SLOVENSKI STANDARD
oSIST prEN ISO 35102:2021

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Industrija za predelavo nafte in zemeljskega plina - Obratovanje v arktičnem okolju - Pobeg, evakuacija in reševanje iz objektov na morju (ISO 35102:2020)

Petroleum and natural gas industries - Arctic operations - Escape, evacuation and rescue from offshore installations (ISO 35102:2020)

Erdöl- und Erdgasindustrie - Arktisbetrieb - Flucht, Evakuierung und Rettung von Offshore-Anlagen (ISO 35102:2020)

Industries du pétrole et du gaz naturel - Opérations en Arctique - Fuite, évacuation et sauvetage depuis les installations en mer (ISO 35102:2020)

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Petroleum and natural gas industries — Arctic operations — Escape, evacuation and rescue from offshore installations

Industries du pétrole et du gaz naturel — Opérations en Arctique — Échappement, évacuation et sauvetage depuis les installations en mer

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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 documents 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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, Subcommittee SC 8, *Arctic operations*.

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 International Standards on arctic operations (ISO 35101, ISO 35102, ISO 35103, ISO 35104, ISO/TS 35105 and ISO 35106) address design and operational requirements and provide guidance on their use by the petroleum and natural gas industries in offshore arctic and cold regions. These documents promote internationally agreed approaches for oil and gas operations in arctic and cold region offshore environments. They were developed in response to the offshore oil and gas industry's demand for a coherent and consistent definition of methodologies to design, analyze, assess and operate arctic and cold region offshore structures. Through their proper application, the intention is to help ensure the safety of life and to minimize damage to the arctic environment. These documents are intended to provide wide latitude in the selection of design and operational solutions without hindering innovation. Even so, sound engineering judgement is expected in the application of these documents.

Personnel working in petroleum and natural gas industries in the arctic offshore face a number of risks from the physical and work environments. These include prolonged periods of darkness (in the winter) and light (in the summer), remoteness, cold ambient air temperatures, wind chill, dense fog, cold water temperatures, sea ice in varying concentrations and thickness and potentially, icebergs. These environmental factors can affect worker safety, should the installation's integrity be compromised. Additionally, these harsh environmental factors can have a negative impact on equipment.

The escape, evacuation and rescue (EER) system facilitates the successful escape from an incident, subsequent precautionary or emergency evacuation from the installation, and the ultimate rescue of installation personnel. The EER provisions are the compensating measures mitigating risks which facilitate the safety of personnel working in arctic and cold region offshore environments.

This document specifies requirements and recommendations applicable to design and operational aspects of EER from oil and gas installations deployed in arctic and cold region offshore environments. Through their application, the intention is to achieve reliability levels appropriate for manned and normally unmanned offshore installations, regardless of the type of structure/facility and the nature or combination of the materials used and the severity of the environment to which the installation is subjected.

The EER provisions are largely performance-based stipulations which include verifiable attributes or benchmarks that provide qualitative levels or quantitative measures of performance. The key characteristic of a performance-based standard is that it is focused on what needs to be achieved rather than on how it should be done. One of the performance targets is that use of the EER minimizes the possibility of casualties in the process. The performance target is developed in the context of a design HSE case.

The main body of this document considers the overall EER system design and operational aspects. Annex A provides EER system design and operational background information and guidance intended to assist the user of this document in understanding the requirements and how they can be met. The clause numbering in Annex A is the same as in the main body text to facilitate cross-referencing. Annex B provides a risk analysis example and information pertaining to operational EER systems.

In this document, the following verbal forms are used:

— "shall" indicates a requirement;

— "should" indicates a recommendation;

— "may" indicates a permission;

— "can" indicates a possibility or a capability.

Users of this document are expected to be familiar with ISO 15544, ISO 17776 and ISO 31000.

