

Mobile and fixed offshore units — Electrical installations —

Part 7: Hazardous areas

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**Partie 7:
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**Mobile and fixed offshore units –
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**Part 7:
Hazardous areas**



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

MOBILE AND FIXED OFFSHORE UNITS – ELECTRICAL INSTALLATIONS –

Part 7: Hazardous area

FOREWORD

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International Standard IEC 61892-7 has been prepared by IEC technical committee 18: Electrical installations of ships and of mobile and fixed offshore units.

The text of this standard is based on the following documents:

FDIS	Report on voting
18/803/FDIS	18/819/RVD

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

Annexes A, B, C and D are for information only.

INTRODUCTION

IEC 61892 forms a series of International Standards intended to enable safety in the design, selection, installation, maintenance and use of electrical equipment for the generation, storage, distribution and utilization of electrical energy for all purposes in offshore units which are being used for the purpose of exploration or exploitation of petroleum resources.

This part of IEC 61892 also incorporates and co-ordinates, as far as possible, existing rules and forms a code of interpretation, where applicable, of the requirements of the International Maritime Organization, a guide for future regulations which may be prepared and a statement of practice for offshore unit owners, constructors and appropriate organizations.

This standard is based on equipment and practices which are in current use but it is not intended in any way to hamper development of new or improved techniques.

The ultimate aim has been to produce a set of International Standards exclusively for the offshore petroleum industry.

MOBILE AND FIXED OFFSHORE UNITS – ELECTRICAL INSTALLATIONS –

Part 7: Hazardous area

1 Scope

This part of IEC 61892 contains additional provisions for electrical installations in hazardous areas in mobile and fixed units used in the offshore petroleum industry for drilling, production, processing and for storage purposes including pipeline, pumping or 'pigging' stations, compressor stations and exposed location single buoy moorings (ELSBM).

It applies to all installations in hazardous areas whether permanent, temporary, transportable or hand-held at all voltages.

Offshore units which are permanently secured to the sea bed, or secured thereto for extended periods, are regarded as fixed units, which may be normally manned or unmanned.

A mobile production unit, in some countries also designated Production Test Ship (PTS), in a fixed position, is regarded as a fixed offshore unit while connected to the well.

This standard does not apply either in rooms used for medical purposes or to the electrical installations of tankers.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 61892. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 61892 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60079-0: 1983, *Electrical apparatus for explosive atmospheres – Part 0: General requirements*

IEC 60079-4: 1975, *Electrical apparatus for explosive gas atmospheres – Part 4: Method of test for ignition temperature*

IEC 60079-10: 1995, *Electrical apparatus for explosive gas atmospheres – Part 10: Classification of hazardous areas*

IEC 60079-11: 1991, *Electrical apparatus for explosive gas atmospheres – Part 11: Intrinsic safety "i"*

IEC 60079-12: 1978, *Electrical apparatus for explosive gas atmospheres – Part 12: Classification of mixtures of gases or vapours with air according to their maximum experimental safe gaps and minimum igniting currents*

IEC 60079-14: 1996, *Electrical apparatus for explosive gas atmospheres – Part 14: Electrical installations in explosive gas atmospheres (other than mines)*

IEC 60079-15: 1987, *Electrical apparatus for explosive gas atmospheres – Part 15: Electrical apparatus with type of protection "n"*

IEC 60079-17: 1996, *Electrical apparatus for explosive gas atmospheres – Part 17: Inspection and maintenance of electrical installations in hazardous areas (other than mines)*

IEC 60092-101: 1994, *Electrical installations in ships – Part 101: Definitions and general requirements*

IEC 60092-201: 1994, *Electrical installations in ships – Part 201: System design – General*

IEC 60092-401: 1980, *Electrical installations in ships – Part 401: Installation and test of completed installation*

IEC 60364-4-41: 1992, *Electrical installations of buildings – Part 4: Protection for safety – Chapter 41: Protection against electric shock*

IEC 60364-4-46: 1981, *Electrical installations of buildings – Part 4: Protection for safety – Chapter 46: Isolation and switching*

IMO 1989 MODU CODE: *Code for the construction and equipment of mobile offshore drilling units*

3 Definitions

For the purpose of this part of IEC 61892, the following definitions apply:

3.1 area classification: Assessed division of a facility into hazardous and non-hazardous areas, and the subdivision of the hazardous areas into zones.

3.2 enclosed area: Any room or enclosure within which, in the absence of artificial ventilation, the ventilation will be limited and any flammable atmosphere will not be dispersed naturally.

3.3 enclosure: All the walls which surround the live parts of electrical apparatus including doors, covers, cable entries, rods, spindles and shafts, ensuring the protection of the electrical apparatus.

