModTL001 ModTL002 ModTL003  ModTL015 ModTL016 ModWP001	Installation of general low-voltage or extra-low-voltage electrical/electronic equipment and wiring systems at Qualification Level III  Explosion-protection principles. Explosion-protected equipment. Hazardous area installation and maintenance techniques. Gas detection fundamentals Gas detection equipment Hazardous area installation work performance.
IECEx 214 A Maintain equipment in hazardous areas. (Endorsement1)	<b>Competencies</b> General  <b>Modules</b> ModTL001 ModTL002 ModTL003  ModTL015 ModTL016 ModWP002	Maintenance of general low-voltage or extra-low-voltage electrical/electronic equipment and wiring systems at Qualification Level III.  Explosion-protection principles. Explosion-protected equipment. Hazardous area installation and maintenance techniques. Gas detection fundamentals Gas detection equipment Hazardous area maintenance work performance.
IECEx 215 A Overhaul and repair explosion-protected equipment. (Endorsement1)	<b>Competencies</b> General  <b>Modules</b> ModTL001 ModTL002 ModTL005 ModWP007	Overhaul and repair of general low-voltage or extra-low-voltage electrical/electronic equipment has been achieved at Qualification Level III.  Explosion-protection principles. Explosion-protected equipment. Explosion-protected equipment overhaul and repair. Explosion-protected equipment overhaul and repair work performance.
IECEx 407 A Assess explosion-protected equipment for compliance with Standards. (Endorsement1)	<b>Competencies</b> General  <b>Modules</b> ModTL001	Compliance assessment of general low-voltage or extra-low-voltage electrical/electronic equipment has been achieved at Qualification Level IV or higher.  Explosion-protection principles.

Unit of Competency	Competencies and modules required to achieve each Unit of Competency	
	ModTL002 ModTL012 ModWP009	Explosion-protected equipment. Explosion-protected equipment conformity assessment. Explosion-protected conformity assessment work performance.
IECEX 408 A Test installations in hazardous areas. (Endorsement1)	<b>Competencies</b> IECEX 107 A  OR IECEX 214 A <b>Modules</b> ModTL013 ModWP003	Install explosion-protected equipment and wiring systems, or Maintain equipment in hazardous areas Hazardous area installation testing. Hazardous area installation testing work performance.
IECEX 409 A Inspect visually existing hazardous area installations. (Endorsement1)	<b>Competencies</b> General  OR IECEX 107 A  OR IECEX 214 A  OR IECEX 408 A <b>Modules</b> ModTL002 ModTL009 ModWP004	Electrical inspection at Qualification Level IV or higher, or Install explosion-protected equipment and wiring systems, or Maintain equipment in hazardous areas, or Test installations in hazardous areas Explosion-protected equipment. Hazardous area close inspection requirements. Hazardous area visual inspection work performance.
IECEX 410 A Inspect in detail hazardous area installations. (Endorsement1)	<b>Competencies</b> IECEX 409 A <b>Modules</b> ModTL004 ModWP005	Inspect visually existing hazardous area installations Hazardous area detailed inspection techniques. Hazardous area detail inspect work performance.
IECEX 609 A Develop and manage maintenance programs for hazardous area electrical equipment. (Endorsement)	<b>Competencies</b> General  OR IECEX 214 A <b>Modules</b> ModTL001 ModTL002 ModTL010 ModWP012	Developing and managing general plant maintenance programs at Qualification Level IV or higher, or Maintain equipment in hazardous areas Explosion-protection principles. Explosion-protected equipment. Hazardous area management. Hazardous area maintenance management work performance.



Unit of Competency	Competencies and modules required to achieve each Unit of Competency	
IECEx 610 A Ensure the safety of hazardous areas.	<b>Competencies</b> General  <b>Modules</b> ModTL001 ModTL010 ModWP013	General plant management at Qualification Level III or higher  Explosion-protection principles. Hazardous area management. Hazardous area management work performance.
IECEx 705 A Design and develop modifications to explosion-protected equipment. (Endorsement)	<b>Competencies</b> General  OR IECEx 215 A  <b>Modules</b> ModTL006 ModWP008	Design and developing of general electrical equipment at Qualification Level V or higher, or  Overhaul and repair explosion-protected equipment.  Explosion-protected equipment modification. Explosion-protected equipment modification design work performance.
IECEx 706 A Classify hazardous areas.	<b>Competencies</b> General  <b>Modules</b> ModTL001 ModTL008 ModWP010	Gathering and analysing technical data and using this data to assess risk at Qualification Level VI level or higher  Explosion-protection principles. Hazardous area classification techniques. Hazardous area classification work performance.
IECEx 707 A Design electrical installations in hazardous areas. (Endorsement1)	<b>Competencies</b> General  OR IECEx 107 A  <b>Modules</b> ModTL001 ModTL002 ModTL007 ModWP006	Planning/designing electrical installations at Qualification Level IV or higher, or  Install explosion-protected equipment and wiring systems.  Explosion-protection principles. Explosion-protected equipment. Hazardous area installation design. Hazardous area installation design work performance.
IECEx 708 A Design explosion-protected electrical systems. Endorsement1)	<b>Competencies</b> General  IECEx 707 A  <b>Modules</b> ModTL011 ModWP011	Designing general electrical systems and installations, at Qualification Level VI level or higher Design electrical installations in hazardous areas.  Explosion-protected electrical system design. Explosion-protected electrical system design work performance.

**Note:**

Endorsement relates to the explosion-protection technique in which competency has been demonstrated. The evidence for granting endorsements is obtained through the relevant work performance module. More than one endorsement for a unit may be achieved. An endorsement is designated as given in Clause 4.

## 8 CURRICULUM

### 8.1 GENERAL

Curriculum modules provide the knowledge and skills underpinning competency. All the curriculum modules and their links to the respective Units of Competency are shown in Table 8.1.

### 8.2 MODULE INFORMATION

General information for each curriculum module is given in Table 8.1.

**TABLE 8.1**  
**SUMMARY OF CURRICULUM MODULES**

Module title	Module code <sup>1</sup>	Suggested structured learning time <sup>2</sup>	Relationship to the IECEx Units of Competency
Explosion-protection principles	ModTL001	10 hours	All units
Explosion-protected equipment	ModTL002	40 hours	IECEX 012 A, IECEx 107 A, IECEx 214 A, IECEx 215 A, IECEx 407 A, IECEx 408 A, IECEx 409 A, IECEx 410 A, IECEx 609 A, IECEx 705 A, IECEx 707 A, IECEx 708 A
Hazardous area installation and maintenance techniques	ModTL003	40 hours	IECEX 012 A, IECEx 107 A, IECEx 214 A, IECEx 408 A, IECEx 410 A, IECEx 707 A
Hazardous area detailed inspection techniques	ModTL004	20 hours	IECEX 410 A
Explosion-protected equipment overhaul and repair	ModTL005	10 + 10/30 hours	IECEX 215 A, IECEx 705 A
Explosion-protected equipment modification	ModTL006	4 + 16 hours	IECEX 705 A
Hazardous area installation design	ModTL007	30 hours	IECEX 707 A, IECEx 708 A
Hazardous area classification techniques	ModTL008	30 hours	IECEX 706 A
Hazardous area close inspection requirements	ModTL009	10 hours	IECEX 409 A
Hazardous area management	ModTL010	20 hours	IECEX 609 A, IECEx 610 A
Explosion-protected electrical systems design	ModTL011	40 hours	IECEX 708 A
Explosion-protected equipment conformity assessment	ModTL012	40 hours	IECEX 407 A
Hazardous area installation testing	ModTL013	10 hours	IECEX 408 A
Explosion-protection visual checks	ModTL014	10 hours	IECEX 010 A
Gas detection fundamentals	ModTL015	6 hours	IECEX 012 A, IECEx 107 A, IECEx 214 A, IECEx 215 A, IECEx 407 A, IECEx 408 A, IECEx 409 A, IECEx 410 A, IECEx 609 A, IECEx 705 A, IECEx 707 A, IECEx 708 A
Gas detection equipment	ModTL016	4 hours	IECEX 107 A, IECEx 214 A, IECEx 215 A
Evaluation and selection of gas detection equipment	ModTL017	10 hours	IECEX 707 A, IECEx 708 A

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**Notes:**

- 1 Module code for training/learning = ModTL and 010 = sequential number within the applicable structure of modules.
  - 2 Suggested structured learning time is the period of time that students with the appropriate entry skills will need to successfully complete the module.
  - 3 ModTL005 and ModTL006 each have two components. One is common for all endorsements, the other applies to each explosion-protection technique (endorsement).
  - 4 Some units require endorsement.
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### 8.3 CONTENT OF MODULES

#### 8.3.1 ModTL001-Explosion-protection principles

##### 8.3.1.1 Module purpose

This module provides knowledge for working in hazardous areas and the basics of explosion-protection. Students will learn the terms used in defining explosion hazards and hazardous areas and the principal methods used to prevent electrical systems from initiating an explosion. Occupational Health and Safety responsibilities for working in hazardous areas and the parties involved in the safety of hazardous areas are also covered.

##### 8.3.1.2 Learning outcomes

To evidence they have met the purpose of this module, learners shall be able to—

- a) demonstrate knowledge of combustible substances and their potential to create an explosive hazard at a knowledge/skill level indicated by the following aspects:
  - i) Stating the condition that will lead to an explosion.
  - ii) Explaining the terms 'combustion', 'ignition' and 'propagation'.
  - iii) Explaining, with the aid of a diagram, the explosive range of a substance and its relationship to ignition energy. (LEL, UEL).
  - iv) identifying the explosive parameters of a substance from given tables of substance characteristics, i.e., properties of combustible materials-liquids, gases and dusts.
- b) demonstrate knowledge of hazardous areas at a knowledge/skill level indicated by the following aspects:
  - i) Explaining the term 'hazardous area' as defined in Standards.
  - ii) Listing the recommended methods for classifying the type and degree of explosion hazard in an area.
  - iii) Identifying the types of hazards as defined by Standards.
  - iv) Explaining hazardous area classifications as defined by Standards.
  - v) Listing factors that are considered when a hazardous area is classified.
- c) demonstrate knowledge of explosion-protection principles and techniques at a knowledge/skill level indicated by the following aspects:
  - i) Explaining the principles of each explosion-protection technique and how they work.
  - ii) Identifying visible conditions or actions that would void the explosion-protection provided by a particular technique.
- d) explain the Occupational Health and Safety responsibilities related to hazardous areas at a knowledge/skill level indicated by the following aspects:
  - i) Describing the main features and purpose of a 'clearance to work' system.
  - ii) Listing the typical safety procedures that should be followed before entering a hazardous area.
  - iii) Describing the purpose of gas detectors and their limitations.
  - iv) Explaining the precautions to be taken when handling and storing gas detectors.
  - v) Listing the safety precautions to be taken when working in a hazardous area.
- e) state the roles of the parties involved in the safety of hazardous areas at a knowledge/skill level indicated by the following aspects:
  - i) Listing common Acts and Regulations related to the safety of hazardous areas and the Authorities responsible for their implementation.

