

Mobile and fixed offshore units — Electrical installations —

Part 7: Hazardous areas

ICS 47.020.60; 75.180.10; 29.260.99

National foreword

This British Standard is the UK implementation of IEC 61892-7:2007. It supersedes BS IEC 61892-7:1997 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee JPEL/18, Electrical installations of ships and of mobile and fixed offshore units.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 29 February 2008

© BSI 2008

ISBN 978 0 580 58164 9

Amendments/corrigenda issued since publication

Date	Comments



BS IEC 61892-7:2007

IEC 61892-7

Edition 2.0 2007-11

INTERNATIONAL STANDARD

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

CONTENTS

INTRODUCTION.....	6
1 Scope.....	7
2 Normative references	7
3 Terms and definitions	8
4 Area classification	13
4.1 General.....	13
4.2 Safety principles.....	14
4.3 Sources of release	14
4.4 Type of zone	15
4.5 Relative density of the gas or vapour when it is released.....	15
4.6 Mobile drilling units	15
4.6.1 Zone 0.....	16
4.6.2 Zone 1	16
4.6.3 Zone 2.....	16
4.6.4 Well test facilities	16
4.7 Fixed production units	16
4.7.1 Zone 0.....	17
4.7.2 Zone 1	17
4.7.3 Zone 2.....	17
4.7.4 Drilling facilities	17
4.8 Mobile production units	17
4.9 Provisions regarding mobile and fixed offshore units	18
4.10 Openings, access and ventilation conditions affecting the extent of hazardous areas.....	18
4.10.1 General	18
4.10.2 Enclosed space with direct access to any zone 1 location	18
4.10.3 Enclosed space with direct access to any zone 2 location	18
4.10.4 An enclosed space with direct access to any zone 1 location.....	18
4.10.5 Notices	19
5 Electrical systems	19
5.1 Sources of electrical power	19
5.2 Distribution systems	19
5.2.1 General	19
5.2.2 Earth fault detection	19
5.3 Electrical protection.....	19
5.4 Emergency conditions due to drilling operations – Mobile drilling units	20
5.5 Emergency switch-off – Ignition source control – Fixed production units.....	20
5.6 Protection from dangerous sparking	21
5.6.1 Dangers from live parts	21
5.6.2 Dangers from exposed and extraneous conductive parts	21
5.6.3 Potential equalization	22
5.6.4 Static electricity	22
5.6.5 Lightning protection	22
5.6.6 Cathodically protected metallic parts	23

5.6.7	Electromagnetic radiation	23
5.7	Danger from rotating parts.....	23
6	Electrical equipment	23
6.1	General.....	23
6.2	Selection of electrical apparatus.....	23
6.2.1	Selection with respect to area classification.....	23
6.2.2	Selection with respect to ignition temperature of the gas or vapour.....	23
6.2.3	Selection according to apparatus grouping	24
6.2.4	External influences	24
6.2.5	Ambient temperature	25
6.3	Electrical apparatus in hazardous areas	25
6.3.1	Equipment for zone 0	25
6.3.2	Equipment for zone 1	25
6.3.3	Equipment for zone 2	25
6.3.4	Apparatus with multiple types of protection.....	26
6.4	Selection of apparatus not available in accordance with IEC standards	26
6.5	Portable apparatus	26
7	Installation.....	27
7.1	General.....	27
7.2	Selection of apparatus.....	27
7.3	Wiring system – General	27
7.4	Connections	28
7.5	Unused openings	28
7.6	Circuits traversing a hazardous area	28
7.7	Unused cores	28
7.8	Cable surface temperature	28
7.9	Jointing	28
7.10	Cable wiring systems	29
7.11	Conduit systems.....	29
7.12	Mixed systems	30
7.13	Apparatus in hazardous areas	31
7.14	Wiring system in zone 0	31
7.15	Intrinsically safe electrical installations	32
7.16	Simple apparatus	33
7.17	Verification of intrinsically safe circuits	34
7.18	Additional requirements for type of protection “d” – Flameproof enclosures	34
7.18.1	General	34
7.18.2	Solid obstacles	34
7.18.3	Protection of flameproof joints	34
7.18.4	Cable entry system.....	35
7.19	Additional requirements for type of protection “e” – Increased safety	37
7.19.1	Cable entry for Ex e equipment	37
7.19.2	Cage induction motors – Overload protection	37
7.19.3	Motors – Varying frequency and voltage	38
7.20	Additional requirements for type of pressurization “p” – Pressurized apparatus	38
7.20.1	General	38
7.20.2	Ducting.....	39

