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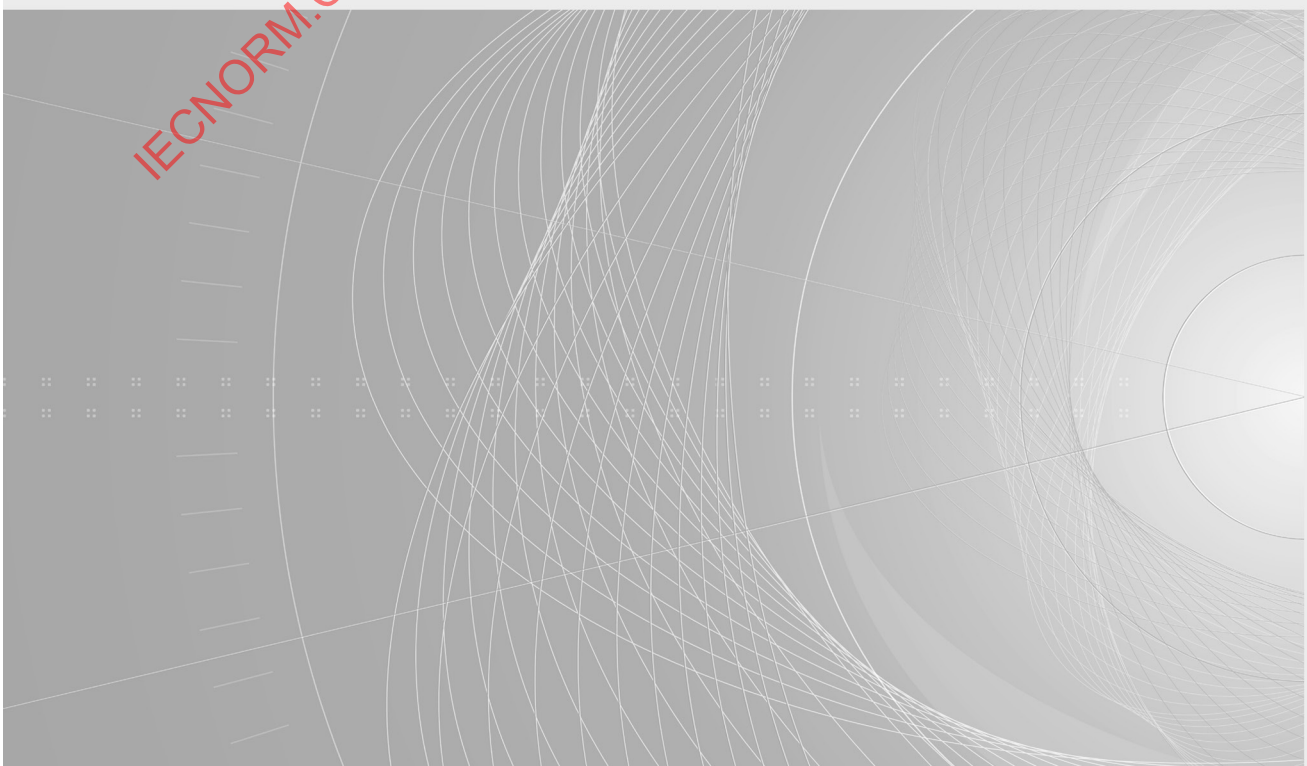
TECHNICAL SPECIFICATION

Explosive atmospheres – Part 44: Personal competence



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FOREWORD

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IEC TS 60079-44 has been prepared by IEC technical committee 31: Equipment for explosive atmospheres. It is a Technical Specification.

The text of this Technical Specification is based on the following documents:

Draft	Report on voting
31/1716/DTS	31/1747/RVDTS

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Specification is English.

A list of all parts in the IEC 60079 series, published under the general title *Explosive atmospheres*, can be found on the IEC website.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

INTRODUCTION

The objective of this document is to minimize the impact on safety and integrity of facilities where hazardous areas could be present, due to human error that may result in an individual's lack of knowledge, skills, or abilities during the performance of certain activities. This document explains how the minimum requirements for the competence and management of competencies of personnel with tasks related to hazardous areas. Assurance that individuals who perform such tasks and those individuals responsible for ensuring a qualified workforce are competent according to this document will also support the achievement of the stated objective.

Competence depends on knowledge, skill, experience, and training. Verification of competence is a difficult task and requires specific assessment methods based on clear criteria. In establishing these criteria, it is acknowledged that:

- The competencies for conducting work in facilities where explosive atmospheres may be present are in addition to any competencies which may apply for the specific type of work being undertaken, for example, electrical, mechanical, operations.
- Competencies for working in hazardous areas vary by the individual roles and tasks performed (see Clause 8), and the protection techniques used.
- As explosion protection measures adopt quite different and individual design and installation requirements it is common for personnel to be trained and competent either in some or all these measures.

Regarding the assurance of competence, it is recognised that competence evolves with years but can also deteriorate if not applied, and so continued training or education and assessment to verify competence is necessary. Where training or assessment of competence is required, it is expected that those conducting these activities should have at least the same level of competence as those being trained or assessed. These and other specific processes and requirements might also be defined in other publications that are employed in competence certification systems.

EXPLOSIVE ATMOSPHERES –

Part 44: Personal competence

1 Scope

The purpose of this part of IEC 60079, which is a Technical Specification, is to provide guidance to establish recommended minimum criteria to determine roles, establish expectations of the necessary skills and evidence of competence to assess and manage the competence of personnel conducting work in or associated with hazardous areas. The purpose of this document is to provide guidance to establish:

- recommended minimum criteria to determine roles,
- expectations of the necessary skills, and
- evidence of competence

in order to assess and manage the competence of personnel who are conducting work in or associated with hazardous areas.