- ii) Stating where assistance and further information can be obtained to assist persons with hazardous area responsibilities, e.g. Standard bodies, experienced consultants.
- iii) Stating the hazardous area responsibilities of the owner of premises in which a hazardous area exists; the occupier of premises in which a hazardous area exists; enterprises and personnel engaged in installation and/or maintenance of explosion-protection systems; enterprises and personnel engaged in the classification of hazardous areas and/or design of explosion-protection systems; enterprises and personnel engaged in the overhaul, modification and/or assessment of explosion-protected equipment; enterprises and personnel engaged in the inspection of explosion-protection installations; manufacturers of explosion-protected equipment; designated authorities; insurers.

### **8.3.2 ModTL002-Explosion-protected equipment**

#### **8.3.2.1 Module purpose**

This module provides knowledge of the design features of explosion-protected equipment and the Standards to which they must comply. Students will learn how each explosion-protection technique works, the important features of each and actions/conditions that will void explosion-protection. The suitability of an explosion-protection technique for a given hazardous area is also covered.

#### **8.3.2.2 Learning outcomes**

##### **8.3.2.2.1 Part A—Flameproof (Ex'd') explosion-protection technique**

To evidence they have met the purpose of this module, learners shall be able to explain the purpose of the design and construction features of the 'Flameproof' explosion-protection technique at a knowledge/skill level indicated by the following aspects:

- a) Explaining the characteristics and features of flameproof explosion-protection, for example, flame paths, integrity under pressure, pressure piling, and enclosure entries.
- b) Listing typical examples of where flameproof explosion-protection is used.
- c) Identifying any action or condition that would void the explosion-protection provided by flameproof systems.
- d) Using Standards, determine the requirements to which the design features of flameproof equipment shall comply.

##### **8.3.2.2.2 Part B—Increased safety (Ex'e') explosion-protection technique**

To evidence they have met the purpose of this module, learners shall be able to explain the purpose of the design and construction features of the 'increased safety' explosion-protection technique at a knowledge/skill level indicated by the following aspects:

- a) Explaining the characteristics and features of increased safety explosion-protection, for example, temperature rise, maximum power dissipation, protection devices, certified components, creepage and clearance distances, absence of sparking contacts and enclosure entries.
- b) Listing typical examples of where increased safety explosion-protection equipment is used.
- c) Identifying any action or condition that would void the explosion-protection provided by increased safety systems.
- d) Using Standards, determine the requirements to which the design features of increased safety equipment shall comply.

##### **8.3.2.2.3 Part C—Non-sparking (Ex'n') explosion-protection technique**

To evidence they have met the purpose of this module, learners shall be able to explain the purpose of the design and construction features of the 'non-sparking' explosion-protection technique at a knowledge/skill level indicated by the following aspects:

- a) Explaining the characteristics and features of non-sparking explosion-protection, for example, creepage and clearance distances and restricted breathing.
- b) Listing typical examples of where non-sparking explosion-protection is used.
- c) Identifying any action or condition that would void the explosion-protection provided by non-sparking systems.
- d) Using Standards determine the requirements to which the design features of non-sparking equipment must comply.

**8.3.2.2.4 Part D—Intrinsic safety (Ex'i') explosion-protection technique**

To evidence they have met the purpose of this module, learners shall be able to explain the purpose of the design and construction features of the 'Intrinsic safety' explosion-protection technique at a knowledge/skill level indicated by the following aspects:

- a) Explaining the characteristics and features of intrinsic safety explosion-protection, for example, field devices, cables, safe area devices, earthing, entity versus integrated system concept, simple devices and interface devices and their parameters, segregation, infallible components, current and voltage limiting, creepage and clearance distances.
- b) Listing typical examples of where intrinsically safe explosion-protection is used.
- c) Identifying any action or condition that would void the explosion-protection provided by intrinsically safe systems.
- d) Using Standards, determine the requirements to which the design features of intrinsically safe equipment must comply.

**8.3.2.2.5 Part E—Pressurized enclosure(Ex'p') and the ventilation (Ex'v') explosion-protection techniques**

To evidence they have met the purpose of this module, learners shall be able to explain the purpose of the design and construction features of the 'pressurized enclosure' and the ventilation explosion-protection technique at a knowledge/skill level indicated by the following aspects:

- a) Explaining the characteristics and features of pressurized enclosure and ventilation explosion-protection, for example, exclusion and dilution, purge periods, controlled shut down, monitoring and sources of internal release.
- b) Listing typical examples of where pressurized enclosure and ventilation explosion-protection techniques are used.
- c) Identifying any action and condition that would void the explosion-protection provided by pressurized enclosure and ventilation systems.
- d) Using Standards, determining the requirements to which the design features of pressurized enclosure and ventilation must comply.

**8.3.2.2.6 Part F—Explosion-protection techniques for dusts (Ex'tD', Ex'pD', Ex'iD', Ex'mD')**

To evidence they have met the purpose of this module, learners shall be able to explain the purpose of the design and construction features of Enclosures (Ex 'tD'), Pressurization (Ex 'pD'), Encapsulation (Ex 'mD') and Intrinsic safety (Ex 'iD') (for dusts) explosion-protection techniques at a knowledge/skill level indicated by the following aspects:

- a) Explaining the characteristics and features of apparatus and circuits protected by enclosures, pressurization, encapsulation and intrinsic safety techniques for dusts.
- b) Listing typical examples of where protection for dusts is used.
- c) Identifying any action or condition that would void the explosion-protection provided for dusts.
- d) Using Standards, determine the requirements to which the design features of explosion-protected equipment for dusts must comply.

**8.3.2.2.7 Part G—Common characteristics of explosion-protection techniques**

To evidence they have met the purpose of this module, learners shall be able to demonstrate an understanding of the common characteristics of explosion-protection techniques at a knowledge/skill level indicated by the following aspects:

- a) Explaining the term 'temperature classification' and its purpose.
- b) Explaining the term 'gas grouping/apparatus grouping' and its purpose.

- c) Describing compliance plate markings.
- d) Stating limitations of non-metallic or specific alloy enclosures.
- e) Explaining the purpose of conformity and certification/ approval for equipment used in hazardous areas.
- f) Identifying environmental conditions that may impact on explosion-protection techniques.
- g) Explaining the principles and applications of mixed explosion-protection techniques.



### **8.3.3 ModTL003-Hazardous area installation and maintenance techniques**

#### **8.3.3.1 Module purpose**

This module provides knowledge of installation and maintenance of electrical and instrument equipment for hazardous areas. Students will learn to use previously

gained skills related to electrical/instrument installation and maintenance to install and maintain explosion-protected equipment and systems.

#### **8.3.3.2 Learning outcomes**

To evidence they have met the purpose of this module, learners shall be able to—

- a) demonstrate knowledge and skills for preparing to install and maintain explosion-protected equipment in hazardous areas at a knowledge/skill level indicated by the following aspects:
  - i) Listing the OH & S procedures to be followed when working in and preparing to work in a hazardous area.
  - ii) Describing the typical information provided on the certification documentation and schedules for a given item of explosion-protected equipment.
  - iii) Describing the typical contents of a site dossier and their purpose.
  - iv) Outlining the limitations for the use of tools and testing devices in a given hazardous area.
- b) demonstrate ability to match explosion-protected equipment, their certification documents and required locations given in specifications and layout drawings and/or written instructions at a knowledge/skill level indicated by the following aspects:
  - i) Explaining the purpose of markings on the compliance plate and certification documents for a given item of explosion-protected equipment.
  - ii) Matching explosion-protected equipment with certification documents and the equipment specified for an installation.
  - iii) Determining the location of each item of explosion-protected equipment for an installation from specifications and layout drawings and/or instructions.
- c) demonstrate knowledge of installation standards and requirements applicable to hazardous areas at a knowledge/skill level indicated by the following aspects:
  - i) Listing the wiring systems permitted and not permitted in or above hazardous areas.
  - ii) Identifying equipment not permitted in or above hazardous areas.
  - iii) Describing the regulations and standards to which explosion-protected equipment and wiring must be installed in a hazardous area and how these are applied.
  - iv) Describing the documentation required as a record of the installation process, including certification documentation.
- d) demonstrate skills applicable to wiring in hazardous areas at a knowledge/skill level indicated by the following aspects:
  - i) Selecting a cable termination device for a given application.
  - ii) Installing a conduit seal to meet hazardous area requirements.
  - iii) Terminating MIMS cable in a flameproof enclosure.
  - iv) Terminating multi-core steel wire armoured cable in an increased safety enclosure.
  - v) Terminating a steel wire armoured cable with a barrier gland in a flameproof enclosure.

- vi) Terminating an intrinsically safe cable in an enclosure.
- e) apply maintenance procedures in hazardous areas that will ensure the integrity of the explosion-protection technique at a knowledge/skill level indicated by the following aspects:
  - i) Describing the purpose of a maintenance schedule.
  - ii) Explaining the purpose of 'visual', 'close', 'sample' and 'periodic' inspections.
  - iii) Listing the typical features of Ex d, Ex e, Ex n, Ex i Ex p/v and DIP explosion-protection techniques that should be included in a maintenance schedule.
  - iv) Explaining the impact of environmental conditions on explosion-protected equipment, including corrosion and frequency of maintenance.
  - v) Describing the documentation required to record the maintenance process and results.

### **8.3.4 ModTL004-Hazardous area detailed inspection techniques**

#### **8.3.4.1 Module purpose**

This module provides knowledge of detailed inspection of hazardous areas including explosion-protected equipment, wiring, circuits and auditing of site records. Students will build on previously gained skills related to installing explosion-protected systems and also cover inspecting explosion-protected equipment, wiring and circuits.

#### **8.3.4.2 Learning outcomes**

To evidence they have met the purpose of this module, learners shall be able to—

- a) demonstrate an ability to conduct an audit of site records at a knowledge/skill level indicated by the following aspects:
  - i) Identifying the components that should be contained in a site dossier.
  - ii) Explaining the procedures for auditing a site dossier.
- b) show the relationship between the documentation held in a site dossier and the installed equipment at a knowledge/skill level indicated by the following aspects:
  - i) Verifying that the location and type of equipment is consistent with the area classification details in the site dossier.
  - ii) Verifying equipment certification and any attached conditions that relate to the equipment as it is installed.
- c) demonstrate knowledge and skills for inspecting a hazardous area installation at a knowledge/skill level indicated by the following aspects:
  - i) Describing a typical process for undertaking the inspection of a hazardous area installation.
  - ii) Determining the requirements applicable to a given installation.
  - iii) Preparing a report on an inspection of a hazardous area installation.