7.20.3	Action to be taken on failure of pressurization – Apparatus without an internal source of release	39
7.20.4	Purging.....	40
7.21	Resistance-heating devices	41
8	Ventilation	41
8.1	General	41
8.2	Ventilation of spaces containing electrical apparatus	42
8.3	Ventilation and operation of rooms or buildings protected by pressurization	42
8.4	Values of overpressure and of protective gas flow	43
8.5	Failure of the pressurization	43
8.6	Ventilation of battery compartments	44
8.6.1	Stationary batteries – Vented and valve regulated types	44
8.6.2	Hermetically sealed lead-acid batteries	46
8.6.3	Fans and ducts	47
8.7	Ventilation of other hazardous spaces	47
9	Inspection and maintenance	47
9.1	General	47
9.2	Inspection	47
9.3	Isolation of apparatus	48
9.4	Precautions concerning the use of ignition sources	48
9.5	Maintenance	48
9.6	Qualifications of personnel	48
10	Documentation	48
10.1	Area classification	48
10.2	Drawings, data sheets and tables	49
10.3	Ventilation	49
10.4	Apparatus	49
10.4.1	Apparatus for use in zone 0 or zone 1	49
10.4.2	Apparatus for use in zone 2	49
10.5	Installation – General	50
10.5.1	Installations of rooms or buildings protected by pressurization	50
10.5.2	Installation of electrical apparatus and electrical systems with the type of protection "i"	50
10.6	Maintenance	50
10.7	Administration of the documentation	50
Annex A	(informative) Examples of sources of release – Process plant	51
Bibliography		57
Figure 1	– Examples of mixed wiring systems	31
Figure 2	– Selection chart for cable entry devices into flameproof enclosures for cables complying with item b) of 7.18.4.3	36
Figure C.1	– Preferred symbols for hazardous area zones	56
Table 1	– Relationship between the temperature classes, surface temperatures and ignition temperatures	24

Table 2 – Minimum distance of obstacles from the flameproof flange joints related to the gas/vapour subgroup of the hazardous area	34
Table 3 – Use of spark and particle barrier	39
Table 4 – Action to be taken when the pressurization with protective gas fails for electrical apparatus without an internal source of release	40
Table 5 – Summary of protective measures to be taken in the event of failure of pressurization	44
Table 6 – Values for current I when charging with constant current / constant voltage chargers	46
Table C.1 – Hazardous area classification data sheet – Part I: Flammable material list and characteristics – Sheet: 1/1	54
Table C.2 – Hazardous area classification data sheet – Part II: List of sources of release – Sheet: 1/1	55

INTRODUCTION

IEC 61892 forms a series of International Standards intended to ensure 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 used for the exploration or production 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 laid down by the International Maritime Organization, and constitutes 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 impede 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 areas

1 Scope

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

It applies to all installations, whether permanent, temporary, transportable or hand-held, to a.c. installations up to and including 35 000 V and d.c. installations up to and including 750 V.(a.c. and d.c. voltages are nominal values).