Petroleum and natural gas industries — Arctic operations — Escape, evacuation and rescue from offshore installations

1 Scope

This document establishes the principles, specifies the requirements and provides guidance for the development and implementation of an escape, evacuation and rescue (EER) plan. It is applicable to offshore installation design, construction, transportation, installation, offshore production/exploration drilling operation service life inspection/repair, decommissioning and removal activities related to petroleum and natural gas industries in the arctic and cold regions.

Reference to arctic and cold regions in this document is deemed to include both the Arctic and other locations characterized by low ambient temperatures and the presence or possibility of sea ice, icebergs, icing conditions, persistent snow cover and/or permafrost.

This document contains requirements for the design, operation, maintenance, and service-life inspection or repair of new installations and structures, and to modification of existing installations for operation in the offshore Arctic and cold regions, where ice can be present for at least a portion of the year. This includes offshore exploration, production and accommodation units utilized for such activities. To a limited extent, this document also addresses the vessels that support ER, if part of the overall EER plan.

While this document does not apply specifically to mobile offshore drilling units (MODUs, see ISO 19905-1) many of the EER provisions contained herein are applicable to the assessment of such units in situations when the MODU is operated in arctic and cold regions.

The provisions of this document are intended to be used by stakeholders including designers, operators and duty holders. In some cases, floating platforms (as a type of offshore installations) can be classified as vessels (ships) by national law and the EER for these units are stipulated by international maritime law. However, many of the EER provisions contained in this document are applicable to such floating platforms.

This document applies to mechanical, process and electrical equipment or any specialized process equipment associated with offshore arctic and cold region operations that impacts the performance of the EER system. This includes periodic training and drills, EER system maintenance and precautionary down-manning as well as emergency situations.

EER associated with onshore arctic oil and gas facilities are not addressed in this document, except where relevant to an offshore development.

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 15544, *Petroleum and natural gas industries — Offshore production installations — Requirements and guidelines for emergency response*

ISO 17776, *Petroleum and natural gas industries — Offshore production installations — Major accident hazard management during the design of new installations*

ISO 19901-6, *Petroleum and natural gas industries — Specific requirements for offshore structures — Part 6: Marine operations*

ISO 19906, *Petroleum and natural gas industries — Offshore production installations — Arctic offshore structures*

ISO 31000, *Risk management — Guidelines*

ISO 35104, *Petroleum and natural gas industries — Arctic operations — Ice management*

ISO 35106, *Petroleum and natural gas industries — Arctic operations — Metocean, ice, and seabed data*

IMO International Convention for the Safety of Life at Sea (SOLAS), 1974

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

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

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

3.1
abandonment
act of personnel on-board leaving an installation in an emergency

3.2
accommodation
place where personnel on-board 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.

3.3
annual risk tolerability criterion
ARTC
value of the individual and collective *risks* (3.50) per year of a fatality for persons, considering the amount of time spent in the operation and considering all risk sources, including workplace accidents, other incidents and *EER* (3.18) risks

3.4
anti-icing
measures to prevent ice from forming on surfaces, structures or equipment

Note 1 to entry: The intent of anti-icing is to make the surfaces, structures or equipment immediately available for use.

3.5
as low as reasonably practicable
ALARP
implementation of *risk* (3.50) reducing measures until the cost (including time, capital costs or other resources/assets) of further risk reduction is grossly disproportional to the potential risk reducing effect achieved by implementing any additional measure

3.6
casualty
serious injury or fatality resulting from an accident that occurs during the *EER* (3.18) process

3.7
cold-climate conditions
potential presence of combinations of low air temperatures, low seawater temperatures, wind, snow, ice, freezing fog, etc.