### **8.3.5 ModTL005-Explosion-protected equipment overhaul and repair**

#### **8.3.5.1 Module purpose**

This module, together with other modules in the ModTL 05 series, provides knowledge of overhaul and repair procedures of explosion-protected equipment. Students will learn to use previously gained skills to overhaul and repair explosion-protected equipment.

#### **8.3.5.2 Part A—General Learning outcomes**

To evidence they have met the purpose of this module, learners shall be able to—

- a) describe the scope and limitations for overhaul and repair at a knowledge/skill level indicated by the following aspects:
  - i) Listing the requirements for registration of a workshop.
  - ii) Listing the requirements of a 'competent person' for a registered workshop.
  - iii) Describing the scope and limitations of work that can be carried out by a registered workshop.
- b) demonstrate a working knowledge of the Repair and Overhaul Standard at a knowledge/skill level indicated by the following aspects:
  - i) Listing the documentation/information required to enable repairs/overhauls to be undertaken.
  - ii) Identifying the categories of work, e.g., overhaul; no repair; overhaul-repair.
  - iii) Identifying modifications that are, and are not, permitted within the equipment certification.
  - iv) Explaining the requirements for overhaul/repair processes relevant to the type of protection and equipment.
- c) list the requirements for documentation and identification of overhauled/repared explosion-protected equipment at a knowledge/skill level indicated by the following aspects:
  - i) Preparing a typical overhaul/repair report document.
  - ii) Stating the requirements for distribution of overhaul/repair reports.
- d) demonstrate knowledge and understanding of quality management systems as covered by international standards at a knowledge/skill level indicated by the following aspects:
  - i) Describing the documentation regime of a quality management system.
  - ii) Describing the principle of document and data control covering both internally and externally generated documents and data.
  - iii) Explaining the principles of process control as applied to the overhaul and repair of explosion-protected equipment.

#### **8.3.5.3 Part B—Technique specific learning outcomes**

To evidence they have met the purpose of this module, learners shall be able to—

- a) demonstrate ability in the overhaul and repair for specific explosion-protection techniques at a knowledge/skill level indicated by the following aspects:
  - i) Using Standards to determine the requirement for a specific explosion-protection technique.
  - ii) Selecting measuring/testing devices/apparatus required to determine whether an item of equipment meets the certification requirements.
  - iii) Maintaining the accuracy/calibration of measuring/testing devices/apparatus.
  - iv) Using measuring/testing devices/apparatus to determine whether an item of equipment meets the certification requirements.

- v) Determining the level of overhaul/repair required from comparisons of test results and requirements specified in the original certification.
  - vi) Specifying overhaul/repair work required to restore an item of explosion-protected equipment to conform with the original certification.
- b) demonstrate ability to verify that an item of equipment meets the original certification requirements.

### **8.3.6 ModTL006-Explosion-protected equipment modification**

#### **8.3.6.1 Module purpose**

This module provides knowledge of developing/designing modifications to explosion-protected equipment. Students will build on previously gained skills related to overhaul and repair of design modifications to explosion-protected equipment within the scope permitted by Standards.

#### **8.3.6.2 Part A—General learning outcomes**

To evidence they have met the purpose of this module, learners shall be able to—

- a) describe the scope and limitations for design and development of modifications of explosion-protected equipment at a knowledge/skill level indicated by the following aspects:
  - i) Listing the requirements of a 'competent person' for a registered workshop engaged in design and development of modifications to explosion-protected equipment.
  - ii) Describing the scope and limitations of work that can be carried out in a registered workshop in relation to modifying explosion-protected equipment.
- b) list the requirements for documenting and identifying modified explosion-protected equipment at a knowledge/skill level indicated by the following aspects:
  - i) Preparing a typical modification report document.
  - ii) Stating the requirements for distribution of reports on modifications.

#### **8.3.6.3 Part B—Technique specific learning outcomes**

To evidence they have met the purpose of this module, learners shall be able to—

- a) demonstrate ability in designing and developing modifications to specific explosion-protection techniques at a knowledge/skill level indicated by the following aspects:
  - i) Verifying that equipment to be modified complies with its certification.
  - ii) Assessing the viability and impact of the requested modification in terms of the explosion-protection properties.
  - iii) Documenting modifications specifications.
  - iv) Verifying whether tests than can be carried out within a workshop.
  - v) Assessing modified equipment and test results for conformance with applicable Standards.
- b) demonstrate ability in obtaining certificate of compliance for modified explosion-protected equipment at a knowledge/skills level indicated by the following aspects:
  - i) Assessing credentials of an organization to test/certify explosion-protected equipment.
  - ii) Obtaining certification/approval for modifications to explosion-protected equipment.

### **8.3.7 ModTL007-Hazardous area installation design**

#### **8.3.7.1 Module purpose**

This module provides knowledge and skills to design hazardous area electrical installations and to select appropriate explosion-protected equipment and wiring. Students will build on previously gained skills related to installing explosion-protected systems to also cover designing hazardous area installations.

#### **8.3.7.2 Learning outcomes**

To evidence they have met the purpose of this module, learners shall be able to—

- a) check and interpret the documents showing the classification of a hazardous area at a knowledge/skill level indicated by the following aspects:
  - i) Describing the methods of classifying hazardous areas.
  - ii) Identifying the delineation of zones, temperature classes and gas groups of a given hazardous area from classification documents.
  - iii) Determining the delineation of zones, temperature classes and gas groups of a given hazardous area from similar situations previously classified, such as those given in Standards.
  - iv) Identifying when further detailed classification of a hazardous area needs to be carried out by a person competent in classification of hazardous areas.
- b) select and check equipment, wiring and accessories at a knowledge/skill level indicated by the following aspects:
  - i) Outlining the impact of environmental conditions such as corrosion and the maintenance requirements on a selection of explosion-protected equipment and accessories.
  - ii) Selecting explosion-protected equipment and accessories to suit the requirements of a given hazardous area.
  - iii) Selecting wiring systems to suit the requirements of a hazardous area as well as load and duty requirements and including capacitive/inductive effects and inductance/resistance ratio where applicable.
  - iv) Determining earthing requirements for a hazardous area installation.
  - v) Determining the equipotential bonding requirements for a hazardous area installation.
  - vi) Detailing procedures used to check the compliance certification of equipment used in a hazardous area.
  - vii) Selecting (electrical) protection systems and devices (e.g., overloads, earth fault protection) appropriate to an explosion-protection technique.
- c) document hazardous area installation design at a knowledge/skill level indicated by the following aspects:
  - i) Describing the elements that should be included in the documentation for the design of a hazardous area installation.
  - ii) Preparing an installation layout, specification, work schedule and other documentation required for inclusion in a site dossier.
  - iii) Describing the essential documentation that needs to be specified/requested from manufacturers when purchasing explosion-protected equipment/accessories.

### **8.3.8 ModTL008-Hazardous area classification techniques**

#### **8.3.8.1 Module purpose**

This module provides knowledge of processes for classifying hazardous areas. Students will learn to use previously gained skills of gathering and analysing technical data to classify hazardous areas.

#### **8.3.8.2 Learning outcomes**

To evidence they have met the purpose of this module, learners shall be able to—

- a) explain the process of classifying hazardous areas at a knowledge/skill level indicated by the following aspects:
  - i) Listing the characteristics/attributes of an area that should be considered in the classification process, e.g., type of process, nature of plant, source and nature of release.
  - ii) Identifying the requirements and standards for classifying a hazardous area.
  - iii) Describing methods by which an area can be classified.
  - iv) Stating the responsibilities of the owner/occupiers for classification of a hazardous area.
- b) demonstrate knowledge and skills for determining the risk of an explosive hazard at a knowledge/skill level indicated by the following aspects:
  - i) Identifying the ignition properties of materials relevant to determining the risk and extent of an explosive hazard.
  - ii) Listing the sources for obtaining data on ignition properties of materials under the conditions in which they could be present in a given process.
  - iii) Demonstrating methods for determining the risk related to hazardous areas and the circumstances appropriate to their use, e.g., 'hazard and operability study' (hazop); 'fault tree analyses' (hazan).
  - iv) Discussing means for reducing hazard risk.
- c) demonstrate knowledge and skills for determining the extent of an explosive hazard and classifying an area accordingly at a knowledge/skill level indicated by the following aspects:
  - i) Determining the extent of classes and zones for an area given data on the explosive hazard risks for that area.
  - ii) Explaining the requirements for documenting the classification of a hazardous area.
  - iii) Showing the extent of the zones, temperature classes and gas groups on site drawings in a hazardous area.



### **8.3.9 ModTL009-Hazardous area close inspection requirements**

#### **8.3.9.1 Module purpose**

This module provides knowledge and skills for close inspection processes. Students will learn how to recognise conditions of explosion-protected equipment that may impair the integrity of the explosion-protected equipment in hazardous areas.

#### **8.3.9.2 Learning outcomes**

To evidence they have met the purpose of this module, learners shall be able to-

- a) apply occupational, health and safety procedures at a knowledge/skill level indicated by the following aspects:
  - i) Listing the occupational, health and safety procedures to be followed before entering hazardous areas.
  - ii) Listing the occupational, health and safety procedures to be followed while conducting close inspection.
- b) demonstrate knowledge and skill for close inspection of hazardous area installations at a knowledge/skill level indicated by the following aspects:
  - i) Describing scope and limitations of close inspection.
  - ii) Listing actions and conditions that may void the explosion-protection provided by flameproof, increased safety, non-sparking, intrinsically safe, dust-excluding ignition-proof and pressurization techniques.
- c) demonstrate an understanding of documentation requirements at a knowledge/skill level indicated by the following aspects:
  - i) Listing the requirements for documentation of hazardous area installations.
  - ii) Describing the documentation requirements for close inspection within a maintenance schedule.

### **8.3.10 ModTL010-Hazardous area management**

#### **8.3.10.1 Module purpose**

This module provides knowledge of procedures used to manage system/apparatus for hazardous areas. Students will learn the management responsibilities related to hazardous areas, the strategies used to maintain the safety of hazardous areas and the maintenance management requirements.