3.4 essential system: System required for the safe navigation, steering or manoeuvring of the unit or for the safety of human life or for special characteristics of the unit (e.g. special services).

3.5 exposed conductive part: Conductive part which can readily be touched and which may become alive under fault conditions.

NOTE – Typical exposed conductive parts are walls of enclosures, operating handles, etc.

3.6 extraneous conductive part: Conductive part not forming a part of the electrical installation and liable to propagate a potential, including earth potential.

3.7 explosive gas atmosphere: Mixture with air, under atmospheric conditions, of flammable materials in the form of gas or vapour in which, after ignition, combustion spreads throughout the unconsumed mixture. [IEV 426-02-03, modified]

NOTE – Although a mixture which has a concentration above the upper explosive limit (UEL) is not an explosive gas atmosphere, it can readily become so and, in certain cases for area classification purposes, it is advisable to consider it as an explosive gas atmosphere.

3.8 fire resistance: Ability of a part to preserve under specified conditions of exposure to fire and for a stated period of time the various properties necessary for its use.

3.9 flameproof enclosure: Type of protection of electrical apparatus in which the enclosure will withstand an internal explosion of a flammable mixture which has penetrated into the interior, without suffering damage and without causing ignition, through any joints or structural openings in the enclosure, of an external explosive atmosphere consisting of one or more of the gases or vapours for which it is designed.

NOTE – This type of protection is indicated by the letter "d".

3.10 flame retardance: Property of a substance, or a treatment applied to a material, of markedly retarding the propagation of a flame.

3.11 ignition temperature (of an explosive gas atmosphere): The lowest temperature of a heated surface at which, under specified conditions according to IEC 60079-4, the ignition of a flammable material in the form of a gas or vapour in mixture with air will occur.

3.12 inspection: Action comprising careful scrutiny of an item carried out either without dismantling, or with the addition of partial dismantling as required, supplemented by means such as measurement, in order to arrive at a reliable conclusion as to the condition of an item.

3.13 intrinsically-safe circuit: Circuit in which any spark or thermal effect produced either normally or in specified fault conditions is incapable, in the specified test conditions, of causing ignition of a given gas or vapour.

NOTE – IEC 60079-11 specifies the test conditions for these circuits.

3.14 gas-tight door: Solid, close fitting door designed to resist the passage of gas under normal atmospheric conditions.

3.15 general artificial ventilation: Movement of air and its replacement with fresh air by artificial means (for example fans) and applied to a general area.

3.16 hazardous area: Area in which an explosive gas 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 apparatus. [IEV 426-03-01, modified]

3.17 local artificial ventilation: Movement of air and its replacement with fresh air by artificial means (usually extraction) applied to a particular source of release or local area.

3.18 lower explosive limit (LEL): Concentration of flammable gas or vapour in air, below which the gas atmosphere is not explosive. [IEV 426-02-10, modified]

3.19 **maintenance:** Combination of any actions carried out to retain an item in or restore it to, conditions in which it is able to meet the requirements of the relevant specification and perform its required functions.

3.20 **natural ventilation:** Movement of air and its replacement with fresh air due to the effects of wind and/or temperature gradients.

3.21 **non-hazardous areas:** Area in which an explosive gas atmosphere is not expected to be present in quantities such as to require special precautions for the construction, installation and use of electrical apparatus. [IEV 426-03-02, modified]

3.22 **normal operation:** Situation when the plant is operating within its design parameters. Minor releases of flammable material may be part of normal operation. For example, releases from seals which rely on wetting by the fluid being pumped are considered to be minor releases. Failures (such as breakdown of pump seals, flange gaskets or spillages caused by accidents) which involve repair or shut-down are not considered to be part of normal operation.

3.23 **opening:** Any aperture, door, window or non-gas-tight fixed panel.

3.24 **open area:** Area in an open air situation without stagnant areas where vapours are rapidly dispersed by wind and natural convection. Typical air velocities should rarely be less than 0,5 m/s and should, frequently be above 2 m/s.

3.25 **petroleum:** Complex mixture of hydrocarbons that occurs in the earth in liquid, gaseous, or solid forms.

3.26 **pressurization:** Type of protection by which the ingress of an explosive atmosphere into a room or enclosure is prevented by maintaining therein a protective gas at a pressure greater than that of the surrounding atmosphere.

3.27 **purging:** Passing of sufficient volume of protective gas through a pressurized room or enclosure and its ducts before the application of voltage to the apparatus to reduce any explosive gas atmosphere to a concentration well below the lower explosive limit.

3.28 **room or building:** Enclosure (or enclosures) provided with doors, cable ducts, conduits, etc. containing electrical apparatus and of sufficient size to permit the entry of a person who may be expected to work or remain inside the enclosure for a prolonged period.