NOTE While many of the roles and tasks identified in this document are common multiple facilities, this document identifies some of the additional considerations that should be considered when they are being performed in facilities with hazardous areas.

This document provides examples and recommendations of minimum levels of competence for typical roles associated with hazardous areas by addressing the knowledge, skills, or abilities that is expected of personnel. Additionally, examples of the evidence of competence expected for each role are provided.

The aim of this document is to assist in defining, assessing, and managing unique requirements for the competence of individuals working in or associated with installations where an explosive atmosphere could be present. Such a programme could be specific to a facility or used in conjunction with other regulatory requirements where they exist. The competencies for conducting work in a hazardous area are in addition to any competencies which may apply for the general type of work being undertaken (for example, professional credentials, electrical, non-electrical, operations, design).

NOTE ISO 10015 provides information on competency management systems.

This document applies to both electrical and non-electrical applications.

This document identifies the minimum level of knowledge and skills required to work in hazardous areas and the specific competence required for work associated with equipment for explosive atmospheres (commonly termed ‘Ex Equipment’) and the standards to which competence is to be assessed and attributed.

The purpose of this document is to provide guidance to establish:

- recommended minimum criteria to determine roles,
- expectations of the necessary skills, and
- evidence of competence

The principal application of this document is for personnel dealing with explosion-protected and associated equipment for use in explosive atmospheres, including the following work functions:

- Classification of areas;

- Producing, processing or servicing functions in a hazardous area and not directly involved in installing, maintaining or repairing explosion-protected equipment and systems;
- Designing, commissioning and maintaining explosion-protection strategies and equipment;
- Selecting, installing, testing and maintaining explosion-protected equipment and systems in hazardous areas;
- Inspecting hazardous area equipment, systems and installations;
- Overhauling, repairing and modifying explosion-protected equipment;
- Management of the Ex aspects of the facility.

2 Normative references

The following documents are referred to in the text in such a way that some, or all, of their content constitutes requirements 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 60050-426, *International Electrotechnical Vocabulary (IEV) – Part 426: Explosive atmospheres*

IEC 60079-0, *Explosive atmospheres – Part 0: Equipment – General requirements*

IEC 60079-10-1, *Explosive atmospheres – Part 10-1: Classification of areas – Explosive gas atmospheres*

IEC 60079-10-2, *Explosive atmospheres – Part 10-2: Classification of areas – Explosive dust atmospheres*

IEC 60079-14, *Explosive atmospheres – Part 14: Electrical installations design, selection and erection*

IEC 60079-17, *Explosive atmospheres – Part 17: Electrical installations inspection and maintenance*

IEC 60079-19, *Explosive atmospheres – Part 19: Equipment repair, overhaul and reclamation*

IEC TS 60079-32-1, *Explosive atmospheres – Part 32-1: Electrostatic hazards, guidance*

ISO 19011, *Guidelines for auditing management systems*

ISO 80079-36, *Explosive atmospheres – Part 36: Non-electrical equipment for explosive atmospheres – Basic method and requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60079-0 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.1
first-party verification
process where an individual self-declares their credentials and competency

Note 1 to entry: Permitting first-party verification for individuals working in hazardous areas could result in liability issues for the employer.

3.2
second-party verification
process where the employer, a person or organization appointed by the employer assesses an individual to a defined set of competency requirements

3.3
third-party verification
process where an organization independent of the employer, or its contractors, assesses individuals against a defined set of competency requirements

Note 1 to entry: Third-party verification organizations typically satisfy ISO/IEC17024 or national requirements and often are assessed by a National Accreditation Body.

3.4
prerequisite qualifications
knowledge, skills, and capabilities required to perform an assigned role or task in non-hazardous areas

Note 1 to entry: Some work roles may require registration or licencing by a local or national authority to verify, approve or endorse specific base knowledge. For example, professional engineer or tradespersons professional registration or licencing.

3.5
competence
ability to apply knowledge and skills to achieve intended results

[SOURCE: ISO/IEC 17024:2012, 3.6]

3.6
competency
ability to perform necessary action in given context to achieve specific outcome

Note 1 to entry: Results are defined with respect to tasks, functions or responsibilities which in turn are related to a job/role/title.

Note 2 to entry: The word competency and competencies can be used as synonyms of competence and competences. Competence can be used to refer to general ability (e.g., overall competence), while competency can be used to refer to a specific ability (e.g., competency in design of user interfaces).

3.7
hazardous area
area in which an explosive atmosphere is present, or can be expected to be present, in quantities such that special precautions for the construction, installation and use of equipment are required

Note 1 to entry: IEC 60079-10-1, Explosive atmospheres – Part 10-1: Classification of areas – Explosive gas atmospheres, gives a classification of hazardous areas containing explosive gas atmospheres (see IEV 426-03-03, IEV 426-03-04 and IEV 426-03-05).

Note 2 to entry: IEC 60079-10-2, Explosive atmospheres – Part 10-2: Classification of areas – Explosive dust atmospheres, gives a classification of hazardous areas containing explosive dust atmospheres (see IEV 426-03-23, IEV 426-03-24, and IEV 426-03-25).

[SOURCE: IEC 60050-426:2020, 426-03-01]

3.8
non-hazardous area
area in which an explosive atmosphere is not expected to be present in quantities such that special precautions for the construction, installation and use of equipment are required

[SOURCE: IEC 60050-426:2020, 426-03-02]

3.9
equipment
apparatus, fittings, devices, components, and the like used as a part of, or in connection with, an installation

[SOURCE: IEC 60050-426:2020, 426-01-01]

3.10
Ex Equipment
equipment with explosion protection

Note 1 to entry: Such equipment often includes Ex Components, but additional evaluation is always required as part of their incorporation into equipment.