#### **8.3.10.2 Learning outcomes**

To evidence they have met the purpose of this module, learners shall be able to-

- a) describe the responsibilities of a person managing activities/site related to a hazardous area at a knowledge/skill level indicated by the following aspects:
  - i) Detailing the OH & S procedures that must be established.
  - ii) Outlining the responsibilities for ensuring a hazardous area is safe.
  - iii) Describing the responsibilities and processes for establishing and maintaining a site dossier.
- b) detail explosion-protection strategies in relation to a hazardous area at a knowledge/skill level indicated by the following aspects:
  - i) Describing the process of classifying a hazardous area.
  - ii) Outlining the various ways in which electrical systems /apparatus can be treated to prevent them from becoming an ignition source.
  - iii) Comparing the cost of the different ways of treating electrical systems/apparatus associated with hazardous areas.
- c) demonstrate knowledge of the requirements for the maintenance of electrical systems associated with hazardous areas at a knowledge/skill level indicated by the following aspects:
  - i) Describing the type and grades of inspection of hazardous areas.
  - ii) Developing a maintenance program for electrical explosion-protected systems/apparatus associated with a given hazardous area.
  - iii) Describing the documentation requirements associated with maintenance procedures.

### **8.3.11 ModTL011-Explosion-protected electrical systems design**

#### **8.3.11.1 Module purpose**

This module provides knowledge and skills to design explosion-protected electrical systems. Students will learn to apply previously gained skills in designing general electrical systems, to designing systems for hazardous areas.

#### **8.3.11.2 Learning outcomes**

To evidence they have met the purpose of this module, learners shall be able to-

- a) demonstrate an understanding of the process for establishing a design brief for an explosion-protected electrical system at a knowledge/skill level indicated by the following aspects:
  - i) Describing a typical consultation process in establishing client requirements and preparing a design brief.
  - ii) Determining the system requirements using site and plant specifications, hazardous area classifications and organization requirements.
- b) demonstrate an understanding of the system design process at a knowledge/skill level indicated by the following aspects:
  - i) Identifying the major considerations influencing explosion-protected electrical system designs.
  - ii) Explaining how the requirements in the relevant Standards and other Regulations will affect the electrical system design for a given situation.
  - iii) Undertaking a typical design process incorporating explosion-protection in an electrical system.
- c) demonstrate an understanding of design documentation required for a hazardous area at a knowledge/skill level indicated by the following aspects:
  - i) Listing typical procedures for checking and approval of explosion-protected system design.
  - ii) Describing requirements for documenting a final design including the relevant documents to be included in a site dossier.

### **8.3.12 ModTL012-Explosion-protected equipment conformity assessment**

#### **8.3.12.1 Module purpose**

This module provides knowledge and skills to assess explosion-protected gained skills in technical assessment to assess explosion-protected equipment.

#### **8.3.12.2 Learning outcomes**

To evidence they have met the purpose of this module, learners shall be able to—

- a) explain the compliance certification and the 'Ex' scheme for recognition of certification at a knowledge/skill level indicated by the following aspects:
  - i) Listing the purposes of certification of explosion-protected equipment.
  - ii) Listing the parties and their responsibilities for the assessment/testing and certification of explosion-protected equipment.
  - iii) Describing the scheme for recognition of assessment/testing and certification of explosion-protected equipment from other countries.
  - iv) Listing the Standards to which equipment shall be certified.
- b) demonstrate an understanding of the preparation required to assess explosion-protected equipment for compliance with Standards at a knowledge/skill level indicated by the following aspects:
  - i) Assessing/testing explosion-protected equipment for conformance with Standards.
  - ii) Listing the documentation required prior to conducting conformity assessment.
  - iii) Determining the tests necessary to establish that an item of explosion-protected equipment conforms with relevant Standards.
  - iv) Identifying when testing is not applicable or required.
- c) demonstrate an understanding of assessing and testing explosion-protected equipment at a knowledge/skill level indicated by the following aspects:
  - i) Determining if explosion-protected equipment conforms to the relevant Standard.
  - ii) Interpreting the results of conformity tests given in a test report.
  - iii) Conducting a conformity assessment of an item of explosion-protected equipment.
- d) demonstrate an understanding of the recording and reporting requirements of conformity assessment of explosion-protected equipment at a knowledge/skill level indicated by the following aspects:
  - i) Listing requirements for documenting assessment and test results and the certification of explosion-protected equipment.
  - ii) Completing a sample product assessment report.

### **8.3.13 ModTL013-Hazardous area installation testing**

#### **8.3.13.1 Module purpose**

This module provides knowledge and skills to test installed explosion-protected equipment, wiring and circuits associated with hazardous areas. Students will learn to use previously gained testing skills to conduct tests on hazardous area installations.

#### **8.3.13.2 Learning outcomes**

To evidence they have met the purpose of this module, learners shall be able to—

- a) demonstrate knowledge and skills for preparing to conduct installation testing in a hazardous area at a knowledge/skill level indicated by the following aspects:
  - i) Listing the OH & S procedures to be followed for working in a hazardous area.
  - ii) Determining whether a given hazardous area is safe to conduct electrical testing.
- b) describe the characteristics and limitations of testing equipment used to test installation in hazardous areas at a knowledge/skill level indicated by the following aspects:
  - i) Listing the testing devices for each of the tests that are required to test an installation in a hazardous area.
  - ii) Determining the suitability of a testing device from its certification document.
- c) demonstrate knowledge and skills to test a hazardous area installation at a knowledge/skill level indicated by the following aspects:
  - i) Explaining the purpose of each test that is required for an installation in a hazardous area. This will include polarity, insulation resistance, earth loop impedance and injection tests.
  - ii) Describing the preparation for each test that is required.
  - iii) Demonstrating each test that is required and determining conformance of circuits and apparatus from test results.
- d) document the results of hazardous area installation tests at a knowledge/skill level indicated by the following aspects:
  - i) Listing the test results that should be recorded in a site dossier.
  - ii) Describing the procedure and options for dealing with test results that show non-conformance.
  - iii) Documenting test results for a given hazardous area installation.

### **8.3.14 ModTL014-Explosion-protection visual checks**

#### **8.3.14.1 Module purpose**

This module provides knowledge and skills to assist in maintaining safety in relation to the explosion risk in hazardous areas. Students will learn to identify visual conditions of explosion-protection systems that indicate the protection is void. Changes in the nature of the explosion hazard that may render the explosion-protection unsafe are also covered.

#### **8.3.14.2 Learning outcomes**

To evidence they have met the purpose of this module, learners shall be able to-

- a) demonstrate knowledge of visible defects in explosion-protected equipment and wiring at a knowledge/skill level indicated by the following aspects:
  - i) Listing defects that are visible in an installed explosion-protection system.
  - ii) Describing how an explosion-protection technique is voided by particular visible defects.
  - iii) Identifying visible defects in given explosion-protected equipment and wiring.
- b) demonstrate knowledge of explosion hazards at a knowledge/skill level indicated by the following aspects:
  - i) Describing typical situations where an explosion hazard may exist including the nature of the hazard.
  - ii) Describing conditions that may indicate a change in a given explosion hazard.
- c) demonstrate an understanding of the actions to be taken when defects in explosion-protected equipment and wiring are found at a knowledge/skill level indicated by the following aspects:
  - i) Describing the purpose of a site dossier.
  - ii) Listing various ways for reporting defects in explosion-protected equipment and wiring.
  - iii) Completing a defect report.
- d) demonstrate an understanding of the actions to be taken when changes to the nature of the explosion hazard are indicated at a knowledge/skill level indicated by the following aspect:
  - i) Listing the procedures to be followed in the event of a change in the explosion hazard for a given industry or enterprise.

### **8.3.15 ModTL015—Gas detection fundamentals**

#### **8.3.15.1 Module purpose**

This module provides an understanding of the principles of gas detection and the use and care of portable gas detection devices. It includes the basic properties of gases, vapours, mists and dusts necessary to their detection.

#### **8.3.15.2 Learning outcomes**

To evidence they have met the purpose of this module, learners shall be able to—

- a) demonstrate knowledge/skill of atmosphere and the nature of gases, vapours, mists and dusts at a level indicated by the following aspects:
  - i) Defining the terms 'gas', 'vapour', 'mist' and 'dust'.
  - ii) Listing the basic properties of gases and vapours and explain the differences between them.
  - iii) Explaining the difference between explosive and toxic characteristics of gases and vapours.
  - iv) Describing how oxygen may become deficient in a given situation.
- b) demonstrate knowledge/skill of the detection of gases and vapours at a level indicated by the following aspects:
  - i) Describing the limitations of gas detection.
  - ii) Explaining the effects of temperature on gas and vapour detection.
  - iii) Suggesting the frequency of testing for presence of vapours for a given situation.
  - iv) Listing the factors affecting the accuracy of gas detectors.
- c) demonstrate knowledge/skill in the use and care of portable gas detectors at a level indicated by the following aspects:
  - i) Describing the fundamental principles in the use of gas and vapour instruments.
  - ii) Following manufacturer's instruction manual to operating, adjustment, calibrate and response check a portable gas detector.
  - iii) Stating the principle safety 'rule' in the use of gas detectors
  - iv) Stating operational limitations and storage requirements of a given gas detector.

### **8.3.16 ModTL016—Gas detection equipment**

#### **8.3.16.1 Module purpose**

This module provides an understanding of the requirements and techniques for the installation and maintenance of gas detection equipment.

#### **8.3.16.2 Learning outcomes**

To evidence they have met the purpose of this module, learners shall be able to—

- a) Demonstrate knowledge/skill in the installation and maintenance for gas detection equipment at a level indicated by the following aspects:
  - i) Determining the requirements for installing and maintaining gas detection equipment from the relevant Standards.
  - ii) Nominating appropriate locations for permanent gas detectors for a given situation.
  - iii) Describing common problems with permanent gas detectors.



### **8.3.17 ModTL017—Evaluation and selection of gas detection equipment**

#### **8.3.17.1 Module Purpose**

This module provides an understanding and application of the factors to consider in the evaluation and selection of gas detection equipment.

#### **8.3.17.2 Learning outcomes**

To evidence they have met the purpose of this module, learners shall be able to—

- a) Demonstrate knowledge/skill of determining requirements for gas detection for a given situation at a level indicated by the following aspects:
  - i) Gathering data on the physical chemistry of the gas to be detected.
  - ii) Assessing conditions under which the gas may be present.
- b) Demonstrate knowledge/skill of processes for assessing the specifications for selecting gas detection equipment for a given situation at a level indicated by the following aspects:
  - i) Accessing sources from which the parameters for gas detection may be obtained.
  - ii) Assessing given gas detection equipment against the required parameters and manufacturer's specifications.

## **8.4 ASSESSMENT STRATEGY**

### **8.4.1 General**

Requirements for assessing competency are included in Section 4 of Part 1.

### **8.4.2 Assessment methods**

Assessment should be progressive reflecting an holistic approach to ensure the module purpose is met. To assist in ensuring validity, reliability and fairness, assessment instruments should include practical exercises, assignments and written tests. Written tests should consist of a number of item types, such as multiple choice, short answer and problem solving.