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

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 60079-0:2007, *Explosive atmospheres – Part 0: Equipment – General requirements*

IEC 60079-1:2007, *Explosive atmospheres – Part 1: Equipment protection by flameproof enclosure “d”*

IEC 60079-2:2007, *Explosive atmospheres – Part 2: Equipment protection by pressurized enclosure “p”*

IEC 60079-5:2007, *Explosive atmospheres – Part 5: Equipment protection by powder filling “q”*

IEC 60079-6:2007, *Explosive atmospheres – Part 6: Equipment protection by oil immersion “o”*

IEC 60079-7:2006, *Explosive atmospheres – Part 7: Equipment protection by increased safety “e”*

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

IEC 60079-11:2006, *Explosive atmospheres – Part 11: Equipment protection by intrinsic safety “i”*

IEC 60079-14:2002, *Electrical apparatus for explosive gas atmospheres – Part 14: Electrical installations in hazardous areas (other than mines)*

IEC 60079-15:2005, *Electrical apparatus for explosive gas atmospheres – Part 15: Construction, test and marking of type of protection “n” electrical apparatus*

IEC 60079-18:2004, *Electrical apparatus for explosive gas atmospheres – Part 18: Construction, test and marking of type of protection encapsulation “m” electrical apparatus*

IEC 60079-20, *Electrical apparatus for explosive gas atmospheres – Part 20: Data for flammable gases and vapours, relating to the use of electrical apparatus*

IEC 60079-26:2006, *Explosive atmospheres – Part 26: Equipment with equipment protection level (EPL) Ga*

IEC 61892-1, *Mobile and fixed offshore units – Electrical installations – Part 1: General requirements and conditions*

IEC 61892-2, *Mobile and fixed offshore units – Electrical installations – Part 2: System design*

IEC 61892-3, *Mobile and fixed offshore units – Electrical installations – Part 3: Equipment*

IEC 61892-4, *Mobile and fixed offshore units – Electrical installations – Part 4: Cables*

IEC 61892-5, *Mobile and fixed offshore units – Electrical installations – Part 5: Mobile units*

IEC 61892-6, *Mobile and fixed offshore units – Electrical installations – Part 6: Installation*

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

3 Terms and definitions

For the purposes of this document the terms and definitions given in IEC 61892-1 through IEC 61892-6 and the following apply.

3.1

appropriate authority

governmental body and/or classification society with whose rules a unit is required to comply

3.2

area classification

assessed division of a facility into hazardous and non-hazardous areas, and the subdivision of the hazardous areas into zones

3.3

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

3.4

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

3.5

explosive atmosphere

mixture with air, under atmospheric conditions, of flammable substances in the form of gas, vapour, mist or dust, in which, after ignition, combustion spreads throughout the unconsumed mixture

[IEV 426-02-02, modified]

3.6

explosive gas atmosphere

mixture with air, under atmospheric conditions, of flammable substances 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.

3.7

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 apparatus

[IEV 426-03-01, modified]

3.8

non-hazardous area

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 apparatus

[IEV 426-03-02, modified]

3.9

zones

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

3.10

zone 0

place in which an explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas, vapour or mist is present continuously or for long periods or frequently

[IEV 426-03-03, modified]

NOTE The MODU code definition is "Zone 0: in which an explosive gas/air mixture is continuously present or present for long periods."

3.11

zone 1

place in which an explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas, vapour or mist is likely to occur in normal operation occasionally

[IEV 426-03-04, modified]

NOTE The MODU code definition is "Zone 1: in which an explosive gas/air mixture is likely to occur in normal operation."

3.12

zone 2

place in which an explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas, vapour or mist is not likely to occur in normal operation but, if it does occur, will persist for a short period only

[IEV 426-03-05, modified]

NOTE 1 In this definition, the word "persist" means the total time for which the flammable atmosphere will exist. This will normally comprise the total of the duration of the release, plus the time taken for the flammable atmosphere to disperse after the release has stopped.

NOTE 2 Indications of the frequency of the occurrence and duration may be taken from codes relating to specific industries or applications.

NOTE 3 The MODU code definition is "Zone 2: in which an explosive gas/air mixture is not likely to occur, or in which such a mixture, if it does occur, will only exist for a short time."

3.13

source of release

point or location from which a flammable gas, vapour, or liquid may be released into the atmosphere in such a way that an explosive gas atmosphere could be formed

[IEV 426-03-06, modified]

3.14

grades of release

there are three basic grades of release, as listed below in order of decreasing frequency and likelihood of the explosive gas atmosphere being present:

- a) continuous grade;
- b) primary grade;
- c) secondary grade.

A source of release may give rise to any one of these grades of release, or to a combination of more than one

3.15

continuous grade of release

release which is continuous or is expected to occur frequently or for long periods

3.16

primary grade of release

release which can be expected to occur periodically or occasionally during normal operation

3.17

secondary grade of release

release which is not expected to occur in normal operation and, if it does occur, is likely to do so only infrequently and for short periods

3.18

release rate

quantity of flammable gas or vapour emitted per unit time from the source of release

3.19

normal operation

situation when the equipment is operating within its design parameters

NOTE 1 Minor releases of flammable material may be part of normal operation. For example, releases from seals which rely on wetting by the fluid which is being pumped are considered to be minor releases.

NOTE 2 Failures (such as the breakdown of pump seals, flange gaskets or spillages caused by accidents) which involve urgent repair or shutdown are not considered to be part of normal operation nor are they considered to be catastrophic.

NOTE 3 Normal operation includes start-up and shutdown conditions.

3.20

air lock

compartment connecting two different environments, usually at different pressures, that enables personnel to transfer from one environment to the other

3.21

ventilation

movement of air and its replacement with fresh air due to the effects of wind, temperature gradients, or artificial means (for example, fans or extractors)

3.22

explosive limits

NOTE The terms "explosive limit" and "flammable limit" are equivalent. IEC 60079-20 and IEC 61779-1 use the term "flammable limit" whilst all the other standards use the more widely accepted term "explosive limit".

3.23

lower explosive limit

concentration of flammable gas or vapour in air, below which the gas atmosphere is not explosive

[IEV 426-02-09, modified]

3.24

upper explosive limit

concentration of flammable gas or vapour in air, above which the gas atmosphere is not explosive

[IEV 426-02-10, modified]

3.25

relative density of a gas or a vapour

density of a gas or a vapour relative to the density of air at the same pressure and at the same temperature (air is equal to 1,0)

3.26

flammable material (flammable substance)

material which is flammable of itself, or is capable of producing a flammable gas, vapour or mist

3.27

flammable liquid

liquid capable of producing a flammable vapour under any foreseeable operating conditions

3.28

flammable gas or vapour

gas or vapour which, when mixed with air in certain proportions, will form an explosive gas atmosphere

3.29

flashpoint

lowest liquid temperature at which, under certain standardized conditions, a liquid gives off vapours in a quantity such as to be capable of forming an ignitable vapour/air mixture

[IEV 426-02-14]

3.30

boiling point

temperature of a liquid boiling at an ambient pressure of 101,3 kPa (1 013 mbar)

NOTE The initial boiling point that should be used for liquid mixtures is to indicate the lowest value of the boiling point for the range of liquids present, as determined in a standard laboratory distillation without fractionation.

3.31**vapour pressure**

pressure exerted when a solid or liquid is in equilibrium with its own vapour. It is a function of the substance and of the temperature

3.32**ignition temperature**

lowest temperature of a heated surface at which, under specified conditions, the ignition of a flammable substance in the form of a gas or vapour mixture with air will occur

[IEV 426-02-01, modified]

NOTE IEC 60079-4 and IEC 60079-4A standardize a method for the determination of this temperature.

3.33**extent of zone**

distance in any direction from the source of release to the point where the gas/air mixture has been diluted by air to a value below the lower explosive limit

3.34**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.

3.35**extraneous conductive part**

conductive part not forming a part of the electrical installation and liable to propagate a potential, including earth potential

3.36**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

3.37**gas-tight door**

solid, close fitting door designed to resist the passage of gas under normal atmospheric conditions

3.38**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

3.39**natural ventilation**

movement of air and its replacement with fresh air due to the effects of wind and/or temperature gradients

3.40**opening**

any aperture, door, window or non-gas-tight fixed panel

3.41

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

3.42

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

3.43

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

3.44

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

3.45

valve regulated cell

a secondary cell which is closed under normal conditions but has an arrangement which allows the escape of gas if the internal pressure exceeds a predetermined value. The cell cannot normally receive addition to the electrolyte

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.

The general principles for area classification are given in IEC 60079-10. This standard gives an interpretation of the principles when used for area classification of mobile and fixed offshore units.

Area classification shall be carried out at an early stage of planning, before any construction work starts and confirmed before start-up of the installation. Reviews should be carried out during the life of the installation.

The area classification should be carried out by those who have knowledge of the properties of flammable materials, the process and the equipment, in consultation with, as appropriate, safety, electrical, mechanical and other engineering personnel.

NOTE 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 (for mobile drilling units) or, IEC 60079-10 (for fixed offshore units).

NOTE 2 Further guidance for area classification given in any National Codes of Practice or similar publications may be adopted, provided they reduce the level of safety below that specified by the IMO MODU code or IEC 60079-10.

NOTE 3 For documentation of requirements for area classification, see 10.1.

NOTE 4 Examples of source of release are given in Annex A.

NOTE 5 A schematic approach to the classification of hazardous areas is given in Annex B.

NOTE 6 Examples of data sheets for use during area classification study are given in Annex C.

4.2 Safety principles

Installations in which flammable materials are handled or stored should be designed, operated and maintained so that any releases of flammable material, and consequently the extent of hazardous areas, are kept to a minimum, whether in normal operation or otherwise, with regard to frequency, duration and quantity.

It is important to examine those parts of process equipment and systems from which release of flammable material may arise and to consider modifying the design to minimize the likelihood and frequency of such releases and the quantity and rate of release of material.

These fundamental considerations should be examined at an early stage of the design development of any process plant and should also receive prime attention in carrying out the area classification study.

In the case of maintenance activities other than those of normal operation, the extent of the zone may be affected but it is expected that this would be dealt with by a permit-to-work system.

In a situation in which there may be an explosive gas atmosphere, the following steps should be taken

- a) eliminate the likelihood of an explosive gas atmosphere occurring around the source of ignition, or
- b) eliminate the source of ignition.

Where this is not possible, protective measures, process equipment, systems and procedures should be selected and prepared so that the likelihood of the coincidence of a) and b) is so small as to be acceptable. Such measures may be used singly, if they are recognized as being highly reliable, or in combination to achieve an equivalent level of safety.

4.3 Sources of release

The basic elements for establishing the hazardous zone types are the identification of the source of release and the determination of the grade of release.

Since an explosive gas atmosphere can exist only if a flammable gas or vapour is present with air, it is necessary to decide if any of these flammable materials can exist in the area concerned. Generally speaking, such gases and vapours (and flammable liquids and solids which may give rise to them) are contained within process equipment which may or may not be totally enclosed. It is necessary to identify where a flammable atmosphere can exist inside a process plant, or where a release of flammable materials can create a flammable atmosphere outside a process plant.

If it is established that the item may release flammable material into the atmosphere, it is necessary, first of all, to determine the grade of release in accordance with the definitions, by establishing the likely frequency and duration of the release. It should be recognized that the opening-up of parts of enclosed process systems (for example, during filter changing or batch filling) should also be considered as sources of release when developing the area classification. By means of this procedure, each release will be graded either "continuous", "primary" or "secondary".

Having established the grade of the release, it is necessary to determine the release rate and other factors which may influence the type and extent of the zone.

If the total quantity of flammable material available for release is "small", for example, laboratory use, whilst a potential hazard may exist, it may not be appropriate to use this area classification procedure. In such cases, account shall be taken of the particular risks involved.

The area classification of process equipment in which flammable material is burned, for example, fired heaters, furnaces, boilers, gas turbines etc., should take into account purge cycle, start-up and shut-down conditions.

4.4 Type of zone

The likelihood of the presence of an explosive gas atmosphere and hence the type of zone depends mainly on the grade of release and the ventilation.

NOTE 1 A continuous grade of release normally leads to a zone 0, a primary grade to zone 1 and a secondary grade to zone 2 (see annex A).

NOTE 2 Where zones created by adjacent sources of release overlap and are of different zonal classification, the higher risk classification will apply in the area of overlap. Where overlapping zones are of the same classification, this common classification will normally apply.

However, care needs to be taken where the overlapping zones relate to flammable materials which have different apparatus groups and/or temperature class. So, for example, if a zone 1 IIA T3 area overlapped a zone 2 IIC T1 area, then classifying the overlap as zone 1 IIC T3 may be over-restrictive, but classifying it as zone 1 IIA T3 or zone 1 IIC T1 would not be acceptable. In this situation, the area classification should be recorded as zone 1 IIA T3 and zone 2 IIC T1.

NOTE 3 Hazardous areas can be limited in extent by construction measures, for example by walls or dams. Ventilation or application of protective gas can reduce the probability of the presence of an explosive gas atmosphere so that areas of greater hazard can be transformed to areas of lesser hazard or to non-hazardous areas.

4.5 Relative density of the gas or vapour when it is released

If the gas or vapour is significantly lighter than air, it will tend to move upwards. If significantly heavier, it will tend to accumulate at ground level. The horizontal extent of the zone at ground level will increase with increasing relative density and the vertical extent above the source will increase with decreasing relative density.

NOTE 1 For practical applications, a gas or vapour which has a relative density below 0,8 is regarded as being lighter than air. If the relative density is above 1,2, it is regarded as being heavier than air. Between these values, both of these possibilities should be considered.

NOTE 2 With gases or vapours lighter than air, an escape at low velocity will disperse fairly rapidly upwards; the presence of a roof will, however, inevitably increase the area of spread under it. If the escape is at high velocity in a free jet the action of the jet, although entraining air which dilutes the gas or vapour, may increase the distance over which the gas/air mixture remains above its lower flammable limit.

NOTE 3 With gases or vapours heavier than air, an escape at low velocity will tend to flow downward and may travel long distances over the ground before it is safely dispersed by atmospheric diffusion. Special regard therefore needs to be paid to the layout of any installation under consideration. If the escape is at high velocity in a free jet the jet-mixing action by entraining air may well reduce the gas/air mixture to below its lower flammable limit in a much shorter distance than in the case of a low-velocity escape.

NOTE 4 Care needs to be taken when classifying areas containing cryogenic flammable gases such as liquefied natural gas. Vapours emitted can be heavier than air at low temperatures and become lighter than air on approaching ambient temperature.

4.6 Mobile drilling units

Area classification of mobile drilling units shall be in accordance with the IMO MODU code.

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

4.6.1 Zone 0

Zone 0 normally includes:

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.

4.6.2 Zone 1

Zone 1 normally includes:

- 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.

4.6.3 Zone 2

Zone 2 normally includes:

- 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 drill floor 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 4.6.2 d) above and beyond the semi-enclosed locations specified in 4.6.2 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.

4.6.4 Well test facilities

Area classification relevant to well test facilities shall be carried out in accordance with the requirements of 4.7 and 4.8.

4.7 Fixed production units

Analysis and classification of the environment where explosive gas may occur should be carried out in accordance with IEC 60079-10. Further guidance for area classification given in national recommendations may be adopted in accordance with 4.1.