[SOURCE: IEC 60050-426:2020, 426-01-14]

3.11
role
tasks or responsibilities within the context of an organization that identifies the responsibility and authority assigned to specific persons

3.12
verification
confirmation of truthfulness, through the provision of objective evidence that specified requirements have been fulfilled

Note 1 to entry: Verification can be applied to claims to confirm the information declared with the claim regarding events that have already occurred or results that have already been obtained.

[SOURCE: ISO/IEC 17000:2020, 6.6]

3.13
competency management system
set of interrelated or interacting elements of an organization to establish policies and objectives and processes to achieve competency of personnel

Note 1 to entry: It is not the intent of this document to specify a specific management system or require the creation of a separate competency management system.

4 General

Competence depends on specific knowledge, skill, experience and behaviour. Measurement of competence is a difficult task and requires assessment methods specific to the role being performed. Competence can develop with experience but can also deteriorate over time, therefore continued training, or reassessment of competence can be required.

Assessors of competence should have at least the level of competence for:

- the activity being assessed; and
- the assessment methodologies to be used.

5 Typical evidence of competence

5.1 General

Individuals should demonstrate they have the knowledge and skills relevant to the Type(s) of Protection, Types of Ex Equipment, or safety related requirements necessary to perform their assigned tasks.

Individuals should demonstrate they have the knowledge and skills relevant for the Ex protection measures applied, for example Type(s) of Protection, Types of Ex Equipment, or safety related requirements necessary to perform their assigned tasks.

Evidence to verify an individual's competence and ability to perform their assigned task can include, but is not limited to:

- review and confirmation of validity of applicable documentation such as educational records and professional credentials;
- documentation of experience;
- evaluation of practical skills;
- theoretical assessment such as exams; and
- second-party verification or third-party verification of knowledge and skills in accordance with Clause 8.

NOTE In many jurisdictions it is the legal responsibility of the owner or operator of a facility to ensure that individuals conducting work have received appropriate training and are competent to complete the tasks assigned to them.

5.2 Prerequisite qualifications

The competence assessment in this document is to assist employers to define requirements in addition to any prerequisite qualifications expected of an individual to perform a specific role. These prerequisites may be due to national requirements.

Some of the roles identified in this document recommend prerequisite qualifications, which are likely to be necessary to meet the objectives.

NOTE 1 Prerequisite qualifications include items such as educational or professional credentials and licences to work required by applicable regulations.

NOTE 2 For example, a prerequisite qualification for an installer could require electrical/non-electrical qualifications in addition to being competent to perform other roles identified in this document such as maintenance.

5.3 Recommendations for the verification of Ex competence

Ex competence may be verified through written or verbal tests, by witnessing of work in-process, or assessment of competency verification systems. The results of the verification should be documented, including the verification methodology used and the level of results attained. The verification should be traceable and auditable.

NOTE 1 Documents such as ISO/IEC 17024 or national requirements can provide guidance for assessment and certification of competence.

NOTE 2 Third-party verification organizations typically satisfy ISO/IEC17024 or national requirements and often are assessed by a National Accreditation Body.

NOTE 3 Employers normally consider including a second-party verification or third-party verification systems only in their employment, contract, or procurement processes.

NOTE 4 First-party verification (the person attesting to their own competence) is typically not acceptable.

6 Task competency expectations

The level of competence required for specific operations should be determined. This could include assigning a competence level required for certain tasks rather than defining a specific role.

Competence expectations should be identified according to the complexity and risk associated with the task and can vary by employer, role, operator, or facility.

NOTE For example, the minimum competency expectation for personnel that only install Cable Glands can require different competencies to that of personnel who are expected to install more complex equipment.

The skill level of a manufacturer's technician working on their equipment is not expected to be the same as the person carrying out the installation of that equipment.

A programme to assess the competence of individuals for specific roles should be established, including pass-fail criteria (see Clause 9).

7 Party legally responsible for a facility

7.1 General

The party legally responsible for a facility where explosive atmospheres could exist should ensure the organizational structure and competency of the personnel are appropriate to this document. The party legally responsible for a facility where explosive atmospheres could exist should understand the additional risks in such facilities that are different from other industries. The responsibilities and authorities should be clearly defined and communicated within the organization and should:

- be appropriate to the purpose of the organization;
- be appropriate to the management structure of the organization;
- include a commitment to comply with regulatory requirements.
- be communicated and understood within the organization;
- be periodically reviewed for continuing suitability; and
- identify or delegate the responsibility to ensure compliance and maintain the integrity of the equipment and facility (see 8.11).

7.2 Internal quality audit of competency management system associated with hazardous areas

7.2.1 General

Competence of workers should be managed in such a way to ensure compliance and maintain integrity of the equipment and installation.

NOTE Guidance on management of competence can be found in ISO 10015

7.2.2 Examples of typical auditing tasks

Audits may have a specific focus based on the auditor's prior experience or knowledge of typically weak areas, event history at the facility, management priorities and regulatory requirements.

Examples of typical auditing tasks include, but are not limited to, to confirm that:

- Ex and relevant management processes are appropriate, up to date and available to those who need them;

- roles and responsibilities are clearly defined and assigned to the appropriate personnel to allow the management processes to be implemented;
- people clearly understand their duties and are competent to carry them out;
- Ex Equipment integrity is well managed and documented, and appropriate records are kept of equipment installed, work carried out, inspections performed and findings;
- records and documentation are kept accurate and current; and
- management of change procedures relating to hazardous areas and Ex Equipment is in place, and correctly implemented.