### **8.4.3 Conditions of assessment**

Normally learning and assessment will take place in a learning/training room environment.

## **8.5 TRAINING DELIVERY**

### **8.5.1 Delivery strategy**

Delivery should be suitable for learning both the theoretical aspects and their application as described in the module purpose. It is considered that the most effective way to achieve this is by the integration of theory and practice where students learn by simulation and through research and reports. It is recommended that learning and assessment be facilitated in a holistic manner that may require a learning outcome sequence other than that indicated in the modules.

### **8.5.2 Resource requirements**

Resources should be sufficient for students to carry out learning activities on an individual basis. See Annex D for the necessary and applicable reference Standards to each of the curriculum modules.

### **8.5.3 Occupational health and safety requirements**

A safe and healthy environment shall be provided for students and teachers as well as safety procedures with regard to learning/teaching activity.

## 9 WORK PERFORMANCE MODULES

### 9.1 GENERAL

Work performance modules provide methods and criteria for gathering evidence that shows a person has achieved the levels of performance specified in the Unit of Competency. These modules shall be undertaken in conjunction with curriculum modules that provide the knowledge and skills underpinning competency. All the work performance modules and their links to the respective Units of Competency are shown in Table 9.1.

### 9.2 MODULE INFORMATION

General information for each work performance module is given in Table 9.1.

**TABLE 9.1**

**SUMMARY OF WORK PERFORMANCE MODULES**

Module title	Module code <sup>1</sup>	Nominal duration <sup>2</sup>	Relationship to the IECEx Units of Competency
Hazardous area installation work performance (Endorsed)	ModWP001	2 hours	IECEX 107 A
Hazardous area maintenance work performance (Endorsed)	ModWP002	2 hours	IECEX 214 A
Hazardous area installation testing work performance (Endorsed)	ModWP003	2 hours	IECEX 408 A
Hazardous area visual inspection work performance (Endorsed)	ModWP004	2 hours	IECEX 409 A
Hazardous area detail inspection work performance (Endorsed)	ModWP005	2 hours	IECEX 410 A
Hazardous area installation design work performance (Endorsed)	ModWP006	2 hours	IECEX 707 A
Explosion-protected equipment overhaul and repair work performance (Endorsed)	ModWP007	2 hours	IECEX 215 A
Explosion-protected equipment modification design work performance (Endorsed)	ModWP008	2 hours	IECEX 705 A
Explosion-protected equipment conformity assessment work performance (Endorsed)	ModWP009	2 hours	IECEX 407 A
Hazardous area classification work performance	ModWP010	2 hours	IECEX 706 A
Explosion-protected electrical system design work performance (Endorsed)	ModWP011	2 hours	IECEX 708 A
Hazardous area maintenance management work performance (Endorsed)	ModWP012	2 hours	IECEX 609 A
Hazardous area management work performance	ModWP013	2 hours	IECEX 610 A
Hazardous area operations reporting work performance	ModWP014	2 hours	IECEX 010 A
Hazardous area attend-to-breakdown work performance (Endorsed)	ModWP015	2 hours	IECEX 012 A

**Notes**

<sup>1</sup> Module code WP = Work performance, and 010 = sequential number within the applicable structure of modules.

<sup>2</sup> Nominal duration is the period of time considered as appropriate, where evidence is obtained through formal assessment event(s); this duration may vary depending on the method used to obtain evidence of competent performance.

### **9.3 CONTENT OF MODULES**

#### **9.3.1 ModWP001—Hazardous area installation work performance (Endorsed)**

##### **9.3.1.1 Module purpose**

This module provides methods and criteria for gathering evidence that shows a person has achieved the level of performance specified in Unit IECEx 107 A Install explosion-protected equipment and wiring systems.

##### **9.3.1.2 Assessment criteria**

Competence must be demonstrated in relation to the explosion-protection technique for which competency is sought. In judging competent performance evidence regarding the following aspects of competency shall be considered:

- a) Working safely in a potentially hazardous area in relation to work permits and clearances, hazard monitoring and evacuation procedures, and plant and electrical isolation.
- b) Handling and installing equipment and wiring in a manner that does not adversely affect the type of protection afforded by the equipment design.
- c) Checking equipment against certification documents and design specifications.
- d) Documenting installation completion.

#### **9.3.2 ModWP002—Hazardous area maintenance work performance (Endorsed)**

##### **9.3.2.1 Module purpose**

This module provides methods and criteria for gathering evidence that shows a person has achieved the levels of performance specified in Unit IECEx 214 A Maintain equipment in hazardous areas.

##### **9.3.2.2 Assessment criteria**

Competence must be demonstrated in relation to the explosion-protection technique for which competency is sought. In judging competent performance evidence regarding the following aspects of competency shall be considered:

- a) Working safely in a potentially hazardous area in relation to work permits and clearances, hazard monitoring and evacuation procedures, and plant and electrical isolation.
- b) Identifying defects and faults.
- c) Interpreting certification documentation in relation to maintenance, repair and replacement.
- d) Following established maintenance procedures.
- e) Documenting maintenance details.

#### **9.3.3 ModWP003—Hazardous area installation testing work performance (Endorsed)**

##### **9.3.3.1 Module purpose**

This module provides methods and criteria for gathering evidence that shows a person has achieved the levels of performance specified in Unit IECEx 408 A Test installations in hazardous areas.

##### **9.3.3.2 Assessment criteria**

Competence must be demonstrated in relation to the explosion-protection technique for which competency is sought. In judging competent performance evidence regarding the following aspects of competency shall be considered:

- a) Working safely in a potentially hazardous area in relation to work permits and clearances, hazard monitoring and evacuation procedures, and plant and electrical isolation.
- b) Handling and installing equipment and wiring in a manner that does not adversely affect the type of protection afforded by the equipment design.
- c) Conducting tests.
- d) Documenting testing outcomes.

### **9.3.4 ModWP004—Hazardous area visual inspection work performance (Endorsed)**

#### **9.3.4.1 Module purpose**

This module provides methods and criteria for gathering evidence that shows a person has achieved the levels of performance specified in Unit IECEx 409 A Inspect visually existing hazardous area installations.

#### **9.3.4.2 Assessment criteria**

Competence must be demonstrated in relation to the explosion-protection technique for which competency is sought. In judging competent performance evidence regarding the following aspects of competency shall be considered:

- a) Working safely in a potentially hazardous area in relation to work permits and clearances, hazard monitoring and evacuation procedures, and plant and electrical isolation.
- b) Inspecting equipment and wiring in a manner that does not adversely affect the type of protection afforded by the equipment design.
- c) Conducting visual inspections.
- d) Documenting inspection outcomes.

### **9.3.5 ModWP005—Hazardous area detail inspection work performance (Endorsed)**

#### **9.3.5.1 Module purpose**

This module provides methods and criteria for gathering evidence that shows a person has achieved the levels of performance specified in Unit IECEx 410 A Inspect in detail hazardous area installations.

#### **9.3.5.2 Assessment criteria**

Competence must be demonstrated in relation to the explosion-protection technique for which competency is sought. In judging competent performance evidence regarding the following aspects of competency shall be considered:

- a) Working safely in a potentially hazardous area in relation to work permits and clearances, hazard monitoring and evacuation procedures, and plant and electrical isolation.
- b) Handling and installing equipment and wiring in a manner that does not adversely affect the type of protection afforded by the equipment design.
- c) Conducting inspections.
- d) Documenting inspection outcomes.

### **9.3.6 ModWP006—Hazardous area installation design work performance (Endorsed)**

#### **9.3.6.1 Module purpose**

This module provides methods and criteria for gathering evidence that shows a person has achieved the levels of performance specified in Unit IECEx 707 A Design electrical installations for hazardous areas.

### **9.3.6.2 Assessment criteria**

Competence must be demonstrated in relation to the explosion-protection technique for which competency is sought. In judging competent performance evidence regarding the following aspects of competency shall be considered:

- a) Interpreting area classification documentation.
- b) Classifying area from Standards.
- c) Documenting area classification.
- d) Selecting equipment for a given classified area.
- e) Selecting wiring systems for a given classified area.
- f) Checking equipment certification for suitability for a given classified area.

### **9.3.7 ModWP007—Explosion-protected equipment overhaul and repair work performance (Endorsed)**

#### **9.3.7.1 Module purpose**

This module provides methods and criteria for gathering evidence that shows a person has achieved the levels of performance specified in Unit IECEx 215 A Overhaul and repair explosion-protected equipment.

#### **9.3.7.2 Assessment criteria**

Competence must be demonstrated in relation to the explosion-protection technique for which competency is sought. In judging competent performance evidence regarding the following aspects of competency shall be considered:

- a) Following OH & S procedures.
- b) Interpreting certification documentation and Standards.
- c) Measuring, testing and inspecting equipment for compliance with certification and Standards.
- d) Specifying overhaul/repair work.
- e) Documenting overhaul/repair work.

### **9.3.8 ModWP008—Explosion-protected equipment modification design work performance (Endorsed)**

#### **9.3.8.1 Module purpose**

This module provides methods and criteria for gathering evidence that shows a person has achieved the levels of performance specified in Unit IECEx 705 A Design and develop modifications to explosion-protected equipment.

#### **9.3.8.2 Assessment criteria**

Competence must be demonstrated in relation to the explosion-protection technique for which competency is sought. In judging competent performance evidence regarding the following aspects of competency shall be considered:

- a) Following OH & S procedures.
- b) Interpreting certification documentation and Standards.
- c) Measuring, testing and inspecting equipment for compliance with certification and/or Standards.
- d) Specifying modification design.
- e) Establishing need for re-certification.

f) Documenting modification design.

### **9.3.9 ModWP009—Explosion-protected equipment conformity assessment work performance (Endorsed)**

#### **9.3.9.1 Module purpose**

This module provides methods and criteria for gathering evidence that shows a person has achieved the levels of performance specified in Unit IECEx 407 A Assess explosion-protected equipment for compliance with standards.

#### **9.3.9.2 Assessment criteria**

Competence must be demonstrated in relation to the explosion-protection technique for which competency is sought. In judging competent performance evidence regarding the following aspects of competency shall be considered:

- a) Following OH & S procedures.
- b) Interpreting certification documentation and Standards.
- c) Examining equipment for compliance with Standards.
- d) Determining conformity tests required.
- e) Interpreting results.
- f) Reporting examination and test outcomes.

### **9.3.10 ModWP010—Hazardous area classification work performance**

#### **9.3.10.1 Module purpose**

This module provides methods and criteria for gathering evidence that shows a person has achieved the levels of performance specified in Unit IECEx 706 A Classify hazardous areas.