3.29 **semi-enclosed:** Semi-enclosed locations are locations where natural conditions of ventilation are notably different from those on open decks due to the presence of structures such as roofs, windbreaks and bulkheads and which are so arranged that the dispersion of gas may not occur.

3.30 **sheltered or obstructed open area:** Area within or adjoining an open area, which may include a partially open building or structure, where owing to obstruction natural ventilation may be less than in a true open area, and this may enlarge the extent of the hazard zone.

3.31 simple apparatus: Electrical component or combination of components of simple construction with well defined electrical parameters which is compatible with the intrinsic safety of the circuit in which it is used. The following apparatus is considered to be simple apparatus:

- a) passive components for example switches, junction boxes, potentiometers and simple semi-conductor devices;
- b) sources of stored energy with well defined parameters, for example capacitors or inductors, whose values are considered when determining the overall safety of the system;
- c) sources of stored energy for example thermocouples and photocells, which do not generate more than 1,5 V, 100 mA and 25 mW. Any inductance or capacitance present in the source of energy is considered as in b).

3.32 source of release: Point or location from which a flammable gas, vapour or liquid may be released into the atmosphere such that an explosive atmosphere could be formed. [IEV 426-03-06, modified]

3.33 valve regulated type batteries: Unit in which under normal operating conditions the products of electrolysis are reconstituted within each individual gas-tight cell or unit and each cell or unit is fitted with a pressure release valve.

3.34 zones: Hazardous areas are classified into zones based upon the frequency of the occurrence and duration of an explosive gas atmosphere, as follows:

3.35 zone 0: Area in which an explosive gas atmosphere is present continuously or for long periods. [IEV 426-03-03, modified]

3.36 zone 1: Area in which an explosive gas atmosphere is likely to occur in normal operation. [IEV 426-03-04, modified]

3.37 zone 2: Area in which an explosive gas atmosphere is not likely to occur in normal operation and, if it does occur, is likely to do so infrequently and will exist for a short period only. [IEV 426-03-05, modified]

NOTE – Indications of the frequency of the occurrence and duration may be taken from codes relating to specific industries or applications.

4 Area classification

4.1 General

All mobile and fixed offshore units shall be assessed with regard to any potential explosive gas atmosphere in accordance with the provisions set out below. The results shall be documented in area classification drawings to allow the proper selection of all electrical components to be installed. Area classification shall be carried out at an early stage of planning, before any construction work starts.

NOTES

- 1 Analysis and classification of the environment where explosive gas may occur should be carried out in accordance with the IMO MODU CODE for the Construction and Equipment of Mobile Offshore Drilling Units 1989 (IMO 1989 MODU CODE), subclause 6.2 (for mobile drilling units) or, IEC 60079-10 (for fixed offshore units).
- 2 Further guidance for area classification given in any National Codes of Practice or similar publications may be adopted, provided they are not in conflict with the IMO 1989 MODU CODE or IEC 60079-10.
- 3 For documentation of requirements for area classification, see 10.1.
- 4 Examples of source of release are given in annex A.
- 5 A schematic approach to the classification of hazardous areas is given in annex B.
- 6 Examples of data sheets for use during area classification study are given in annex C.

4.2 *Mobile drilling units*

Area classification of mobile drilling units shall comply with provisions set out in the IMO 1989 MODU CODE.

Hazardous areas which normally apply on drilling units include the following.

NOTE – The hazardous areas as specified may be extended depending on the actual arrangement in each case.

4.2.1 Zone 0 include:

the internal spaces of closed tanks and pipes for active drilling mud, as well as oil and gas products, for example escape gas outlet pipes, or spaces in which an oil/gas/air mixture is continuously present or present for long periods.

NOTE – Active drilling mud is considered as being mud in the system which is between the well and the final degassing discharge.

4.2.2 Zone 1 include:

- a) enclosed spaces containing any part of the mud circulating system that has an opening into the spaces and is between the well and the final degassing discharge;
- b) enclosed spaces or semi-enclosed locations that are below the drill floor and contain a possible source of release such as the top of a drilling nipple;
- c) enclosed spaces that are on the drill floor which are not separated by a solid floor from the spaces in item b) above;
- d) in outdoor or semi-enclosed locations, except as provided for in item b) above, the area within 1,5 m from the boundaries of any opening to apparatus which is a part of the mud system as specified in item a) above, any ventilation outlets of zone 1 spaces or any access to a zone 1 space;
- e) pits, ducts or similar structures in locations which would otherwise be zone 2 but which are arranged so that dispersion of gas may not occur.

4.2.3 Zone 2 include:

- a) enclosed spaces which contain open sections of the mud circulating system from the final degassing discharge to the mud pump suction connection at the mud pit;
- b) outdoor locations within the boundaries of the drilling derrick up to a height of 3 m above the drill floor;
- c) semi-enclosed locations below and contiguous to the drill floor and up to the boundaries of the derrick or to the extent of any enclosure which is liable to trap gases;
- d) outdoor locations below the drillfloor and within a radius of 3 m from a possible source of release such as the top of a drilling nipple;
- e) the areas 1,5 m beyond the zone 1 areas specified in 4.2.2 d) above and beyond the semi-enclosed locations specified in 4.2.2 b);
- f) outdoor areas within 1,5 m of the boundaries of any ventilation outlet from or access to a zone 2 space;

- g) semi-enclosed derricks to the extent of their enclosure above the drill floor or to a height of 3 m above the drill floor, whichever is the greater;
- h) air locks between a zone 1 and a non-hazardous area.

4.2.4 Area classification relevant to production test facilities shall be carried out in accordance with the requirements of 4.3 and 4.4.

4.3 *Fixed production units*

Area classification of fixed offshore units, shall comply with national recommendations. IEC 60079-10 shall be taken into account.

NOTE – Unless national requirements apply, recommendations of the IMO 1989 MODU CODE should be applied.

Hazardous areas which normally apply on fixed offshore units include the following:

4.3.1 Zone 0 include, for example:

- a) areas within process apparatus developing flammable gas or vapours;
- b) areas within enclosed pressure vessels or storage tanks;
- c) areas around vent pipes which discharges continually or for long periods;
- d) areas over/near surface of flammable liquids in general.

4.3.2 Zone 1 include, for example:

- a) areas above roofs and outside sides of storage tanks;
- b) areas with a certain radius around the outlet of vent pipes, pipelines and safety valves;
- c) rooms without ventilation, with direct access from a zone 2 area;
- d) rooms or parts of rooms containing secondary sources of release, be where internal outlets indicate zone 2, but where efficient dilution of an explosive atmosphere cannot be expected because of lack of ventilation;
- e) areas around ventilation openings from a zone 1 area;
- f) area around flexible pipelines and hoses;
- g) area around sample taking points (valves, etc.);
- h) areas around seals of pumps, compressors, and similar apparatus, if primary source of release.

4.3.3 Zone 2 include, for example:

- a) area around flanges, connections, valves, etc.;
- b) areas outside of zone 1, around the outlet of vent pipes, pipelines and safety valves;
- c) areas around vent openings from the zone 2 area.

4.3.4 For drilling facilities, see 4.2.

4.4 *Mobile production units*

Area classification of mobile production units shall comply with national recommendations. IEC 60079-10 shall be taken into account.

NOTE – Unless national requirements apply, recommendations of the IMO 1989 MODU CODE should be applied.

4.5 *Provisions regarding mobile and fixed offshore units*

4.5.1 Pipelines without flanges, connections, valves or other similar fittings shall not be regarded as a source of release.

4.5.2 Certain areas and rooms shall, if so indicated by the circumstances, be classified as a more hazardous zone than set out in these examples.

4.5.3 Certain areas and rooms may under certain circumstances and/or when special precautions are taken, be classified as a less hazardous zone than indicated by these examples. Such special circumstances may be, for example, shielding or reinforced ventilation arrangements.

4.5.4 Enclosed rooms, without ventilation, with openings to an area with explosion risks, shall be designated as the same, or as a more hazardous zone than such an area.

4.6 *Openings, access and ventilation conditions affecting the extent of hazardous areas*

Except for operational reasons, access doors or other openings shall not be provided between a non-hazardous space and a hazardous area or between a zone 2 space and a zone 1 space. Where such access doors or other openings are provided, any enclosed space not referred to under 4.2.2, 4.2.3, 4.3.2 or 4.3.3 and having a direct access to any zone 1 or zone 2 location becomes the same zone as that location with the exceptions which follow.

4.6.1 An enclosed space with a direct access to any zone 1 location can be considered as zone 2 if:

- a) the access is fitted with a self-closing gas-tight door opening into the zone 2 space;
- b) ventilation is such that the air flow with the door open is from the zone 2 space into the zone 1 location;
- c) loss of ventilation sets off an alarm at a manned station.

4.6.2 An enclosed space with direct access to any zone 2 location is not considered hazardous if:

- a) the access is fitted with a self-closing gas-tight door that opens into the non-hazardous space, and
- b) ventilation is such that the air flow with the door open is from the non-hazardous space into the zone 2 location, and
- c) loss of ventilation sets off an alarm at a manned station.

4.6.3 An enclosed space with direct access to any zone 1 location is not considered hazardous if:

- a) the access is fitted with two self-closing gas-tight doors forming an air lock;
- b) the space has ventilation overpressure in relation to the hazardous space;
- c) loss of ventilation overpressure sets off an alarm at a manned station.