7.2.3 Examples of evidence of competence

The auditor should have competence in the audit process and knowledge of the activities to be audited. Examples of evidence of competence can include, but are not limited to:

- having prior experience in the audit process including; plan, conduct, prepare an opening meeting and conduct close out presentations and reports. (ref. ISO 19011); and
- being experienced in the range of measures required to manage Ex Equipment in hazardous areas including:
  a) understanding the requirements of the applicable national or international legislation;
  b) being familiar with the legislation governing the management of Ex Equipment;
  c) being able to demonstrate a practical understanding of the requirements for Ex areas, explosion protection principles and installation, maintenance, and repair requirements; and,
  d) having prior working experience in various aspects of Ex tasks related to hazardous areas.

8 Roles associated with hazardous areas where competence should be verified

8.1 General

This section provides examples of roles of individuals working in, or associated with, hazardous areas. Each role is based on the typical tasks performed with examples for the evidence of competence for those tasks.

The appropriate level of competence for each task associated with a role shall be maintained. Continuing education or training are methods to achieve this.

NOTE 1 Assessment of competence is addressed in Clause 9.

NOTE 2 Reassessment of competence is addressed in Clause 10.

NOTE 3 Certain tasks can include the use of a Permits to Work (PTW) management system to ensure that work conducted in a facility is performed safely and efficiently.

8.2 Area classification

8.2.1 General

The area classification should be carried out by personnel who understand the relevance and significance of the properties of the flammable substances, sources of release, principles of dispersion, and the potential for an explosive atmosphere to develop. Personnel should be familiar with the activities, process, and the equipment.

Area classification typically requires inputs from other disciplines such as electrical, non-electrical, process engineers, plant operations personnel and others as applicable. Personnel involved in area classification should have a broad range of experience and appropriate analytical skills.

Competence should be relevant to the nature of the facility and methodology used for carrying out the area classification.

8.2.2 Examples of area classification tasks

Typical area classification tasks include, but are not limited to:

- area classification involving gathering and analysing of data relative to explosion hazards;
- identification of the relevant characteristics of the flammable materials;
- identification of the type and extent of the hazardous area in accordance with the appropriate codes or regulations for the jurisdiction of the facility and material(s) involved;
- determination of the types and availability of ventilation for gases / vapours and the impact it has on the hazardous area (such as in IEC 60079-10-1);
- determination of the type dusts involved and the potential for explosive dust atmospheres or dust layering forming (such as in IEC 60079-10-2);
- Consideration of any influence due to other workplace conditions such as environmental and material toxicity; and
- preparation of drawings and documentation to identify the hazardous areas within a facility, and the associated risks that occur in those areas;

8.2.3 Examples of evidence of area classification competence

Typical evidence of area classification competence includes, but is not limited to:

- understanding of the relevant standards and guidance documents applicable to the jurisdiction of work and the legal expectations of the local jurisdiction;
- ability to interpret the input from others as appropriate to understand the processes within a facility and the necessary documents required to enable area classification;
- ability to identify and grade all potential release sources and the impact of ventilation;
- ability to determine the extent of the zone using appropriate look-up tables, reference materials or calculations taking into account their limits of use; and
- ability to understand the relationship between equipment, processes, and area classification where changes or modifications in one area can affect other area(s).

NOTE Multiple standards and guidance documents are available and specific to the application and jurisdiction. This document does not attempt to list them (for example IEC 60079-10-1 and IEC 60079-10-2).

8.3 Design of systems or installations for hazardous areas

8.3.1 General

The design of installations in hazardous areas should be carried out by those who understand the various Types of Protection, installation practices, relevant rules and regulations and the general principles of area classification.

A designer needs the ability to design electrical or non-electrical systems, or software, that relate to the operation of a facility in a hazardous area as applicable. There can be multiple requirements based on the complexity of a facility. This requires that the design start with the objectives and consider the appropriate Ex Equipment that will be able to achieve the process and safety goals.

NOTE A designer may be part of a team in which individuals have different competencies necessary to complete the design of a system or installation.

8.3.2 Examples of typical design tasks

Examples of typical design tasks include, but are not limited to:

- evaluation of local regulatory, legal and facility requirements for an installation in hazardous areas;
- selection of Ex Equipment and interconnecting systems based on the area classification using documents such as IEC 60079-14;
- selection and application of standards, owner specifications and legal requirements relevant to the systems being designed and the location;
- ensure any parameters identified during the preliminary area classification are included in the design and installation documents;
- preparation of construction or installation drawings with supporting detail where required;
- preparation of, or participation in, installation and commissioning plans
- preparation of specifications for procurement; and
- preparation of, or participation in, the verification dossier to support future maintenance, inspection, and repair.

8.3.3 Examples of evidence of design competence

Examples of design competence include, but are not limited to:

- interpretation and application of requirements from source documents such as functional specifications, area classification drawings;
- understanding of the area classification and environmental conditions on which to base the design of systems and selection equipment that are appropriate;
- demonstrating the practical skills necessary for the preparation and compilation of relevant design, procurement, installation, inspection, testing, and maintenance information and documentation for the applicable concepts of protection and systems involved;
- identification of any ignition sources which shall be properly protected or controlled;
- understanding the general principles of explosion protection, relevant standards and Ex Equipment marking;
- understanding the content of instruction manual and Ex Equipment certificates;
- understanding the specific techniques employed in the selection and erection of Ex Equipment.

NOTE The design of systems or installations for hazardous areas typically requires prerequisite competence in other areas such as earthing, electrical systems and lightning protection.

8.4 Installation

8.4.1 General

Installation of the Ex Equipment includes verification of proper mounting, appropriate electrical and non-electrical interconnection and documentation of the installation while ensuring the Ex Equipment specifications are appropriate and any Specific Conditions of Use are addressed.