#### **9.3.10.2 Assessment criteria**

Competence must be demonstrated in relation to the explosion-protection technique for which competency is sought. In judging competent performance evidence regarding the following aspects of competency shall be considered:

- a) Accessing necessary information and identifying hazardous products involved in a given process, explosive properties of materials involved in a given process, and potential sources and characteristics of release of hazardous products.
- b) Analysing data in the context of explosion risk.
- c) Determining area delineation and documenting area classifications.

### **9.3.11 ModWP011—Explosion-protected electrical system design work performance (Endorsed)**

#### **9.3.11.1 Module purpose**

This module provides methods and criteria for gathering evidence that shows a person has achieved the levels of performance specified in Unit IECEx 708 A Design explosion-protected electrical systems.

#### **9.3.11.2 Assessment criteria**

Competence must be demonstrated in relation to the explosion-protection technique for which competency is sought. In judging competent performance evidence regarding the following aspects of competency shall be considered:

- a) Accessing and interpreting relevant information.



- b) Providing design options and justifications including hazard risk, functionality and economic considerations.
- c) Following checking and documentation procedures.

#### **9.3.12 ModWP012—Hazardous area maintenance management work performance (Endorsed)**

##### **9.3.12.1 Module purpose**

This module provides methods and criteria for gathering evidence that shows a person has achieved the levels of performance specified in Unit IECEx 609 A Develop and manage maintenance programs for hazardous area electrical equipment.

##### **9.3.12.2 Assessment criteria**

Competence must be demonstrated in relation to the explosion-protection technique for which competency is sought. In judging competent performance evidence regarding the following aspects of competency shall be considered:

- a) Establishing maintenance policies and procedures that encompass OH & S responsibilities.
- b) Establishing maintenance management systems that address the special requirements for explosion-protected equipment and installations.
- c) Ensuring a hazardous area is appropriately classified and explosion-protection strategies are adequate.
- d) Developing and implementing maintenance programs and schedules in relation to explosion-protected equipment and installations.
- e) Evaluating maintenance programs in relation to explosion-protected equipment and installations.

#### **9.3.13 ModWP013—Hazardous area management work performance**

##### **9.3.13.1 Module purpose**

This module provides methods and criteria for gathering evidence that shows a person has achieved the levels of performance specified in Unit IECEx 610 A Ensure the safety of hazardous areas.

##### **9.3.13.2 Assessment criteria**

Competence must be demonstrated in relation to the explosion-protection technique for which competency is sought. In judging competent performance evidence regarding the following aspects of competency shall be considered:

- a) Application of relevant statutory requirements.
- b) Establishing procedures for engaging competent persons.
- c) Establishing and maintaining procedures for identifying potentially explosive hazards.
- d) Establishing procedures for implementing and maintaining explosion-protection strategies.

#### **9.3.14 NSHWP014—Hazardous area operations reporting work performance**

##### **9.3.14.1 Module purpose**

This module provides methods and criteria for gathering evidence that shows a person has achieved the levels of performance specified in Unit IECEx 010 A Report on the integrity of explosion-protected equipment in hazardous areas.

### **9.3.14.2 Assessment criteria**

Competence must be demonstrated in relation to the explosion-protection technique for which competency is sought. In judging competent performance evidence regarding the following aspects of competency shall be considered:

- a) permits and clearance.
- b) Hazard monitoring and evacuation procedures.
- c) Operation of plant and machinery.
- d) Plant and electrical isolation.
- e) Identifying visual damage and corrosion of equipment and wiring systems.
- f) Reporting defects.

### **9.3.15 ModWP015—Hazardous area attend-to-breakdown work performance (Endorsed)**

#### **9.3.15.1 Module purpose**

This module provides methods and criteria for gathering evidence that shows a person has achieved the levels of performance specified in Unit IECEx 012 A Attend to breakdowns in hazardous areas.

#### **9.3.15.2 Assessment criteria**

Competence must be demonstrated in relation to the explosion-protection technique for which competency is sought. In judging competent performance evidence regarding the following aspects of competency shall be considered:

- a) Work permits and clearance.
- b) Hazard monitoring and evacuation procedures.
- c) Plant and electrical isolation.
- d) Evaluating extent of breakdown.
- e) Interpreting certification documentation in relation to repair and replacement.
- f) Following established breakdown procedures.

## **9.4 ASSESSMENT STRATEGY**

### **9.4.1 General**

Requirements for assessing competency are included in Clause 6.

### **9.4.2 Assessment methods**

Evidence of competent performance may be gathered from real work activities by work reports, logbooks, profiles or portfolios. The evidence gathered in this way shall be stated as accurate and signed by the student's immediate supervisor competent in the subject area.

Alternatively, evidence may be obtained through formalised assessment events that simulate relevant work activities.

### **9.4.3 Conditions of assessment**

Evidence of competent performance may be gathered from the workplace or a simulated work environment. A simulated environment would necessarily include the explosion-protected equipment and wiring systems similar to those encountered in a real workplace.

As well as the generic aspects of competency, assessment should take into account variations between particular industry sectors and different enterprises. For example, equipment used in underground coal mining will be different in some respects from that used in a petrochemical plant.

#### **9.4.4 Evidence of competency**

Competence should be judged from evidence collected across a range of operational activities, with regard to explosion-protection.

#### **9.4.5 Resource requirements**

Resources should be sufficient for participants to carry out activities, from which evidence may be gathered, on an individual basis. This will include access to tools, equipment, Standards and other documents that are necessary to perform the activities required.

#### **9.4.6 Occupational health and safety requirements**

A safe and healthy environment shall be provided for participants and assessors as well as safety procedures with regard to assessment activity.

#### **9.4.7 Endorsement**

Competency shall be judged on evidence specific to an explosion-protection technique. The explosion-protection technique in which competency is demonstrated shall appear on the qualification transcript as an endorsement (through the Ex designation for each explosion-protection technique as a suffix to the unit title). The unit endorsements are as shown in Clause 4

## **Annex A**

### **SPECIFIC PREREQUISITE UNITS AND RECOMMENDED GENERAL COMPETENCIES FOR ACHIEVEMENT OF EACH UNIT OF COMPETENCY**

(Informative)

The Units of Competency in this specification have been developed to complement competencies/qualifications in the general functions of production, installation, maintenance, overhaul/repair, design, inspection and/or related management that have been previously acquired.

For persons who have not acquired the competencies related to the general functions, the quantum of education and training will be much greater than that indicated in Clause 8 and Clause 9 of this specification.

Table A1 shows the specific prerequisite units and the recommended general competencies and level assumed to be held by a person before undertaking training/assessment to achieve Units of Competency in this specification.

TABLE A 1

## SUMMARY OF PREREQUISITE UNITS AND RECOMMENDED GENERAL COMPETENCIES

Unit of Competency	Specific prerequisite Units	Previously attained competency	
		Description	Minimum recommended Qualification level
IECEX 010 A—Report on the integrity of explosion-protected equipment in hazardous areas		Plant or machinery operation or installations, maintenance or service functions	II
IECEX 012 A—Attend to breakdowns in hazardous areas	IECEX 010 A	Attending to breakdowns in general electrical or instrumentation equipment	III
IECEX 020 A—Use and maintain the integrity of portable gas detection devices		Plant or machinery operation or installations, maintenance or service functions	II
IECEX 107 A—Install explosion-protected equipment and wiring systems	IECEX 010 A	Installation of general low-voltage or extra-low voltage electrical/electronic equipment and wiring systems	III
IECEX 116 A—Install and maintain integrity of fixed gas detection equipment	IECEX 107 A or IECEX 214 A		
IECEX 214 A—Maintain equipment in hazardous areas	IECEX 010 A	Maintenance of general low-voltage or extra-low voltage electrical/electronic equipment and wiring systems <sup>2</sup>	III
IECEX 215 A—Overhaul and repair explosion-protected equipment		Overhaul and repair of general low-voltage or extra-low voltage electrical/electronic equipment	III
IECEX 407 A—Assess explosion-protected equipment for compliance with Standards		Compliance assessment of general low-voltage or extra-low voltage electrical/electronic equipment	IV
IECEX 408 A—Test installations in hazardous areas	IECEX 107 A or IECEX 214 A		
IECEX 409 A—Conduct close inspection of existing hazardous areas installations	IECEX 012 A or IECEX 107 A or IECEX 214 A or IECEX 707 A	Competencies in general electrical installation inspection are an alternative to the specific units listed in Column 2	IV
IECEX 410 A—Conduct detailed inspection of hazardous areas installations	IECEX 409 A		
IECEX 609 A—Develop and manage maintenance programs for hazardous areas electrical equipment	IECEX 214 A	Competencies in developing and managing general electrical/instrumentation maintenance programs are an alternative to the specific unit listed in Column 2	IV
IECEX 610 A—Ensure the safety of hazardous areas		General plant management	III

Unit of Competency	Specific prerequisite Units	Previously attained competency	
		Description	Minimum recommended Qualification level
IECEX 705 A—Design and develop modifications to explosion-protected equipment	IECEX 215 A	Competencies in design and developing of general electrical equipment are an alternative to the specific unit listed in Column 2	V
IECEX 706 A—Classify hazardous areas		Gathering and analysing technical data and using this data for risk assessment	VI
IECEX 707 A—Design electrical installations in hazardous areas	IECEX 107 A	Competencies in designing electrical installations are an alternative to the specific unit listed in Column 2	IV
IECEX 708 A—Design explosion-protected electrical systems		Designing electrical systems and installations	VI
IECEX 711 A—Design gas detection systems	IECEX 708 A		

## Annex B

### LIST OF STANDARDS RELEVANT TO THE UNITS OF COMPETENCY

(Informative)

#### Hazardous Areas Standards

IEC  
60079-10      Classification of hazardous areas

This section to be completed

#### Explosion-Protection Standards

Equipment  
IEC  
60079      Electrical equipment for explosive gas atmospheres  
60079-0      Part 0: General requirements  
60079-1      Part 1: Flameproof enclosure 'd'  
60079-2      Part 2: Pressurized enclosures

This section to be completed

#### Installation and maintenance

IEC  
60079-14      Electrical equipment for explosive gas atmospheres—Selection and installation  
61241-14      Electrical equipment for use in the presence of combustible dust—Selection and installation

This section to be completed

#### Coal Mining Standards

This section to be completed

#### Gas Detection Standards

IEC  
61779      Electrical apparatus for detection and measurement of flammable gases  
61779-1      Part 1: General requirements and test methods  
61779-2      Part 2: Performance requirements for Group I apparatus indicating a volume fraction up to 5% methane in air  
61779-3      Part 3: Performance requirements for Group I apparatus indicating a volume fraction up to 100% methane in air  
61779-4      Part 4: Performance requirements for Group II apparatus indicating a volume fraction up to 100% lower explosive limit  
61779-5      Part 5: Performance requirements for Group II apparatus indicating a volume fraction up to 100% gas  
61779-6      Part 6: Guide for the selection, installation, use and maintenance of apparatus for the detection and measurement of flammable gases

#### Other relevant Standards

This section to be completed

Other Standards may be required in industries not restricted to IEC requirements. Examples of these industries are shipping and off-shore petroleum industries.

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## Annex C

### LIMITING ENDORSEMENT OF COMPETENCIES FOR WORK CONFINED TO COAL MINING

(Normative)

#### C.1 SCOPE

This Appendix sets out the requirements for limiting endorsements that may be applied to Units of Competency for persons whose work is confined to explosion-protected equipment for coal mining.

#### C.2 ENDORSEMENTS

##### C.2.1 Basis of endorsements

Endorsements outlined in Paragraph C.2.3 shall be based on essential knowledge limited to Group I explosion-protected equipment and techniques for which competency is sought. All other aspects of competency shall be met.

##### C.2.2 Means of endorsement

A Unit shall be endorsed for each protection technique in which competency is demonstrated. The endorsements shall be shown by the Ex designation and I, for Group I, as a suffix to the unit title, for each explosion-protection technique.

##### C.2.3 Units allowing Group I endorsement

The following Units may be endorsed for Group I explosion-protected equipment.

###### C.2.3.1 IECEx 012 A—Attend to breakdowns in hazardous areas

The Unit endorsements are as follows:

Unit endorsement	Explosion-protection technique	Essential Knowledge and associated skills
Ex 'd'I	Flameproof, Group I	Clauses 3.2.1, 3.2.2 and 3.2.3
Ex 'e'I	Increased safety, Group I	Clauses 3.2.1, 3.2.2 and 3.2.4
Ex 'i'I	Intrinsic safety, Group I	Clauses 3.2.1, 3.2.2 and 3.2.6
Ex 'p'I	Pressurization, Group I	Clauses 3.2.1, 3.2.2 and 3.2.7

###### C.2.3.2 IECEx 214 A—Maintain equipment in hazardous areas

The Unit endorsements are as follows:

Unit endorsement	Explosion-protection technique	Essential Knowledge and associated skills
Ex 'd'I	Flameproof, Group I	Clauses 3.2.1, 3.2.2, 3.2.3, 3.2.9 and 3.2.11
Ex 'e'I	Increased safety, Group I	Clauses 3.2.1, 3.2.2, 3.2.4, 3.2.9 and 3.2.11
Ex 'i'I	Intrinsic safety, Group I	Clauses 3.2.1, 3.2.2, 3.2.6 and 3.2.9
Ex 'p'I	Pressurization, Group I	Clauses 3.2.1, 3.2.2, 3.2.7 and 3.2.9

###### C.2.3.3 IECEx 215 A—Overhaul and repair explosion-protected equipment

The Unit endorsements are as follows:

Unit	Explosion-protection	Essential Knowledge and
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endorsement	technique	associated skills
Ex 'd'I	Flameproof, Group I	Clauses 3.2.1, 3.2.2, 3.2.3, 3.2.9, 3.2.13.1 and 3.2.13.2
Ex 'e'I	Increased safety, Group I	Clauses 3.2.1, 3.2.2, 3.2.4, 3.2.9, 3.2.13.1 and 3.2.13.2
Ex 'i'I	Intrinsic safety, Group I	Clauses 3.2.1, 3.2.2, 3.2.6, 3.2.9, 3.2.13.1 and 3.2.13.2
Ex 'p'I	Pressurization, Group I	Clauses 3.2.1, 3.2.2, 3.2.7, 3.2.9, 3.2.13.1 and 3.2.13.2

#### C.2.3.4 IECEx 407 A—Assess explosion-protected equipment for compliance with Standards

The Unit endorsements are as follows:

Unit endorsement	Explosion-protection technique	Essential Knowledge and associated skills
Ex 'd'I	Flameproof, Group I	Clauses 3.2.1, 3.2.2, 3.2.3, 3.2.9 and 3.2.21
Ex 'e'I	Increased safety, Group I	Clauses 3.2.1, 3.2.2, 3.2.4, 3.2.9 and 3.2.21
Ex 'i'I	Intrinsic safety, Group I	Clauses 3.2.1, 3.2.2, 3.2.6, 3.2.9 and 3.2.21
Ex 'p'I	Pressurization, Group I	Clauses 3.2.1, 3.2.2, 3.2.7, 3.2.9 and 3.2.21

#### C.2.3.5 IECEx 705B—Design and develop modifications to explosion-protected equipment

The Unit endorsements are as follows:

Unit endorsement	Explosion-protection technique	Essential Knowledge and associated skills
Ex 'd'I	Flameproof, Group I	Clauses 3.2.1, 3.2.2, 3.2.3, 3.2.9, 3.2.14.1 and 3.2.14.2
Ex 'e'I	Increased safety, Group I	Clauses 3.2.1, 3.2.2, 3.2.4, 3.2.9, 3.2.14.1 and 3.2.14.2
Ex 'i'I	Intrinsic safety, Group I	Clauses 3.2.1, 3.2.2, 3.2.6, 3.2.9, 3.2.14.1 and 3.2.14.2
Ex 'p'I	Pressurization, Group I	Clauses 3.2.1, 3.2.2, 3.2.7, 3.2.9, 3.2.14.1 and 3.2.14.2

#### C.2.4 Assessment methodology

Assessment processes and methods shall be in accordance with Clause 6.

## Annex D

### KEY COMPETENCIES

(Normative)

The competencies described in this specification include the integration of ‘Key competencies’ as shown in the following Table. Although the ‘Key competencies’ are explicitly identified here, within the Units of Competency they reside in the context of the skills described and at the applicable levels (Level 1: Use; Level 2: Manage; Level 3: Design), as indicated in Table D 1.

'Key competencies' are—

- 1) collecting, analysing, and organizing ideas and information;
- 2) communicating ideas and information;
- 3) planning and organizing activities;
- 4) working together and in groups;
- 5) using mathematical ideas and techniques;
- 6) solving problems; and
- 7) using technology.

**TABLE D1**

**INCORPORATION OF KEY COMPETENCIES IN THE**

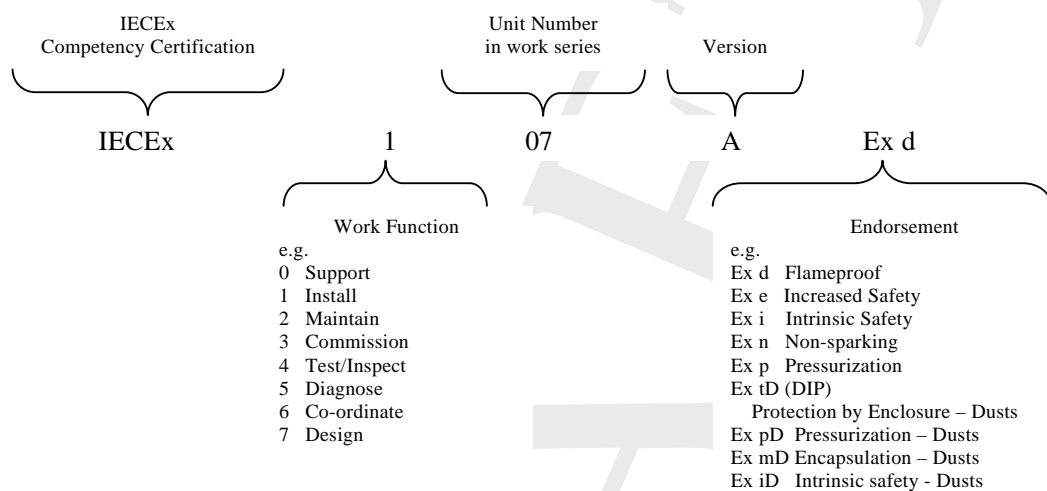
**UNITS OF COMPETENCY**

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## Annex E COMPETENCY CODING SYSTEM

(Informative)

The Units of Competency in this specification are coded. The coding system is explained in the following example for one of the Units of Competency:



**Annex F**  
**SUMMARY OF ESSENTIAL KNOWLEDGE AND ASSOCIATED SKILLS**  
**FOR EACH UNIT OF COMPETENCY**

(Normative)

(Normative)  Unit of Competency	Clauses specifying the 'Essential knowledge and associated skills'
IECEx 010 A—Report on the integrity of explosion-protected equipment in hazardous areas	3.2.1—Hazardous areas and explosion-protection principles 3.2.2—Explosion-protected equipment 3.2.23—Explosion-protection visual checks
IECEx 012 A—Attend to breakdowns in hazardous areas	3.2.1—Hazardous areas and explosion-protection principles 3.2.2—Explosion-protected equipment 3.2.3—Flameproof (Ex 'd') explosion-protection technique 3.2.4—Increased safety (Ex 'e') explosion-protection technique 3.2.5—Non-sparking (Ex 'n') explosion-protection technique 3.2.6—Intrinsic safety (Ex 'i') explosion-protection technique 3.2.7—Pressurization (Ex 'p') explosion-protection technique 3.2.8—Explosion-protection techniques for dusts 3.2.9—Common characteristics of explosion-protection techniques 3.3.23—Explosion-protection visual checks
IECEx 020 A—Use and maintain the integrity of portable gas detection devices	3.2.1—Hazardous areas and explosion-protection principles 3.2.24—Gas detection: portable devices
IECEx 107 A—Install explosion-protected equipment and wiring systems	3.2.1—Hazardous areas and explosion-protection principles 3.2.2—Explosion-protected equipment 3.2.3—Flameproof (Ex 'd') explosion-protection technique 3.2.4—Increased safety (Ex 'e') explosion-protection technique 3.2.5—Non-sparking (Ex 'n') explosion-protection technique 3.2.6—Intrinsic safety (Ex 'i') explosion-protection technique 3.2.7—Pressurization (Ex 'p') explosion-protection technique 3.2.8—Explosion-protection techniques for dusts 3.2.9—Common characteristics of explosion-protection techniques 3.2.10—Hazardous areas installation and maintenance requirements 3.2.11—Hazardous areas cable termination techniques 3.3.23—Explosion-protection visual checks
IECEx 116 A—Install and maintain integrity of fixed gas detection equipment	3.2.1—Hazardous areas and explosion-protection principles 3.2.2—Explosion-protected equipment 3.2.3—Flameproof (Ex 'd') explosion-protection technique 3.2.4—Increased safety (Ex 'e') explosion-protection technique 3.2.5—Non-sparking (Ex 'n') explosion-protection technique

(Normative)

(Normative) Unit of Competency	Clauses specifying the 'Essential knowledge and associated skills'
	3.2.6—Intrinsic safety (Ex 'i') explosion-protection technique 3.2.7—Pressurization (Ex 'p') explosion-protection technique 3.2.8—Explosion-protection techniques for dusts 3.2.9—Common characteristics of explosion-protection techniques 3.2.10—Hazardous areas installation and maintenance requirements 3.2.11—Hazardous areas cable termination techniques 3.3.23—Explosion-protection visual checks 3.2.25—Gas detection: fixed equipment
IECEx 214 A—Maintain equipment in hazardous areas	3.2.1—Hazardous areas and explosion-protection principles 3.2.2—Explosion-protected equipment 3.2.3—Flameproof (Ex 'd') explosion-protection technique 3.2.4—Increased safety (Ex 'e') explosion-protection technique 3.2.5—Non-sparking (Ex 'n') explosion-protection technique 3.2.6—Intrinsic safety (Ex 'i') explosion-protection technique 3.2.7—Pressurization (Ex 'p') explosion-protection technique 3.2.8—Explosion-protection techniques for dusts 3.2.9—Common characteristics of explosion-protection techniques 3.2.10—Hazardous areas installation and maintenance requirements 3.2.11—Hazardous areas cable termination techniques 3.3.23—Explosion-protection visual checks
IECEx 215 A—Overhaul and repair explosion-protected equipment	3.2.1—Hazardous areas and explosion-protection principles 3.2.2—Explosion-protected equipment 3.2.3—Flameproof (Ex 'd') explosion-protection technique 3.2.4—Increased safety (Ex 'e') explosion-protection technique 3.2.5—Non-sparking (Ex 'n') explosion-protection technique 3.2.6—Intrinsic safety (Ex 'i') explosion-protection technique 3.2.7—Pressurization (Ex 'p') explosion-protection technique 3.2.8—Explosion-protection techniques for dusts 3.2.9—Common characteristics of explosion-protection techniques 3.2.13—Explosion-protected equipment overhaul and repair
IECEx 407 A—Assess explosion-protected equipment for compliance with Standards	3.2.1—Hazardous areas and explosion-protection principles 3.2.2—Explosion-protected equipment 3.2.3—Flameproof (Ex 'd') explosion-protection technique 3.2.4—Increased safety (Ex 'e') explosion-protection technique 3.2.5—Non-sparking (Ex 'n') explosion-protection technique 3.2.6—Intrinsic safety (Ex 'i') explosion-protection technique 3.2.7—Pressurization (Ex 'p') explosion-protection technique 3.2.8—Explosion-protection techniques for dusts 3.2.9—Common characteristics of explosion-protection techniques

(Normative)

(Normative) Unit of Competency	Clauses specifying the 'Essential knowledge and associated skills'
IECEX 408 A—Test installations in hazardous areas	3.2.21—Explosion-protected equipment conformity assessment 3.2.1—Hazardous areas and explosion-protection principles 3.2.2—Explosion-protected equipment 3.2.3—Flameproof (Ex 'd') explosion-protection technique 3.2.4—Increased safety (Ex 'e') explosion-protection technique 3.2.5—Non-sparking (Ex 'n') explosion-protection technique 3.2.6—Intrinsic safety (Ex 'i') explosion-protection technique 3.2.7—Pressurization (Ex 'p') explosion-protection technique 3.2.8—Explosion-protection techniques for dusts 3.2.9—Common characteristics of explosion-protection techniques 3.2.10—Hazardous areas installation and maintenance requirements 3.2.11—Hazardous areas cable termination techniques 3.2.22—Hazardous areas installation testing 3.3.23—Explosion-protection visual checks
IECEX 409 A—Conduct close inspection of existing hazardous areas installations	3.2.1—Hazardous areas and explosion-protection principles 3.2.2—Explosion-protected equipment 3.2.3—Flameproof (Ex 'd') explosion-protection technique 3.2.4—Increased safety (Ex 'e') explosion-protection technique 3.2.5—Non-sparking (Ex 'n') explosion-protection technique 3.2.6—Intrinsic safety (Ex 'i') explosion-protection technique 3.2.7—Pressurization (Ex 'p') explosion-protection technique 3.2.8—Explosion-protection techniques for dusts 3.2.9—Common characteristics of explosion-protection techniques 3.2.10—Hazardous areas installation and maintenance requirements 3.2.18—Hazardous areas close inspection requirements 3.3.23—Explosion-protection visual checks
IECEX 410 A—Conduct detailed inspection of hazardous areas installations	3.2.1—Hazardous areas and explosion-protection principles 3.2.2—Explosion-protected equipment 3.2.3—Flameproof (Ex 'd') explosion-protection technique 3.2.4—Increased safety (Ex 'e') explosion-protection technique 3.2.5—Non-sparking (Ex 'n') explosion-protection technique 3.2.6—Intrinsic safety (Ex 'i') explosion-protection technique 3.2.7—Pressurization (Ex 'p') explosion-protection technique 3.2.8—Explosion-protection techniques for dusts 3.2.9—Common characteristics of explosion-protection techniques 3.2.10—Hazardous areas installation and maintenance requirements 3.2.12—Hazardous areas detailed inspection techniques 3.2.18—Hazardous areas close inspection requirements 3.3.23—Explosion-protection visual checks

(Normative)

(Normative)  Unit of Competency	Clauses specifying the 'Essential knowledge and associated skills'
IECEX 609 A—Develop and manage maintenance programs for hazardous areas electrical equipment	3.2.1—Hazardous areas and explosion-protection principles 3.2.2—Explosion-protected equipment 3.2.3—Flameproof (Ex 'd') explosion-protection technique 3.2.4—Increased safety (Ex 'e') explosion-protection technique 3.2.5—Non-sparking (Ex 'n') explosion-protection technique 3.2.6—Intrinsic safety (Ex 'i') explosion-protection technique 3.2.7—Pressurization (Ex 'p') explosion-protection technique 3.2.8—Explosion-protection techniques for dusts 3.2.9—Common characteristics of explosion-protection techniques 3.2.10—Hazardous areas installation and maintenance requirements 3.2.19—Hazardous areas management 3.3.23—Explosion-protection visual checks
IECEX 610 A—Ensure the safety of hazardous areas	3.2.1—Hazardous areas and explosion-protection principles 3.2.19—Hazardous areas management
IECEX 705 A—Design and develop modifications to explosion-protected equipment	3.2.1—Hazardous areas and explosion-protection principles 3.2.2—Explosion-protected equipment 3.2.3—Flameproof (Ex 'd') explosion-protection technique 3.2.4—Increased safety (Ex 'e') explosion-protection technique 3.2.5—Non-sparking (Ex 'n') explosion-protection technique 3.2.6—Intrinsic safety (Ex 'i') explosion-protection technique 3.2.7—Pressurization (Ex 'p') explosion-protection technique 3.2.8—Explosion-protection techniques for dusts 3.2.9—Common characteristics of explosion-protection techniques 3.2.13—Explosion-protected equipment overhaul and repair 3.2.14—Explosion-protected equipment modification 3.3.23—Explosion-protection visual checks
IECEX 706 A—Classify hazardous areas	3.2.1—Hazardous areas and explosion-protection principles 3.2.16—Common classified hazardous areas 3.2.17—Hazardous areas classification techniques
IECEX 707 A—Design electrical installations in hazardous areas	3.2.1—Hazardous areas and explosion-protection principles 3.2.2—Explosion-protected equipment 3.2.3—Flameproof (Ex 'd') explosion-protection technique 3.2.4—Increased safety (Ex 'e') explosion-protection technique 3.2.5—Non-sparking (Ex 'n') explosion-protection technique 3.2.6—Intrinsic safety (Ex 'i') explosion-protection technique 3.2.7—Pressurization (Ex 'p') explosion-protection technique 3.2.8—Explosion-protection techniques for dusts 3.2.9—Common characteristics of explosion-protection techniques



(Normative)

(Normative) Unit of Competency	Clauses specifying the 'Essential knowledge and associated skills'
	3.2.10—Hazardous areas installation and maintenance requirements 3.2.15—Hazardous areas installation planning 3.2.16—Common classified hazardous areas
IECEx 708 A—Design explosion-protected electrical systems	3.2.1—Hazardous areas and explosion-protection principles 3.2.2—Explosion-protected equipment 3.2.3—Flameproof (Ex 'd') explosion-protection technique 3.2.4—Increased safety (Ex 'e') explosion-protection technique 3.2.5—Non-sparking (Ex 'n') explosion-protection technique 3.2.6—Intrinsic safety (Ex 'i') explosion-protection technique 3.2.7—Pressurization (Ex 'p') explosion-protection technique 3.2.8—Explosion-protection techniques for dusts 3.2.9—Common characteristics of explosion-protection techniques 3.2.10—Hazardous areas installation and maintenance requirements 3.2.15—Hazardous areas installation planning 3.2.16—Common classified hazardous areas 3.2.20—Explosion-protected electrical systems design
IECEx 711 A—Design gas detection systems	3.2.1—Hazardous areas and explosion-protection principles 3.2.2—Explosion-protected equipment 3.2.3—Flameproof (Ex 'd') explosion-protection technique 3.2.4—Increased safety (Ex 'e') explosion-protection technique 3.2.5—Non-sparking (Ex 'n') explosion-protection technique 3.2.6—Intrinsic safety (Ex 'i') explosion-protection technique 3.2.7—Pressurization (Ex 'p') explosion-protection technique 3.2.8—Explosion-protection techniques for dusts 3.2.9—Common characteristics of explosion-protection techniques 3.2.10—Hazardous areas installation and maintenance requirements 3.2.15—Hazardous areas installation planning 3.2.16—Common classified hazardous areas 3.2.20—Explosion-protected electrical systems design 3.2.26—Evaluation and selection of gas detection equipment: portable and fixed

## **Annex G**

### **ASSESSMENT OF EXISTING WORKERS**

(Normative)

#### **G.1 SCOPE**

This Appendix sets out the minimum requirements for enterprises/businesses to assess employees who currently practice skills described in the Units of Competency in Clause 4.

#### **G.2 EXTENT OF RECOGNITION**

##### **G.2.1 General**

These requirements shall apply only to the assessment of persons who are currently working in an industry, on explosion-protected equipment and installations for the purpose of showing that they are competent to carry out such work.

##### **G.2.2 Minimum level of recognition**

Although it is desirable that existing workers achieve competency in complete units they may be deemed competent for skills, including the relevant essential knowledge, that are part of a Unit of Competency. The skills so recognized shall be those in which the worker has previous experience.

Note: It is recommended that such persons undertake the necessary gap training to achieve the relevant Units of Competency.

##### **G.2.3 Assessment methodology**

Assessment processes and methods shall be in accordance with Clause 6.