International Standard

ISO 13702

Oil and gas industries — Control and mitigation of fires and explosions on offshore production installations — Requirements and guidelines

Industries du pétrole et du gaz — Contrôle et atténuation des feux et des explosions dans les installations en mer — Exigences et lignes directrices

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 67, *Oil and gas industries including lower carbon energy*, Subcommittee SC 6, *Process equipment, piping, systems, and related safety,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 12, *Oil and gas industries including lower carbon energy,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 13702:2015), which has been technically revised.

The main changes are as follows:

— visualized the risk treatment process in a flow diagram in 5.8;

— improved description of the explosion blast description in Clause A.3;

— improved guidance with respect to risk mitigation in Clause B.1;

— introduction of ESD hierarchy and guidance related to principles to protect pressurised equipment against fire in Clause B.2;

— improved guidance on ignition source control in Clause B.3;

— included guidance for control of spills related to floating LNG in Clause B.4;

— expanded guidance related to gas detection in Clause B.6;

— included guidance related to ignition source control for firewater pump drivers and external power supplies in B.8.2;

— addressing personnel safety related to CO_2 or other asphyxiating gases in B.8.11;

— introduced guidance related to passive fire-retarding surface for helidecks in B.8.13;

— introduced guidance related to tests in B.13;

— introduced the terms A-class and H-class for fire barriers in C.4.3.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The successful development of the arrangements required to promote safety and environmental protection during the recovery of hydrocarbon resources requires a structured approach to the identification and management of health, safety, and environmental hazards applied during the design, construction, commissioning, operation, inspection, maintenance, and decommissioning of a facility.

This document has been prepared primarily to assist in the development of new installations through their lifecycle.

The content of this document is arranged as follows.

— Objectives: lists the goals to achieved by the control and mitigation measures being described.

— Functional requirements: represent criteria to meet the stated objectives. The functional requirements are performance-orientated measures and, as such, are applicable to the variety of offshore installations utilized for the development of hydrocarbon resources throughout the world.

— Annex A: describes typical fire and explosion hazardous events.

— Annex B: describes recognized practices that can be considered in conjunction with statutory requirements, industry standards, and individual operator philosophy to determine that the measures necessary are implemented for the control and mitigation of fires and explosions. The guidance is limited to principal elements and are intended to provide specific guidance which, due to the wide variety of offshore operating environments, cannot be applicable in some circumstances.

— Annex C: describes typical examples of design requirements for large integrated offshore installations.

This document is based on an approach where the selection of control and mitigation measures for fires and explosions primarily caused from loss of containment is determined by an evaluation of hazards on the offshore installation. The methodologies employed in this assessment and the resultant recommendations differ depending on the complexity of the production process and facilities, type of facility (i.e. open or enclosed), staffing levels, and environmental conditions associated with the area of operation.

NOTE Requirements, rules, and regulations can, in addition, be applicable for the individual offshore installation concerned.

Oil and gas industries — Control and mitigation of fires and explosions on offshore production installations — Requirements and guidelines

1 Scope

This document specifies the objectives and functional requirements for the control and mitigation of fires and explosions on offshore installations used for the development of hydrocarbon resources in oil and gas industries. The object is to achieve:

— safety of personnel;

— protection of the environment;

— protection of assets;

— minimization of financial and consequential losses of fires and explosions.

This document is applicable to the following:

— fixed offshore structures;

— floating systems for production, storage, and offloading.

Mobile offshore units and subsea installations are excluded, although many of the principles contained in this document can be used as guidance.

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.

ISO 31073, *Risk management — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 31073 and the following apply.

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
accommodation
place where personnel onboard sleep and spend their off-duty time

Note 1 to entry: It can include dining rooms, recreation rooms, lavatories, cabins, offices, sickbay, living quarters, galley, pantries, and similar permanently enclosed spaces.

3.2
active fire protection
AFP
equipment, systems, and methods which, following initiation, can be used to control, mitigate, and extinguish fires

3.3
ALARP
as low as reasonably practicable
implementation of risk-reducing measures until the cost (including time, capital costs or other resources and assets) of further *risk* (3.35) reduction is grossly disproportional to the potential risk reducing effect achieved by implementing any additional measure

Note 1 to entry: See UK HSE[41].