Completion of an installation can include selection of appropriate materials and tools required for the task.

8.4.2 Examples of typical installation tasks

Examples of typical installation tasks include, but are not limited to:

- confirmation that Ex Equipment is per specification, or as ordered and is appropriate for the location, including the consideration of any Specific Conditions of Use;

- selection and installation of various types of equipment not specified in the design that are required for the correct installation of Ex Equipment;
- handling and installation of Ex Equipment;
- interconnection of electrical systems, cable termination and the use of supports as required;
- installation of equipment as per design drawings;
- working safely in a hazardous area including hazard monitoring, evacuation procedures and the use of permit to work system or safe isolation procedures;
- testing of installed cables/circuits to ensure safety where required (this can also be completed in the commissioning process); and
- documenting the completion of installation as required.

8.4.3 Examples of evidence of installation competence

Installers need to demonstrate competence to the extent necessary to perform their tasks:

Examples of evidence of installation competence include, but are not limited to:

- understanding of installation of and work with Ex Equipment;
- knowledge of the installation requirements in the applicable standards or documents, such as IEC 60079-14;
- understanding of the general principles of explosion protection concepts;
- knowledge of ignition sources;
- understanding of the principles of Types of Protection, marking and appropriate areas of use;
- understanding of the equipment installation requirements which could affect the protection concept;
- correct use of instruction manuals, equipment certificates and installation documentation;
- application of proper installation techniques and ability to correctly select any additional materials when required to complete the task (such as cables, Cable Glands, cable trays, filters, spark arrestors);
- raising of technical queries (TQ) (when required) with the appropriate technical authority;
- application of permit to work systems and complying with any limitations;
- understanding of installation requirements in the applicable standards or documents;
- understanding of inspection and maintenance requirements; and
- correct use and operation of the appropriate testing equipment and consideration of any impact this may have in the hazardous area.

8.5 Maintenance

8.5.1 General

Maintenance personnel should have the knowledge and skills required for the relevant Types of Protection and types of Ex Equipment involved.

It is important that any maintenance procedures in hazardous areas ensure the explosion-protection features of the Ex Equipment involved are not compromised.

8.5.2 Examples of typical maintenance tasks

Examples of typical maintenance tasks include, but are not limited to:

- implementation of maintenance programs and schedules, in relation to Ex Equipment and Specific Conditions of Use;

- performance of testing as required, fault finding and corrective maintenance;
- ensuring that the features of each explosion-protection technique are included in the maintenance schedule and tasks;
- ensuring the maintenance program considers any environmental conditions, such as corrosion, that could require an increased frequency in the maintenance of Ex Equipment;
- recording of all maintenance conducted and results as appropriate;
- working safely in a hazardous area including hazard monitoring, evacuation procedures and the use of permit to work system or safe isolation procedures; and
- interpretation of equipment documentation in relation to maintenance, repair and replacement.

8.5.3 Examples of evidence of maintenance competence

Maintenance personnel need to provide evidence of their maintenance competence to the extent necessary to perform their tasks.

Examples of evidence of maintenance competence include, but are not limited to:

- an understanding of those aspects of equipment which affect the Types of Protection and the related markings;
- an understanding of the content of Ex Equipment Certificates and Specific Conditions of Use;
- an understanding and ability to read and assess engineering drawings and identify differences to the condition as installed;
- understanding of the local regulatory requirements for installations;
- ability to confirm that the Ex Equipment is fit for purpose, correctly installed and suitable for the location in which it is installed, has not been compromised or damaged and has not had any unauthorised modifications;
- ability to identify Ex Equipment which has deteriorated or is damaged and is no longer in compliance with the Type(s) of Protection;
- detailed knowledge of the additional importance of permit to work systems and safe isolation in relation to explosion protection;
- detailed knowledge of the techniques to be employed in the selection and installation of equipment referred to in this document;
- ability to update or provide the information for the applicable maintenance record, verification dossier, and facility drawings;
- knowledge of the maintenance requirements in the applicable standards or documents for both electrical and non-electrical requirements;
- knowledge of the overhaul and repair requirements in the applicable standards or documents for both electrical and non-electrical requirements;
- knowledge of quality assurance, including the principles of auditing, documentation, traceability of measurement and instrument calibration; and
- knowledge of the correct operation and use of the appropriate testing equipment for use in, or that may impact, the hazardous area;
- an understanding of the application and limitations of permit to work systems.

NOTE The knowledge requirements can vary in respect of:

- the relevant standards specific to legacy installations for example; classification / product / installation/ inspection and maintenance.
- types of installations including low voltage, high voltage, Types of Protection, engines, etc.

8.6 Overhaul and repair activities by service facilities

8.6.1 General

Users of Ex Equipment suitable for use in hazardous areas have a duty to ensure equipment remains in compliance with applicable regulations, which can include the need to ensure their equipment is overhauled, repaired, and reclaimed and returned to serviceable condition by persons or organizations competent in the application of standards such as IEC 60079-19.

Overhaul and repair are typically conducted offsite or outside a hazardous area and therefore the requirements for individuals or organizations involved in those specific tasks need to be verified by the user.

Competence should apply to each Type of Protection and Ex Equipment type for which the person is involved. For example: it is possible for a person to be competent in the field of repair and overhaul of Ex “d” electric machines only and not be fully competent in repair of Ex “d” switchgear or Ex “e” electric machines.

The responsible person (see 8.6.2 and 8.6.3) for overhaul and repair activities within the management organization, accepts responsibility and authority for ensuring that the overhauled/repaired equipment complies with the Ex Equipment Certificate or any change in status is agreed to by the user. The person so appointed should have a working knowledge of the appropriate explosion protection standards and an understanding of this document.