3.8
action
measure to limit the extent and/or duration of a hazardous event to prevent *escalation* (3.16)

3.9
direct evacuation
dry evacuation
movement of personnel from the installation directly to a *safe haven* (3.52) or to a vessel in the vicinity with the capability of safely reaching the platform without having to enter the sea or the ice cover

3.10
drills and exercises
activities undertaken to ensure verification of performance criteria, targets or requirements

3.11
duty holder
individual, legal entity or organization holding legal title to the equipment or process and accountable for the safety and welfare of all associated personnel

3.12
embarkation area

place from which personnel abandon the installation during *evacuation* (3.20)

3.13
emergency breathing system
EBS

compressed air emergency breathing system
CA-EBS
form of personal protective equipment that provides the user with a means to breathe underwater for at least one minute, overcoming the need to make a single breath last for the complete duration of an underwater *escape* (3.17) from a helicopter

Note 1 to entry: If used correctly, EBS can mitigate the *risk* (3.50) of drowning. EBSs are categorized as follows:

— Category A: capable of deployment in air and underwater within 12 s;

— Category B: capable of deployment in air within 20 s.

3.14
emergency
hazardous event which cannot be handled by normal measures and requires immediate *action* (3.8) to limit its extent, duration or consequences

3.15
emergency response
ER
action (3.8) taken by personnel on or off the installation to control or mitigate a hazardous event or initiate and execute *abandonment* (3.1)

3.16
escalation
increase in the consequences of a hazardous event

3.17
escape
act of personnel moving away from a hazardous event to a place on the installation where its effects are reduced or removed

3.18
escape, evacuation and rescue
EER
range of possible *actions* (3.8) in an *emergency* (3.14)

EXAMPLE *Escape* (3.17), *muster* (3.38), refuge, emergency or *precautionary evacuation* (3.44) and *rescue* (3.48).

3.19
escape route
normally available and unobstructed route from locations where personnel can be present on the installation to the *temporary refuge* (3.61) or alternative protected muster point

3.20
evacuation
planned method of abandoning the installation in an *emergency* (3.14)

3.21
evacuation craft
survival craft
marine or amphibious craft used by installation personnel to evacuate to the sea or ice cover

Note 1 to entry: An evacuation or survival craft provides evacuees with protection from the incident and the physical environment.

Note 2 to entry: This is a generic term that can cover lifeboats, life rafts, personnel basket or similar.

3.22
immersion suit
protective suit made of materials which reduce loss of body heat of a person wearing it in cold water or on the ice

3.23
first-year ice
FYI
sea ice of not more than one winter's growth

3.24
floe
relatively flat piece of sea ice greater than 20 m across

Note 1 to entry: Typical subcategories are: small (20 m to 100 m across), medium (100 m to 500 m across), big (500 m to 2 000 m across), vast (2 km to 10 km across) and giant (greater than 10 km across).

3.25
freeboard
ice freeboard
vertical distance from the mean sea surface to the ice surface

3.26
hazard
potential source of harm

3.27
hazard zone
largest possible area within which personnel safety is at *risk* (3.50) due to the installation *hazard* (3.26)

3.28
iceberg
glacial or shelf ice of greater than 5 m *freeboard* (3.25) that has broken (calved) away from its source

Note 1 to entry: Icebergs can be freely floating or grounded, and their shapes are sometimes defined as tabular, dome, pinnacle, wedge or block. Smaller pieces of ice are called bergy bits or growlers

3.29
ice detection
discrimination of ice features from the surrounding environment

3.30
ice island
large tabular-shaped ice feature that has calved from an ice shelf or glacier

3.31
ice management
active processes used to alter the ice environment with the intent of reducing the frequency, severity or uncertainty of ice actions

3.32
ice management plan
detailed plan outlining the objectives, active procedures involved and individual responsibilities for the implementation of the ice management strategy

3.33
indirect evacuation
movement of personnel from the installation to an intermediate *safe haven* (3.52) off the installation, such as an *evacuation* (3.20) craft

3.34
indirect evacuation system
system by which evacuees move from the *temporary refuge* (3.61) or muster point on the installation to a location outside the *hazard zone* (3.27) if they are able to do so

3.35
landfast ice
fast ice
ice that remains attached to a shoreline, island or a grounded ice feature

3.36
major incident
major accident
event with potential for multiple personnel casualties, significant environmental damage, installation failure, or any combination of these consequences

3.37
multi-year ice
sea ice that has survived at least one summer melt season

Note 1 to entry: When the term “multi-year ice” is used in conjunction with the term “second-year ice”, the former should be interpreted as ice that has survived at least two summer melt seasons.

3.38
muster
movement of people to a designated area(s) so that the person in overall charge can account for all people and thereby facilitate *emergency response* (3.15) *actions* (3.8)

3.39
muster station
MS
muster area
assembly station
designated area(s) to which personnel report when required to do so in an *emergency* (3.14)

3.40
offshore installation manager
OIM
person legally responsible for the installation and all operations on and around an offshore platform

3.41
pack ice
sea ice consisting of discrete *floes* (3.24) that are not *landfast ice* (3.35)

3.42
performance-based standard
standard that specifies in qualitative and quantitative terms the requirements of safety-critical systems and their elements

3.43
personnel on board
POB
total number of personnel on board the installation

Note 1 to entry: This includes visitors, vessel crews, cross-shift personnel on the installation transferring to vessel, helicopter or other means, etc.

3.44
precautionary evacuation
controlled means of removing personnel from the installation prior to an uncontrolled or escalating incident that can otherwise dictate an emergency *evacuation* (3.20)

3.45
preferred means of evacuation
method of choice for evacuating personnel based on the lowest *risk* (3.50) and on the familiarity, frequency of use, availability and suitability under prevailing conditions

Note 1 to entry: This is the method normally used to transfer personnel to and from the offshore location and could possibly not be available in an emergency.

3.46
primary means of evacuation
method of evacuating personnel that can be carried out in a controlled manner under the direction of the person in charge

Note 1 to entry: This is the *preferred means of evacuation* (3.45) of the installation in an emergency.

3.47
recovery
retrieval
transfer of evacuees to a rescue vessel, helicopter, safe installation or other *safe haven* (3.52)

3.48
rescue
process by which those who have evacuated, survived until a *safe haven* (3.52) is available and are retrieved to a place where medical assistance is generally available

3.49
ridge
ice ridge
linear ice feature, formed of ice blocks created by the relative motion between ice sheets

Note 1 to entry: A pressure ice ridge is formed when ice sheets are pushed together, and a shear ice ridge is formed when ice sheets slide along a common boundary.

3.50
risk
probability that a specified undesirable event will occur combined with the severity of the consequences of that event

3.51
rubble field
region of broken ice blocks floating together as a continuous body

3.52
safe haven
area outside the *hazard zone* (3.27) in which personnel safety is no longer at *risk* (3.50) due to the installation *hazard* (3.26) or physical environmental risks, and where medical attention is normally available

EXAMPLE A safe haven can be a rescue helicopter or a *standby vessel* (3.58).

3.53
safety-critical element
SCE
item of equipment, procedure or structure whose failure can lead to a *major incident* (3.36) or whose purpose is to prevent or limit the consequences of a major incident

3.54
scenario risk tolerability criterion
SRTC
upper limit of the individual and collective *risk* (3.50) for any *EER* (3.18) scenario

3.55
secondary means of evacuation
method of evacuating personnel in an *emergency* (3.14) when the primary *means of evacuation* (3.46) cannot be used, which can be carried out in a fully controlled manner under the direction of the person in charge, independent of external support

Note 1 to entry: This means of *evacuation* (3.20) does not provide as much protection from *hazards* (3.26) and the elements as does the *primary means of evacuation* (3.46) but it can avoid immersion in the sea/ice.

3.56
second-year ice
sea ice that has survived one summer's melt season

Note 1 to entry: Second-year ice is sometimes referred to as *multi-year ice* (3.37).

3.57
stamukha
grounded ice feature composed of broken ice pieces or rubble

Note 1 to entry: The plural form of "stamukha" is " stamukhi".