3.4
area classification
division of an installation into *hazardous areas* (3.24) and non-hazardous areas and the sub-division of *hazardous areas* (3.24) into zones under normal operation

Note 1 to entry: This classification is based on the materials that can be present and the probability of a flammable atmosphere developing. Area classification is primarily used in the selection of electrical equipment to minimize the likelihood of ignition if a release occurs.

3.5
cellulosic fire
CF
fire involving primarily cellulosic material such as wood, timber, or paper

3.6
control
limitation of the extent or duration of a *hazardous event* (3.25)

3.7
control station
place from which personnel can monitor the status of the installation, initiate appropriate shutdown actions, and undertake any emergency communication

Note 1 to entry: Control station is typically known as CCR or central point.

3.8
critical safety system
system that has a major role in the prevention and mitigation of releases, fires and *explosions* (3.21) and in any subsequent *escape, evacuation, and rescue* (3.19) activities

3.9
deluge system
system to apply fire-water through an array of open spray nozzles by operation of a valve on the inlet to the system

3.10
embarkation area
place from which personnel leave the installation during *evacuation* (3.18)

EXAMPLE Helideck and associated waiting area or a lifeboat or life raft boarding area.

3.11
emergency depressurization
EDP
controlled disposal of pressurized fluids to a flare or vent system when required to avoid or minimize a *hazardous event* (3.25)

3.12
emergency response
action taken by personnel on or off the installation to control or mitigate a *hazardous event* (3.25) or initiate and execute abandonment of the facility

3.13
emergency response team
group of personnel who have designated duties in an emergency

3.14
emergency shutdown
ESD
control (3.6) actions undertaken to shut down equipment or processes in response to a *hazardous event* (3.25)

3.15
escalation
spread of impact from fires, *explosions* (3.21), toxic gas releases to equipment or other areas thereby causing an increase in the consequences of the initial *hazardous event* (3.25)

3.16
escape
act of personnel moving away from a hazardous event to a place where its effects are reduced or removed

3.17
escape route
route that provides a safe path from an area of an installation leading to a *muster area* (3.31), *temporary refuge (TR)* (3.37), *embarkation area* (3.10), or means of *escape* (3.16) to the sea

3.18
evacuation
planned method of leaving the installation in an emergency

3.19
escape, evacuation, and rescue
EER
range of possible actions including *escape* (3.16), muster, refuge, *evacuation* (3.18), escape to the sea, and rescue or recovery

3.20
evacuation route
escape route (3.17) that leads from the *temporary refuge (TR)* (3.37) to the place(s) used for *evacuation* (3.18) from the installation

3.21
explosion
event characterized by a rapid release of energy which has the potential to generate high blast overpressures and drag forces, as well as blast waves propagating away from the ignition point

3.22
fire and explosion strategy
FES
results of the process that uses information from the fire and *explosion* (3.21) evaluation to determine the measures required to manage these *hazardous events* (3.25) and the role of these measures

3.23
hazard
potential source of harm

EXAMPLE A source for potential human injury, damage to the environment, damage to property, or a combination of these.

[SOURCE: ISO/IEC Guide 51:2014[13], 3.2, modified — Example has been added.]

3.24
hazardous area
three-dimensional space in which a flammable atmosphere can be expected to be present at such frequencies as to require special precautions for the *control* (3.6) of potential *ignition sources* (3.27) as a result of *area classification* (3.4) studies

3.25
hazardous event
event that can cause harm

EXAMPLE The incident that occurs when a *hazard* (3.23) is realized such as release of gas, fire, loss of buoyancy.

[SOURCE: ISO/IEC Guide 51:2014[13], 3.3, modified — Example has been added.]

3.26
human factors
environmental, organisational, and job factors that influence behaviour of work in a way that can affect health and safety outcomes including the performance of *critical safety systems* (3.8)

3.27
ignition source
source with sufficient energy to initiate combustion

3.28
integrated installation
offshore installation that contains on the same load-bearing structure *accommodation* (3.1) and utilities, in addition to process or wellhead facilities

3.29
jet fire
JF
turbulent diffusion flame resulting from the combustion of a fuel continuously released with momentum in a particular direction

3.30
mobile offshore unit
mobile platform, including drilling ships, equipped for drilling for subsea hydrocarbon deposits and mobile platform for purposes other than production and storage of hydrocarbon deposits

Note 1 to entry: It includes mobile offshore drilling units, including drill ships, *accommodation* (3.1) units, construction and pipelay units, and well servicing and well stimulation vessels.

3.31
muster area
designated area where personnel report when required to do so

3.32
operator
individual, partnership, firm, or corporation having control or management of operations on the leased area or a portion thereof

Note 1 to entry: The operator can be a lessee, designated agent of the lessee(s), or holder of operating rights under an approved operating agreement.

3.33
passive fire protection
PFP
coating or cladding arrangement or free-standing system which, in the event of fire, will provide thermal protection to restrict the rate at which heat is transmitted to the object or area being protected

3.34
pool fire
turbulent diffusion fire burning above a horizontal pool of vaporizing flammable or combustible liquid under conditions where the liquid has zero or very low initial momentum

3.35
risk
combination of the probability of occurrence of harm and the severity of that harm

[SOURCE: ISO/IEC Guide 51:2014[13], 3.9, modified — Note to entry has been removed.]

3.36
running liquid fire
fire involving a flammable liquid flowing over a surface

3.37
temporary refuge
TR
place provided where personnel can take refuge for a predetermined period while investigations, *emergency response* (3.12), and *evacuation* (3.18) preplanning are undertaken

4 Abbreviated terms

AB	accommodation block
API	American Petroleum Institute
BOP	blowout preventer
CCR	central control room
CS	control station
DIFFS	deck integrated fire fighting system
F&G	fire and gas
GOR	gas oil ratio
HC	hydrocarbon
HMI	human machine interface
HVAC	heating, ventilation, and air conditioning
IEC	International Electrotechnical Commission
IMO	International Maritime Organization
PA	public address
SSIV	sub-sea isolation valve
SSSV	sub-surface safety valve
TEMPSC	totally enclosed motor-propelled survival craft
UA	utility area
UPS	uninterruptable power supply

WH wellhead area

5 Fire and explosion evaluation and risk management

5.1 Management system

All companies associated with the offshore recovery of hydrocarbons shall have, or conduct their activities in accordance with, an effective management system that addresses safety and environmental issues. As an example, operators should have an effective management system; contractors should have either their own management system or conduct their activities consistently with the operators' management system and additionally address issues relating to health and safety. The management system shall include a process of evaluating and managing risk in a framework of policies, procedures and organizational arrangements that embeds the management of risk throughout the organization.

5.2 Risk assessment and the risk management framework

This document assumes that the risk assessment is performed within the principles and guidelines for risk management described in IEC 31010[12].

In particular, those carrying out risk assessments shall be clear about the following:

a) organization's risk management policy, its objectives, and the context in which the organization operates;

b) extent and type of risks that are tolerable and how to treat any risks that are deemed not to be tolerable;

c) how risk assessment integrates into organizational processes;

d) methods and techniques to be used for risk assessment and their contribution to the risk management process;

e) accountability, both for performing risk assessment and for making decisions taking account of the results;

f) resources required to carry out risk assessment;

g) how the risk assessment will be reported, reviewed and audited.

5.3 Risk assessment process

Risk assessment provides decision-makers and responsible parties with an improved understanding of risks that can affect achievement of objectives and the adequacy and effectiveness of controls planned or already in place. This provides a basis for decisions about the most appropriate approach to be used to manage the risks. The output of risk assessment is an input to the decision-making processes of the organization.

Risk assessment is the overall process of hazard identification, risk analysis, and risk evaluation. The way this process is applied depends on the context of the risk management process and on the methods and techniques used to carry out the risk assessment.

5.4 Hazard identification

The starting point for risk management is the systematic identification of the sources of hazards and their potential consequences which can be dependent on the location, activities, and materials which are used or encountered in them.

The hazard identification process shall be applied to all stages in the life cycle of an installation and to all types of hazards encountered as a consequence of the development of hydrocarbon resources.