Repair operators (see 8.6.4 and 8.6.5) work under the technical authority of the Responsible Person within the site management system.

8.6.2 Examples of typical overhaul and repair tasks –Responsible Person for overhaul and repair

Examples of typical overhaul and repair tasks include, but are not limited to:

- explaining to user the status of the Ex Equipment after overhaul and repair and obtain acceptance of the resulting status before any repair is undertaken;
- obtaining approval from the user on the scope of work involved in the repair or reclamation;
- confirming the Ex Equipment is in serviceable condition with sufficient verification of compliance and authorize application of the Ex repair label;
- maintaining records such as Ex job records, Type of Protection standards, technical specifications, schedule drawings, operation and maintenance manuals, spare parts list;
- verification of the competence of repair operators periodically; and
- participation in the Quality Management System review process.

8.6.3 Examples of evidence of overhaul and repair competence – Responsible person for overhaul and repair

Examples of overhaul and repair competence include, but are not limited to:

- demonstration of the evidence of competence as detailed in 8.6.5;
- demonstrating a working knowledge and understanding of the relevant standards in explosion protection field;
- demonstrating a practical understanding of explosion-protection principles and Types of Protection;
- demonstrating an understanding and ability to read and assess engineering drawings and identify differences to the as-built condition;
- demonstrating an understanding of the local regulatory requirements for overhaul and repair applicable for equipment and for the location in which it is installed; and

- demonstrating a knowledge of quality assurance, including principles of traceability of measurement and instrument calibration.

8.6.4 Examples of typical overhaul and repair tasks – Repair operator

Examples of typical overhaul and repair tasks include, but are not limited to:

- identification of the relevant standards from the nameplate or documentation for the equipment and conduct visual inspection and electrical and non-electrical required tests;
- communication to the responsible person the requirements to return equipment to serviceable condition in accordance with the relevant standards;
- communication to the responsible person that the assessment of equipment condition and that it has not had any unauthorised modifications, completion of approved repairs and provision of inspection and test records, including traceability of instruments used and pass-fail criteria; and
- when authorized by the Responsible Person for overhaul and repair, application of the repair label.

8.6.5 Examples of evidence of competence – Repair Operator

Examples of overhaul and repair competence include, but are not limited to:

- understanding of the applicable principles of explosion protection, Types of Protection, the content of Ex Equipment Certificates and any Specific Conditions for Use;
- understanding of nameplate data and marking to accurately identify the relevant standards to be used in assessing equipment condition and conducting overhauls, repairs, and reclamations;
- ability to evaluate equipment to identify any unauthorised modifications, the equipment condition and any deterioration or damage which may affect the compliance with the Type of Protection;
- knowledge of the overhaul and repair requirements in the relevant standards or documents such as IEC 60079-19; and
- ability to update or provide the information for the applicable repair record, job report and Quality Management Systems (QMS) records.

8.7 Inspection

8.7.1 General

Inspection is the examination of an item or installation to determine its conformity to specific requirements.

NOTE National regulations may exist related to inspections.

8.7.2 Examples of typical inspection tasks

Examples of typical inspection tasks include, but are not limited to:

- Performance of detailed, close, or visual inspection to confirm compliance with the applicable standards, manufacturers' instructions, and installation requirements and that there is no deterioration of the equipment that could affect the Type of Protection;
- conduct of testing as required according to 8.10; and
- recording and retention of the results of all inspections including the extent, type and findings of an inspection and submit the report to management as required.

8.7.3 Examples of evidence of inspection competence

Examples of inspection competence include, but are not limited to:

- ability to obtain the relevant information from the engineering drawings to conduct the inspection;
- an understanding of those aspects of equipment design which affect the protection concept and ability to identify Ex Equipment which has deteriorated and is no longer in compliance with the Type of Protection concept;
- an understanding of the content of Ex Equipment Certificates and relevant parts of the applicable standard(s) and to identify that any Specific Conditions of Use are met;
- understanding of the particular techniques to be employed in the selection and installation;
- ability to identify differences between the drawings and the condition as installed;
- an understanding of the local regulatory requirements for installations;
- knowledge of quality assurance, including the principles of auditing, documentation, traceability of measurement and instrument calibration;
- knowledge of the correct operation and use of the appropriate testing equipment for use in, or that can impact, the hazardous area;
- detailed knowledge of the application and limitations of permit to work systems and safe isolation in relation to explosion protection;
- ability to confirm the equipment is fit for purpose, correctly installed and suitable for the location in which it is installed, and there have not been any unauthorised modifications;
- understanding of the applicable principles of explosion protection, Types of Protection and marking;
- ability to accurately and clearly record any defect that has been found in such a manner as to ensure that the repairer can effectively plan and carry out an appropriate repair;
- knowledge of the inspection and installation requirements in the applicable standards or documents such as IEC 60079-14; and
- knowledge of the inspection requirements in the applicable standards or documents such as IEC 60079-17.

8.8 Commissioning

8.8.1 General

Commissioning involves activities undertaken to ensure the verification and functioning of equipment and facilities forming a system or group of sub-systems, by demonstrating and recording its conformance with design parameters, regulation and specified operational requirements, to show that the system is safe and operable.

Commissioning can require a combination of some or all the skills including that of inspection, testing, maintenance, installation, and operation.

These are some of the basic inspection and checks carried out to demonstrate that plant and equipment has been fabricated, constructed, and installed correctly as part of construction, pre-commissioning, and maintenance activities.

