



SLOVENSKI STANDARD SIST EN ISO 35104:2020

01-december-2020

**Industrija za predelavo nafte in zemeljskega plina - Obratovanje v arktičnem okolju
- Upravljanje z ledom (ISO 35104:2018)**

Petroleum and natural gas industries - Arctic operations - Ice management (ISO 35104:2018)

Erdöl- und Erdgasindustrie - Arktisbetrieb - Eismanagement (ISO 35104:2018)

Industries du pétrole et du gaz naturel - Opérations en Arctique - Gestion des glaces
(ISO 35104:2018)

iTeh STANDARD PREVIEW
(standards.itteh.ai)

SIST EN ISO 35104:2020

Ta slovenski standard je istoveten z: EN ISO 35104:2020

<http://standards.itteh.ai/catalog/standards/sist/35104-2020/en-iso-35104-2020>
<https://standards.itf604614f/sist-en-iso-35104-2020>

ICS:

75.020

Pridobivanje in predelava
nafte in zemeljskega plina

Extraction and processing of
petroleum and natural gas

SIST EN ISO 35104:2020

en,fr,de

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN ISO 35104:2020

<https://standards.iteh.ai/catalog/standards/sist/542cbeb6-6a37-42ef-82dc-62fef604614f/sist-en-iso-35104-2020>

EUROPEAN STANDARD

EN ISO 35104

NORME EUROPÉENNE

EUROPÄISCHE NORM

October 2020

ICS 75.020

English Version

Petroleum and natural gas industries - Arctic operations - Ice management (ISO 35104:2018)

Industries du pétrole et du gaz naturel - Opérations en
Arctique - Gestion des glaces (ISO 35104:2018)

Erdöl- und Erdgasindustrie - Arktisbetrieb -
Eismanagement (ISO 35104:2018)

This European Standard was approved by CEN on 4 October 2020.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

<https://standards.iteh.ai/catalog/standards/sist/542cbeb6-6a37-42ef-82dc-62fe604614f/sist-en-iso-35104-2020>



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Contents	Page
European foreword.....	3

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN ISO 35104:2020
<https://standards.iteh.ai/catalog/standards/sist/542cbeb6-6a37-42ef-82dc-62fef604614f/sist-en-iso-35104-2020>

European foreword

The text of ISO 35104:2018 has been prepared by Technical Committee ISO/TC 67 "Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries" of the International Organization for Standardization (ISO) and has been taken over as EN ISO 35104:2020 by Technical Committee CEN/TC 12 "Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries" the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2021, and conflicting national standards shall be withdrawn at the latest by April 2021.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

iTeh STANDARD PREVIEW
Endorsement notice
(standards.iteh.ai)

The text of ISO 35104:2018 has been approved by CEN as EN ISO 35104:2020 without any modification.

<https://standards.iteh.ai/catalog/standards/sist/542cbeb6-6a37-42ef-82dc-62fef604614f/sist-en-iso-35104-2020>

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN ISO 35104:2020

<https://standards.iteh.ai/catalog/standards/sist/542cbeb6-6a37-42ef-82dc-62fef604614f/sist-en-iso-35104-2020>

INTERNATIONAL
STANDARD

ISO
35104

First edition
2018-10

**Petroleum and natural gas
industries — Arctic operations — Ice
management**

*Industries du pétrole et du gaz naturel — Opérations en Arctique —
Gestion des glaces*

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN ISO 35104:2020](https://standards.iteh.ai/catalog/standards/sist/542cbeb6-6a37-42ef-82dc-62feff604614f/sist-en-iso-35104-2020)

<https://standards.iteh.ai/catalog/standards/sist/542cbeb6-6a37-42ef-82dc-62feff604614f/sist-en-iso-35104-2020>



Reference number
ISO 35104:2018(E)

© ISO 2018

iTeh STANDARD PREVIEW (standards.iteh.ai)

SIST EN ISO 35104:2020

<https://standards.iteh.ai/catalog/standards/sist/542cbeb6-6a37-42ef-82dc-62fef604614f/sist-en-iso-35104-2020>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2018