8.8.2 Examples of typical commissioning tasks

Examples of typical commissioning tasks include, but are not limited to:

- testing as required according to 8.10;
- installation and hook up of equipment;
- insulation resistance testing of cables and Ex Equipment;
- high voltage testing of cables where required;
- cold loop checks (cables continuity tests);

- performing equipment calibration;
- performing no-load tests on rotating equipment;
- energizing electrical switchgear;
- relay testing and functional testing of electrical interlocks;
- cause and effect logic testing;
- load testing;
- functional testing of instrument loops from field devices to the Human Machine Interfaces and energised functional checks;
- alignment of rotating equipment couplings;
- ensuring guards are correctly secured;
- ensuring lubrication levels are correct;
- ensuring no visible signs of leakage from pump or gearboxes seals; and
- recording and retaining the results of checks and inspections.

8.8.3 Examples of evidence of commissioning competence

Examples of commissioning competence include, but are not limited to:

- demonstrating their competence relevant to the Types of Protection or Ex Equipment involved.
- understanding, application, and limitations of the permit to work systems; and
- demonstrating a level of commissioning competency which is related to the tasks being performed.

8.9 Facility operation

8.9.1 General

Individuals are responsible for the safe operation of a facility with hazardous areas. This includes but is not limited to the coordination of multiple roles, tasks, work requirements, emergency procedures and management reporting.

8.9.2 Examples of typical facility operation tasks

Examples of typical facility operation tasks include, but are not limited to:

- operating and monitoring control of equipment, processes, and areas of facilities to maintain parameters within prescribed limits during normal and abnormal conditions;
- initiation of appropriate action when parameters vary outside normal operating limits;
- managing approval of work, permit to work system or other control procedures of work conducted by others in the facility;
- monitoring and approval of entry of personnel;
- oversight of the movement, transport, storage of equipment and materials within the facility;
- initiation, coordination, and execution of emergency response procedures;
- status reporting to facility managers; and
- review and approval of management of change requests on behalf of the operations department.

8.9.3 Examples of evidence of facility operation competence

Examples of facility operation competence include, but are not limited to:

- facility operation staff need to demonstrate their abilities which relate to their role and the exact nature of the facility:
- use of information sources to identify the hazardous area classification for a part of a facility and identify the potentially flammable materials that may be present;
- demonstrating the knowledge of the principles of hazardous area classification to identify what changes could impact the facility (example of changes: addition of enclosures, change of use of pipes, change of pump seal types, increased sample frequency, failure of ventilation, lack of cleanliness, leaking joints);
- showing sufficient understanding of the applicable hazardous area equipment marking to be able to establish in which areas equipment may be used, such as gas/dust group and temperature class confirm whether the equipment can be used in specific locations of a facility;
- identifying the suitability of personal, portable or transportable equipment to be used in various areas of a facility;
- ascertaining if Ex Equipment is suitable for continued operation (for example understand and report alarm status, integrity of enclosures, management of leaks, spills,);
- understanding the actions to take where equipment and process parameter restrictions are exceeded;
- understanding emergency response procedures and how to perform required actions;
- managing / monitoring work at the site to avoid ignitions of a potentially explosive atmosphere. This includes the ability to:

  a) assign competent personnel appropriate to tasks;

  b) identify actions at the site that could cause releases of potentially flammable / explosive materials / atmosphere and specify appropriate controls;

  c) identify actions and events that may cause ignition and specify appropriate controls;

  d) understand the principal sources of ignition (these are identified in documents such as ISO 80079-36) along with the knowledge and experience to understand how these may occur in practice at the place of work;

  NOTE Additional guidance can be found in other documents such as EN 1127-1.

  e) originate, verify, check, monitor or control measures whether implemented by self or others;

  f) check selection and use of tools and equipment for the task being performed;

  g) identify means by which electrostatic charges may be generated and controlled in practice at the place of work (for example, clothing, PPE, splash filling, use of plastics, appropriate hoses, earthing of moveable pumps, pump trucks and persons identified in documents such as IEC TS 60079-32-1 and other relevant documents);

  h) manage / undertake portable gas testing, if appropriate, including an appreciation of the limitations of this technique;

  i) identify unacceptable levels of cleanliness in a dust environment, as appropriate; and

  j) confirm that the qualifications of the personnel working in a facility are appropriate for the assigned tasks.

8.10 Testing of installed Ex Equipment

8.10.1 General

Where there is a requirement for lifecycle integrity testing there should be an understanding of the limitations that exist and the hazards that can be created by the execution of the tests. This is in addition to understanding the Ex Equipment being inspected, requirements for facilities with hazardous areas in relation to permit to work and clearances, hazard monitoring, evacuation procedures, as well as plant and electrical shut down and isolation.

8.10.2 Examples of typical testing of installed Ex Equipment tasks

Examples of typical testing of installed Ex Equipment include, but are not limited to:

- planning for and conducting testing in a hazardous area;
- identifying the Occupational Health and Safety (OH&S) procedures to be followed;
- determining if the area is safe for the tests to be carried out;
- defining the characteristics, suitability and limitations of the testing equipment being used;
- defining or identifying the appropriate pass-fail criteria for each test procedure;
- documentation of results of the installation tests in a verification dossier; and
- developing procedures and options for dealing with test results that show non-conformance.

8.10.3 Example of evidence of typical testing of installed equipment competence

Examples of testing of installed equipment include, but are not limited to:

- understanding the aspects of commissioning, maintenance, and inspection; and
- ability to conduct testing, interpret, record results and report accordingly where corrective action is required.

8.11 Responsibility for specific Ex compliance functions

8.11.1 General

Organizations may appoint a specific person(s) as responsible for ensuring installations comply with Ex requirements and regulations. Compliance functions can include management, implementation, audit, and analysis.