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

	Page
Foreword	vi
Introduction	vii
1 Scope	1
2 Normative references	1
3 Terms, definitions and abbreviations	2
3.1 Terms and definitions.....	2
3.2 Abbreviated terms.....	5
4 General ice management requirements	6
4.1 Fundamental requirements for an ice management system.....	6
4.1.1 General.....	6
4.1.2 Ice management plan.....	6
4.1.3 Ice alert system.....	6
4.1.4 Hazardous ice conditions.....	7
4.2 Safety requirements.....	7
4.2.1 Ice management approach.....	7
4.2.2 Redundancy.....	7
4.2.3 Existing operations.....	7
4.3 Safe learning.....	8
4.3.1 Safe learning principles.....	8
4.3.2 Continuous improvement.....	8
4.4 Risk management.....	8
4.4.1 General requirements.....	8
4.4.2 Hazard identification and consequences.....	8
4.4.3 Responsibility for risk management.....	9
4.4.4 Use of risk assessment.....	9
4.5 Health, safety, security and environment.....	9
4.5.1 Health, safety, security and environment plan.....	9
4.5.2 Safe working environment.....	9
4.5.3 Incident reporting.....	10
4.5.4 Compliance with health, safety, security and environment requirements.....	10
4.6 Organizational functions and procedures.....	10
4.6.1 General requirements.....	10
4.6.2 Organization and communication.....	10
4.7 Specific design, planning and execution requirements.....	11
5 Ice management plan (IM plan)	12
5.1 IM plan scope.....	12
5.2 IM plan implementation.....	12
5.3 IM plan maintenance.....	13
6 Ice management system performance	13
6.1 High-level IM system issues.....	13
6.2 Measures of IM performance.....	13
6.3 Demonstration of intended performance.....	14
6.4 IM system design.....	14
6.5 Degradation of ice alert and IM system performance.....	14
6.6 Operating ice envelope.....	15
6.7 Operational readiness of IM system.....	15
6.8 Performance monitoring and documentation.....	15
6.9 Maintenance and improvement.....	15
7 Data requirements	15
7.1 General ice management data requirements.....	15
7.2 Parameters and conditions.....	16
7.2.1 Ice and metocean parameters.....	16

ISO 35104:2018(E)

7.2.2	Monitoring of operational parameters	17
7.2.3	Combined situations	17
7.2.4	Managed ice conditions	17
7.2.5	Wildlife observations	17
7.3	Timeline	17
7.3.1	Planning situations	17
7.3.2	Strategic situations	18
7.3.3	Tactical situations	18
7.3.4	Phases of operations	19
7.4	Forecasting	19
7.4.1	General	19
7.4.2	Accuracy	19
7.4.3	Metocean data	20
7.4.4	Ice management forecast parameters	20
7.4.5	Nowcasts	21
7.4.6	Forecasts for weather windows	21
7.5	Data collection	21
7.5.1	General	21
7.5.2	Data quality	21
7.6	Data organization	22
7.6.1	General requirements	22
7.6.2	Accuracy and bias of data	22
7.6.3	Instrument specifications	22
7.6.4	Data backup	22
7.7	Data dissemination	22
7.7.1	General	22
7.7.2	Communications and infrastructure	23
7.7.3	Presentation	23
8	Ice detection and tracking	23
8.1	Objectives	23
8.2	System criteria	24
8.3	Detection capabilities	24
8.4	Tracking capabilities	24
9	Threat evaluation and response	25
9.1	Threat evaluation strategy	25
9.2	Identification of ice hazards	25
9.3	Methods for threat evaluation	26
9.4	Key concepts	27
9.4.1	T-time	27
9.4.2	T-distance	27
9.4.3	Ice hazard distance	27
9.4.4	Ice hazard time	27
9.4.5	Ice drift speed	27
9.4.6	Closest point of approach	27
9.5	Ice alert levels and zones	28
9.5.1	Zoning strategy	28
9.5.2	Monitoring zone	28
9.5.3	Management zones	28
9.5.4	Secure zones	28
9.5.5	Exclusion zone	28
9.6	T-time calculations	28
9.7	Stages of threat assessment	29
9.8	Models for ice actions	29
9.9	Situations requiring increased vigilance	29
9.10	Infrequent, unanticipated and unforecast ice events	29
10	Physical ice management	30
10.1	Selection criteria	30

10.2	IM vessel requirements	30
10.3	Operation-specific procedures	31
10.4	Preparedness	31
10.5	Physical IM strategies and techniques	31
10.6	Ice-restricted operations	32
10.7	Effects of IM	32
11	Personnel and training	32
11.1	IM personnel requirements	32
11.2	General training requirements	33
11.3	Requirements for training	33
11.3.1	Organizations offering ice management training	33
11.3.2	Training personnel	33
11.3.3	Training facility	34
11.3.4	Training elements	34
11.3.5	Training requirements for monitoring and advisory personnel	35
11.3.6	Training requirements for other personnel	35
11.3.7	Training curriculum	35
11.4	Ice management training: specific requirements	36
11.4.1	General	36
11.4.2	Operations in arctic and cold regions	36
11.4.3	Field experience	36
	Annex A (informative) Ice management HAZID workbook	37
	Annex B (informative) Additional information and guidance	38
	Bibliography	91

iteh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN ISO 35104:2020](https://standards.iteh.ai/catalog/standards/sist/542cbeb6-6a37-42ef-82dc-62fef604614f/sist-en-iso-35104-2020)

<https://standards.iteh.ai/catalog/standards/sist/542cbeb6-6a37-42ef-82dc-62fef604614f/sist-en-iso-35104-2020>

ISO 35104:2018(E)

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).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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

This document specifies requirements and recommendations applicable to ice management for oil and gas operations in arctic and cold regions.

Ice management (IM) is defined as the sum of all activities, carried out with the objective to mitigate hazardous situations by reducing or avoiding actions from any kind of ice (sea ice or glacial ice), and includes:

- establishment of an understanding of the ice regime and potential ice hazards prior to the initiation of operations;
- operational surveillance, including detection, tracking and forecasting;
- identification and evaluation of any physical threat to the operation;
- a working ice alert system and associated procedures;
- physical ice management by the supporting IM vessels, including ice breaking and/or iceberg management;
- procedures associated with the safe avoidance of potentially hazardous ice;
- documentation of IM performance and revision of the IM system to ensure continuous improvement;
- relevant procedures associated with the safe shut-down of floating structures (moored or DP), both active (move off and ice management) or semi passive (ice management, but no move off);
- relevant procedures associated with the safe shut-down of bottom-founded structures, both active (with ice management and move-off capability), or passive (fixed with ice management).

This document describes performance requirements and recommendations to ensure timely identification of ice hazards, their mitigation through ice management, and securement of the facility if necessary.

This document is intended to ensure that ice management operations are planned, engineered, integrated and implemented whenever needed. Performance requirements of an ice management system can depend on the type of facility and the operations undertaken on the facility. Particular emphasis is placed on ensuring adequate performance in circumstances where there is little prior experience with a particular facility or in a particular geographical region.

This document consists of a normative part and an informative part. The normative part considers the overall operations, hazards and possible counter measures, systems and procedures.

[Annex A](#) contains a HAZID workbook, which is to be used in conjunction with the relevant clauses when preparing an ice management plan.

[Annex B](#) provides informative data, which supplements the normative part and is to be read in conjunction with the main body of the document.

There are other International Standards which are also relevant to ice management, such as ISO 35101 for working environments and ISO 35106 for arctic and cold regions data requirements (for design and operation). In addition, ISO 19900 specifies general principles for the design and assessment of offshore structures subjected to known or foreseeable types of actions, applicable worldwide to all types of offshore structures, including bottom-founded structures as well as floating structures, and ISO 19906 specifies requirements and provides recommendations and guidance for the design, construction, transportation, installation and removal of offshore structures, related to the activities of the petroleum and natural gas industries in arctic and cold regions.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN ISO 35104:2020

<https://standards.iteh.ai/catalog/standards/sist/542cbeb6-6a37-42ef-82dc-62fef604614f/sist-en-iso-35104-2020>

Petroleum and natural gas industries — Arctic operations — Ice management

1 Scope

This document establishes the principles, specifies the requirements and provides guidance for ice management (IM) in arctic and cold regions, from the point of view of planning, engineering, implementation and documentation. Reference to arctic and cold regions in this document is deemed to include both the Arctic and other regions characterized by low ambient temperatures, sea ice, icebergs and icing conditions. These regions are often remote and lacking in marine and communications infrastructure.

Ice management to support the following in-ice activities and infrastructures are covered by this document:

- floating moored and/or dynamically positioned drilling vessels, coring vessels, production facilities and work-over vessels;
- construction and installation (includes trenching, dredging, pipe laying);
- tanker loading and other offloading operations;
- protecting subsea structures and equipment;
- seismic operations;
- oil spill response;
- bottom founded structures (fixed platforms and movable structures, including jack-ups).

This document also applies to mobilization, demobilization and construction support services, because these can be affected by ice conditions.

In view of the wide range of possible offshore operations in arctic and cold regions, this document provides guidelines, but does not present typical ice management plans for field operations.

This document does not provide requirements, recommendations or guidance pertaining to the design of structures, systems and components used in ice management, beyond the principles given. This document does not provide specific formulations for ice loads, which are covered by ISO 19906.

This document is not applicable to coastal port operations and to commercial trading vessels conducting transit or convoy operations.

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 19901-1, *Petroleum and natural gas industries — Specific requirements for offshore structures — Part 1: Metocean design and operating considerations*

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

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