NOTE 1 For example, IEC 60079-14 and IEC 60079-17 have historically used the terms “Responsible Person”, “Operative”, and “Technical Person with Executive Function” to describe specific tasks which can be addressed by the roles defined in this document.

NOTE 2 Certain tasks require different levels of knowledge, skills, and competencies to enable them to meet the requirements of the relevant standards and legal requirements in the country of operation.

8.11.2 Examples of typical compliance functions

Examples of compliance functions include, but are not limited to:

- identification of the applicable legal requirements for safe operation of the facility;
- ensure an effective Safety Management System (SMS) is in place for the control of ignition sources;
- establishing an overview of the tasks necessary for Ex compliance;
- identification of and maintain the content requirements of the verification dossier where required;
- development, maintenance, and monitoring of an inspection methodology and strategy appropriate for the facility; and
- monitoring of inspection reports, initiating and prioritizing any remedial actions.

8.11.3 Examples of evidence of compliance function competence

Examples of compliance function competence include, but are not limited to:

- demonstration of knowledge of the applicable legal requirements for the jurisdiction involved;
- demonstration of a practical understanding of the requirements for Ex areas, explosion protection principles and installation, maintenance, and repair requirements;

- demonstration of knowledge of risk evaluation and mitigation methodology;
- knowledge of the roles, responsibilities of all other (applicable to an Ex facility) tasks;
- demonstration of a general understanding of engineering and ability to read and assess engineering drawings; and
- demonstration of an ability to communicate effectively with plant and engineering management regarding equipment in hazardous areas issues.

8.12 Management (accountable administration)

8.12.1 General

The term management is here used to define the person(s) or organization given accountability and responsibility on behalf of the owners to ensure that a facility is designed, built, commissioned, safely operated and fulfils all legal requirements.

Technical knowledge of the hazardous area operations in a facility is not a prerequisite requirement for management (accountable administration); however this does require they assign key role responsibilities to persons with executive functions with appropriate competence.

The management (accountable administration) is expected to read and act upon reports from persons with executive functions when critical safety issues or other important details are identified to protect persons and property where appropriate.

8.12.2 Examples of typical management tasks

Examples of typical management (accountable administration) tasks include ensuring competent persons and systems are in place to address safety critical items; this includes but is not limited to ensuring:

- persons with knowledge of governing laws, directives and codes are in place in the organization and given responsibility to advise management on issues that may give rise to potential explosions at the facilities under management;
- all personnel engaged in activities that may affect the performance of a facility are aware of their roles, have the resources and time to execute these effectively and have sufficient knowledge and experience to undertake these, while being able to avoid, mitigate, identify, or manage hazards. Best practice is to maintain evidence of:
  a) role descriptions / task definitions and verification that these have been communicated to the individuals who hold them;
  b) competence verification and ongoing training provision, including dates, training objectives, assessment criteria, attainment; and
  c) periodic staff assessment against defined roles, including feedback from staff.
- competent persons are assigned to ensure:
  a) all codes and standards used in design, design modifications, installation, testing, commissioning, operation, maintenance are appropriate
  b) consultants and contractors appointed have sufficient knowledge / experience; Procedures are in place to ensure evidence of this is provided;
  c) key facility documentation (for example area classification drawings, maintenance records, asset registers) is current and an effective management of change procedure is implemented;
  d) inventory of flammable and combustible material used at a site is controlled to be appropriate for the actual throughput of the facility; Records of inventory / throughput are maintained;
  e) facility and equipment are operated and maintained appropriately; roles or positions in the organization that manages the asset are specified such that all accountabilities and

responsibilities for all aspects of the management of avoidance of explosions and management of emergency situations are covered and can be traced;

f) up to date guides or procedures are available to staff for the tasks to be safely carried out on explosion protected equipment;

g) records are kept of operational actions taken, work carried out and inspections reports, including corrective actions required and remedial actions performed;

h) procedures are in place to identify, as far as is reasonably practical, where a potential unsafe condition that could give rise to an incident occurring and is communicated to management;

i) approval procedure for continued operation in case of increased risks are in place, are appropriate, and are formally recorded;

j) effective procedures are in place to control work and personnel (including visitors) entry at site;

k) emergency response procedures appropriate to potential events are in place and proved to be effective by periodic drills or simulations; Records of which are maintained; and

l) defines safe work procedures and authorization requirements (such as a permit to work system in hazardous areas for the various levels of risk involved);

– internal audit procedures to verify all the above are in place. Results of audits are recorded, and correction action taken in a timely and appropriate manner.

8.12.3 Examples of evidence of management (accountable administration) competence

Examples of management (accountable administration) competence include, but are not limited to:

- demonstration of ability to manage an organization where hazardous areas may be present;
- demonstration of ability to manage a team of persons experienced with hazardous areas and risk mitigation;
- demonstration of knowledge of the roles, responsibilities of all other (applicable to an Ex facility) tasks.

8.13 Procurement

8.13.1 General

When procuring Ex Equipment or services (purchasing, inspection, installation, repair,) or when entering contractual agreements for services of the same, it is important to follow the Ex requirements of the facility.

Persons responsible for procurement should have the competence to understand, or obtain, the minimum information required to identify the type of Ex Equipment or services being requested.

While it may not be critical for procurement to understand equipment construction requirements, they should be aware the impact of not following the specifications for Ex Equipment and related codes and standards.

External service providers should be evaluated to confirm their competence, including whether their staff has sufficient skills and experience to safely perform the tasks included in the contract.

NOTE Where procurement is an automated function, the system data is typically reviewed by persons competent in Ex requirements.

8.13.2 Examples of typical procurement tasks

Examples of procurement tasks include, but are not limited to: