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ARCTIC COUNCIL

FINAL REPORT: STANDARDIZATION AS A TOOL FOR

PREVENTION OF OIL SPILLS IN THE ARCTIC

Final Report: Standardization as a tool for prevention of oil spills in the Arctic

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Bureau of Safety and Environmental Enforcement

EMERGENCY PREVENTION, PREPAREDNESS AND RESPONSE

ARCTIC COUNCIL

Final report: Standardization as a tool for prevention of oil spills in the Arctic

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Arctic Council – EPPR
Standardization as a tool for prevention of oil spills in the Arctic

Client:	**Contact person:**
Arctic Council - EPPR	Ole Kristian Bjerkemo

Resume:

This final report on "Standards for the Prevention of Oil Spills from Offshore Oil and Maritime Industry in the Arctic" has been prepared for the Arctic Council - Emergency, Prevention, Preparedness and Response (EPPR) Working Group as a response to the Task Force on Pollution Prevention (TFOPP) Framework Plan recommendation "Promotion of standardization activities". The work has been financed by the Norwegian Ministry of Foreign Affairs and administered by the Norwegian Coastal Administration (NCA).
The final report will be presented and discussed at the IOGP workshop in Montreal, June 14th 2016 and at the EPPR workshop June 15-16th. If necessary the report will be updated based on these discussions. A condensed summary report will be prepared for the Arctic Council meeting in 2017.

Key word	standards, offshore petroleum, maritime, oil spill prevention, Arctic
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02	01.04.2016	2nd draft report – including comments from EPPR members and others, further processing.
03	20.05.2016	Preliminary Final report - including comments from various organisations. For discussion at IOGP/EPPR meeting and at EPPR meeting in June 2016
04	30.07.2016	Final report including g comments from nnsa.doe.gov and USCG
05	21.11.2016	Incorporated text from Alaska and Norway

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1 Summary

The report on “Standards for the Prevention of Oil Spills from Offshore Oil and Maritime Industry in the Arctic” has been prepared for the Arctic Council - Emergency, Prevention, Preparedness and Response (EPPR) Working Group as a response to the Task Force on Pollution Prevention (TFOPP) Framework Plan recommendation “Promotion of standardization activities”. The work has been financed by the Norwegian Ministry of Foreign Affairs and administered by the Norwegian Coastal Administration (NCA).

The purpose of the work is to describe how necessary engineering and technical standards are identified, developed, established, and maintained. Furthermore the work done by various international trade groups and standards organizations are described, and participants in the various phases of the work have been identified.

Reports, recommended practices and guidelines, previously prepared by the Arctic Council, trade organisations and others, representing a background for the development of Standards for the Prevention of Oil Spills in the Arctic, are described.

The work relates to offshore petroleum and maritime activities. Petroleum activities (oil and gas) include exploration; drilling and production; subsea and topside installations; internal and external transportation pipelines, and offshore storage and offloading facilities. Drilling or stationary petroleum activities performed by mobile offshore drilling units (MODUs) are included in petroleum activities.

Maritime activities include all kinds of shipping; including cruise traffic, fisheries in international waters, national and international transportation of products, transportation of crude oil and petroleum products and petroleum service vessels. MODU’s under transit are Maritime activities.

The roles and functions of a total of 47 organizations in the Arctic states, dealing with standardization in one form or another, both nationally and internationally in the maritime and petroleum sectors, are presented. In the maritime industry, the equivalent to standards is Codes and Class Rules.

Some organizations develop standards, some organize standardization work, some apply standards in regulations and others recommend use of standards. The roles and functions of each organization are shown in Table 2-1 of the report.

Normally the standardization process consists of the following elements (in short):

- Individuals, companies, industry associations or NGO’s can propose a standard, a standard development or a standard revision.
- The need for a standard development is considered by the nation’s standardization organization
- A standard development project is typically initiated with a ballot and establishment of a technical working committee.
- Members of the technical committee can be representatives from industry (associations), research institutes, certification bodies, government, NGOs and other interested parties.
- A committee draft standard is sent for hearing to relevant stakeholders (authorities, organizations and industry groups / associations). The hearing is normally public.
- Following the hearing, comments are incorporated into the standard.
- The standard is sent for voting to the relevant stakeholders / nations.
- Given a majority approval, the standard is published as a national or international standard.
- Standards (which per ISO definition includes a variety of documents) may also be published as industry guidelines, recommended practices etc. and not only national or international Standards.

Usually participation in standardization work is voluntary and the work is consensus based. The process is somewhat different between national and international standardization projects, but the principles are

the same. Typically the time to develop a new international standard is 3-5 years. Revision of standards normally occur at intervals of 5-10 years to take into account the technical development.

Both the petroleum industry and the maritime industry apply a wide range of standards both for construction and design and for their daily operations. Many standards contribute to preventing oil spills and are generally applicable. Therefore, while the number of "Arctic-specific" standards is relatively limited, there are in fact many standards that contribute to preventing incidents in the Arctic.

Standards which are specifically focusing on prevention of oil spills in the Arctic has not been identified. It is however recognized that a wide range of safety related industrial standards are relevant for prevention of oil pollution in general and thus are also applicable in the Arctic.

One standard, the ISO 19906:2010 - Arctic offshore structures, has been published and is currently under revision. This is an important standard for design and construction of Arctic petroleum installations. National variations of this standard also exist.

The work done by the Barents 2020 project has formed an important basis for the development of Arctic Petroleum Operation standards within the International standards Organization (ISO) in ISO/TC 67/SC 8, where six new ISO standards are under development. These are:

- ISO 35101 - Working environment
- ISO 35102 - Escape, evacuation and rescue from offshore installations
- ISO 35103 - Environmental monitoring
- ISO 35104 - Ice management standard
- ISO TS 35105 - Material requirements for Arctic operations
- ISO 35106 - Arctic metocean, ice and seabed data

The ISO 35103 Environmental monitoring standard addresses the monitoring of both regular discharges and acute spills, but does not specifically address the prevention of oil pollution.

In the petroleum sector, regulators often utilise standards as recognised best practices. In some countries the standards are made mandatory when included in the regulations, while in other countries standards are included as guidelines or as examples of a way to comply with the regulations.

For the Maritime sector, the Polar Code developed by the International Maritime Organization (IMO) form the central document for Prevention of Oils Spills in the Arctic from maritime activities and will, in practice, function as a combination of a standard and an international regulation. Internationally adopted Conventions, Codes and Class Rules are mandatory for vessels in international waters, while within the harbour states national waters, the harbour state include a set of Codes and Class rules into their regulations and define which to include. Conventions are binding for ratifying nations.

IMO has adopted the International Code for Ships Operating in Polar Waters (Polar Code) and related amendments to make it mandatory under both the International Convention for the Safety of Life at Sea (SOLAS) and the International Convention for the Prevention of Pollution from Ships (MARPOL).

The Polar Code and SOLAS amendments were adopted during the 94th session of IMO's Maritime Safety Committee (MSC), in November 2014; the environmental provisions and MARPOL amendments were adopted during the 68th session of the Marine Environment Protection Committee (MEPC) in May 2015.

The Polar Code is expected to enter into force on 1 January 2017.

2 Introduction

2.1 Background

One outcome of the Ministerial meeting of the Arctic Council in Kiruna, Sweden, in 2013, was the establishment of the Task Force on Oil Pollution Prevention (TFOPP). The TFOPP was given a mandate to develop an Arctic Council action plan or other arrangement on oil pollution prevention, and to present the outcomes of its work and any recommendations for further action at the Ministerial meeting in 2015.

The background of this report is the Framework plan developed by the TFOPP, which was based on negotiations within the TFOPP. The Framework Plan applies to petroleum and maritime activities in the marine areas of the Arctic that entail a risk of oil pollution to the Arctic marine environment.

The Framework Plan recommends to promote the development of standards and/or best practices relevant to the prevention of oil pollution in the Arctic from petroleum exploration and production activities, e.g., well design, source control, capping, containment and other technical and operational measures.

In their meeting in June 2015, the Arctic Council working group EPPR (Emergency, Prevention, Preparedness and Response) supported a proposal from Norway to initiate a project to address the role of the recommendations in the Framework Plan. This report is a direct follow up activity of the recommendation, “Promotion of standardization Activities”.

Furthermore the Framework Plan recommends measures to prevent oil pollution from maritime activities such as traffic management and maritime services as well as risk reductions related to transportation, storage and use of heavy fuel oil.

The goal of the EPPR Working Group is “*to contribute to the protection of the Arctic environment from the threat or impact that may result from an accidental release of pollutants or radionuclides”.*

EPPR addresses various aspects of prevention, preparedness, and response to environmental emergencies in the Arctic. Members of the working group exchange information on best practices and conduct projects to include development of guidance and risk assessment methodologies, response exercises, and training. The goal of the EPPR working group is to “contribute to the protection of the Arctic environment from the threat or impact that may result from an accidental release of pollutants or radionuclides”. In addition, the working group considers issues related to response and to the consequences of natural disasters. In their reports “Recommended Practices for Arctic Oil Spill Prevention” and the related “Summary report” EPPR has described standards as an important tool to prevent oil pollution.

A preliminary version of this report was provided as input to a workshop facilitated by the International Association of Oil and Gas Producers (IOGP) in cooperation with the EPPR in Montreal, June 2016. IOGP had proposed the following objectives for the workshop: “*To increase awareness of the overall standards process, and to establish a dialogue between the Arctic Council and industry regarding how standards are identified, developed and maintained, and future needs for Arctic standards. This is intended to contribute to EPPR deliverables, and may assist in the wider Arctic Council arena towards sharing information on how oil and gas operations are undertaken in the Arctic.*”

After the workshop comments provided by EPPR members have been incorporated into the final report, which provide information about what standards are, how they are developed and maintained.

The report is supposed to form a knowledge base for improved understanding on the development and maintenance of standards to prevent potential accidents with subsequent oil pollution in the Arctic from offshore petroleum and maritime activities.

The final report is prepared by Proactima for the Norwegian Coastal Administration (NCA), acting on behalf of the EPPR. The final report will be handled by EPPR for further processing.

2.2 Scope of work and focus areas

2.2.1 Scope of work

The purpose of the work is to describe how necessary engineering and technical standards are identified, developed, established, and maintained. Furthermore the purpose is to describe the work done by various international trade groups and standards organizations, and identify who participates in the various phases of the work.

The work relates to offshore petroleum and maritime activities. Petroleum activities (oil and gas) include exploration; drilling and production; subsea and topside installations; internal and external transportation pipelines, and offshore storage and offloading facilities. Drilling or stationary petroleum activities performed by mobile offshore drilling units (MODUs) are petroleum activities.

Maritime activities include all kinds of shipping; including cruise traffic, fisheries in international waters, national and international transportation of products, transportation of crude oil and petroleum products and petroleum service vessels. MODUs under transit are Maritime activities.

2.2.2 Focus areas

The focus of the project has been on international standardization and on standardization work, contributing to development of standards relevant to prevention of oil pollution in the Arctic, within the Arctic Council countries.

The report describes standardization organizations, their standard development work processes and identified standards to prevent oil pollution from offshore petroleum and maritime activities, to the extent this has been evident. Furthermore, some Guidelines and recommended practices have been mentioned.

2.2.3 Scope of work limitations

It has been defined by the EPPR co-leads that standards for oil spill preparedness and response are not part of the scope of work.

Best practices and standards developed to prevent accidents and acute oil spills outside the Arctic naturally form a basis for identical challenges found inside the region, but these have not been the primary focus of the report. It is assumed that both petroleum and maritime activities will or have already adopted, in whole or in part, these best practices and standards. In addition it is assumed that the industries will address the special conditions present in the Arctic, through development and application of standards, Guidelines and best practices for their Arctic operations.

Standards that are not Arctic specific are outside the scope of work for the report. However, a number of standards for petroleum and maritime activities have been described or listed in the Appendices. It is recognized that a wide range of petroleum and maritime standards are relevant for the prevention of oil pollution, however some may need modifications or additions to be applicable for the Arctic, or additional standards may be needed.

How standards are used in the Petroleum and Maritime industries and in National regulations are outside the scope of the report, however the role of standards as part of regulations have been included, where identified.

It has not been part of scope for this work to consult with all listed organizations for verification of their specific descriptions within the report, however a significant number of organizations have been consulted and have provided valuable additional input.

Throughout the work it has been sought to balance information related to both petroleum and maritime activities. However, this has been difficult as much more information is available for the petroleum activities, and as the standardization work is less complex in the Maritime sector with IMO as the international standardization organization and main regulatory body for maritime activities in international waters.

Other countries, not included in the report, may also have standardization activities relevant for petroleum and maritime activities in the Arctic, e.g. the Netherlands Dutch Polar Strategy 2016-2020, in which international standardization is one of the important instruments.

2.3 Method

Figure 2-1 below illustrates the work process for the project. This report corresponds to the final report defined to be the result of phase 3 of the project.

The work encompasses gathering information from a wide range of sources, amongst others open sources publicly available on the internet, in addition to reports and information provided to the project.

As much of the information has been gathered from various organizations' publicly available webpages, it has been sought to remove or replace commercial phrases with more neutral text.

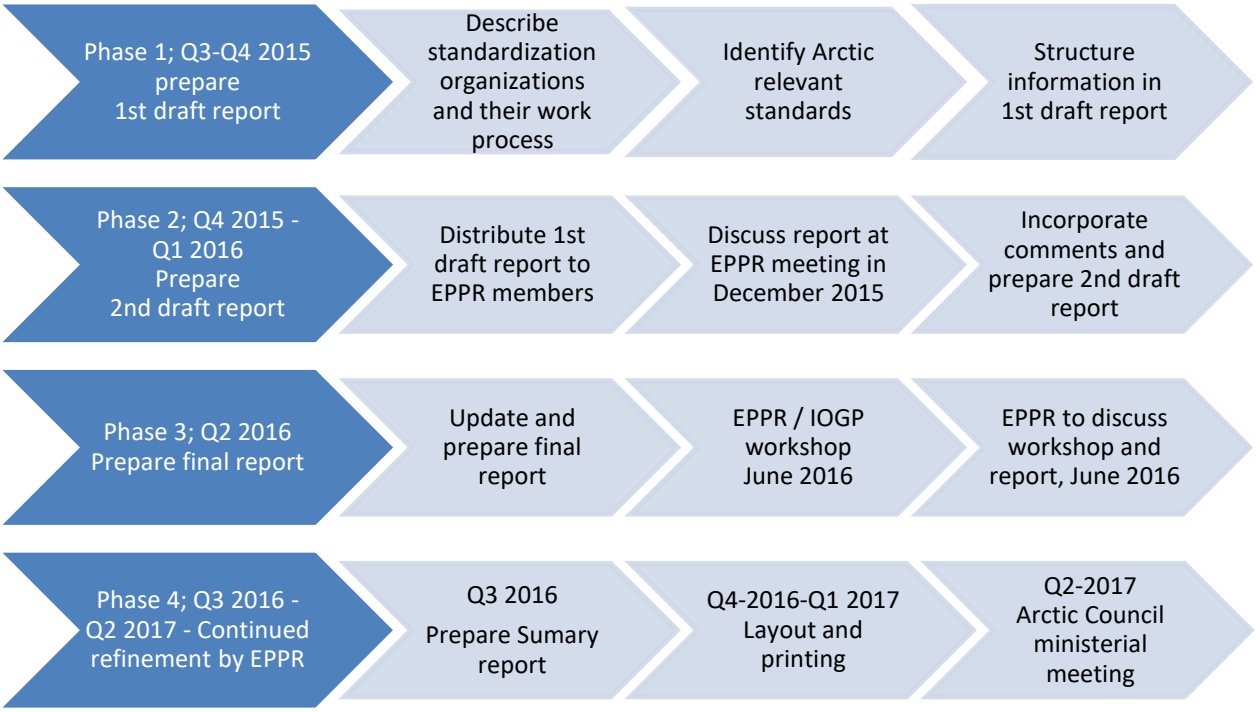

Figure 2-1 Work process for the EPPR standards project. Approach for identifying and describing standards to prevent oil pollution from offshore petroleum and maritime activities in the Arctic. Phase 3 has been modified in the final report.

Phase 3 of the project was slightly revised due to technical difficulties with arrangement of EPPR/IOGP workshop in April 2016, as originally planned. The workshop was moved to June 2016 at the EPPR meeting in Montreal, where the report was briefly presented. The final report was updated after the EPPR meeting, and a summary report will be prepared by EPPR for the Arctic Council Ministerial meeting in 2017.

Representatives of American Petroleum Institute (API), Bureau of Safety and Environmental Enforcement (BSSE, USA), Canadian National Energy Board (NEB), Defence Command Denmark, Federal Foreign Office - Germany, IOGP, the Netherlands Institute for Standardization (NEN), Norwegian Maritime Authority (NMA), Norwegian Oil and Gas Association, Norwegian Petroleum Safety Authority (PSA), Norwegian Shipowners' Association (NSA), Standards Norway, Russian delegation to EPPR and U.S. Coast Guard (USCG), all have provided input or revisions to the report. Furthermore, some stakeholders involved in standard development by the ISO/TC 67/SC 8 committee, have been consulted.

Information structuring:

In order to ensure that the information gathered is within the scope of this work, a template has been developed for describing both the standard organizations and their work. The information provided is structured according to the following:

- About - Brief description of the organization
- Members - Who do they represent?
- What they do, including their role in standardization – Develops, Supports Development, Uses, Promotes, Regulator, standardization organization, standard developer, Provide recommendations etc.
- Work process - How do they work?

Identified standards, Guidelines and reports relevant to the prevention of oil spills in the Arctic from Petroleum and Maritime activities are mentioned under the various organizations. Brief descriptions of these documents are provided in Appendix II.

2.4 Report structure

The report is organized with the following topics:

- Section 1 – Summary
- Section 2 – Introduction
- Section 3 – International organizations and their role in standardization work
- Section 4 - National standardization systems and organizations
- Section 5 – Other input to standard development

Section 2 contains the background, scope of work and limitations as well as description of method, report structure, a generic description of standardization and an overview of the roles and functions of the various organizations described in the report.

Sections 3 to 4 of the report are structured alphabetically.

Section 3 provides information on the international organizations' role in standardization, some develop standards themselves and others do not. For the latter, their standardization process is also described.

Section 4 provides information about national standardization organizations and their work processes. To some extent this section also includes national regulatory bodies using or referring to standards as part of their regulations.

Section 5 provides a brief description of various reports and organizations providing recommendations for standard development.

The following Appendices are included:

Appendix I	Abbreviations
Appendix II	International organizations - relevant standards, Guidelines and reports
Appendix III	Classification Societies – relevant Classification Rules and Guidelines

2.5 About standardization

"*standardization is the activity of establishing, with regard to actual or potential problems, provisions for common and repeated use, aimed at the achievement of the optimum degree of order in a given context.*" (ISO/IEC Guideline 2:2004). In particular, the activity consists of the processes of formulating, issuing and implementing standards. Important benefits of standardization are improvement of the suitability of products, processes and services for their intended purposes, prevention of barriers to trade and facilitation of technological cooperation

A definition of a **standard** is a "*Document for common and repeated use, brought forward by consensus and approved by a recognised body providing rules, Guidelines or criteria for standardization activities and their results, to achieve optimal order of a specific context*." (ISO/IEC Guideline 2:2004). Standards should be based on the consolidated results of science, technology and experience, and aimed at the promotion of optimum community benefits.

The purpose of a standard is to secure that industry follow the same principles for their production of goods and services. This is supposed to lead to more generic solutions which are cost and time efficient. A standard should also represent some form of acceptance of quality and reliability and is a basis for

comparison between companies and solutions. Standards, in particular safety standards, may contribute to the prevention of accidents and oil spills. There are also a large number of piping and equipment standards that prevent accidents and oil spills by providing adequate design rules so pipes and equipment do not fail.

Standards typically represent an industry level of current good / best practice, and in that sense also include a level of risk / performance. Combining the supporting use of risk assessment and the use of standards promotes acceptable performance levels.

In standardization the term voluntary participation and consensus are often used. These terms may have somewhat different meaning by the various organizations and nations described. Our interpretations of the terms are:

Voluntary participation: Organisations participate in standardization work by free will and are free to participate if they wish.

Voluntary use: International standards are not mandatory to use, unless national regulators have made them mandatory by reference in their legislation.

Consensus, as defined by ISO (ISO/IEC Directives Part 1:2015, 2.5.6): General agreement, characterized by the absence of sustained opposition to substantial issues by any important part of the concerned interests and by a process that involves seeking to take into account the views of all parties concerned and to reconcile any conflicting arguments.

2.5.1 standardization in the Petroleum Industry

In most of the countries assessed, the standard development process in principle follows the following steps as illustrated in Figure 2-2 and described below, although with some differences.

Figure 2-2 General approach to standard development

Initiative / need for standard

1. Individuals, companies or industry associations see a need for a standard, a standard development or a standard revision. Examples are the Norwegian Oil and Gas Association's

NORSOK initiatives, the Norwegian Foreign Office and DNV's Barents 2020 project, and the initiatives taken to develop the IMO Polar Code.

2. The need for a standard development is communicated as a proposal to the nation's standardization organization which considers the proposal versus national priorities and budget possibilities.
3. If relevant the national standard organization consults with an international standard development organization to organize an international standard development project.
4. Standard development can also be initiated at an international level directly.

Development of standard

5. If a sufficient number of national standard organizations agree, an international standard development project is established and a working committee with experts on the area is appointed.
6. Usually each nation's standards organization will organize the nation's committee members and assure harmonization of opinions to take care of the nation's interests. Members of the technical committee can be representatives from industry (associations), research institutes, certification bodies, government, NGOs and other interested parties.
7. When a committee draft standard has been prepared, this is sent for hearing to relevant authorities, organizations and industry groups / associations. This hearing is normally public.

Finalization of standard

8. After committee hearing, comments are incorporated into a draft national or international standard.
9. The draft national standard is sent for comments to the relevant stakeholders while a draft international standard is sent for comment to the nations standardization organizations.
10. Thereafter comments are incorporated and the standard is issued as a final draft national or international standard which is sent to the members of the standardization organization for voting.
11. After a voting process, with majority, the final draft standard will then be issued by the national or international standardization body as an national or international standard.
12. An International standard may then also be adopted as a national standard, in some cases with national additions or modifications.
13. For CEN members, European standards are mandatory for adoption as national standards.

Participation in standardization work is usually voluntary and consensus based. Within the Oil and Gas industry, there is broad stakeholder recognition that prescriptive approaches alone are not sufficient to prevent incidents in innovative/high technology industries. Standards represent one tool within a wider risk management process, where risk assessment supports and tailors needs beyond the scope of generic standards.

An illustration of the role of standards in the larger context of building knowledge and experience as well as regulations for the Arctic is shown in Figure 2-3. Both company requirements, recommended practices and Guidelines provide important elements of the standardization process.

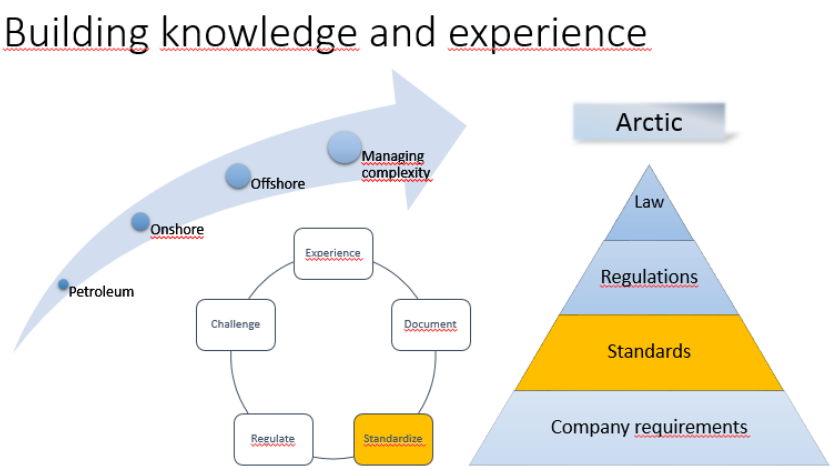

Figure 2-3. The role of standardization in the process of building knowledge, experience and regulations for the Arctic. From presentation at EPPR meeting Dec. 2015. Source: Petroleum Safety Authority (PSA).

Development of standards can be a time consuming process. As an example, the Arctic standards now under development by ISO/TC 67/SC 8 (see section 3.6) were initiated in late 2012. The development of these standards was to a large extent based on the work done during 2008 - 2012 by the Barents 2020 project, described in section 5.1. The committee drafts were issued in late 2015 and one additional year is expected before the new international standards are published.

Typically the time to develop a new International standard is 3-5 years. Revision of standards typically occur at intervals of 5-10 years.

standardization is also undertaken outside of the established standards organizations. This was the case for the Barents 2020 and NORSOK initiatives. In such cases the proposal for a standard may be directed to the appropriate national or international standards organisation, ISO, IEC, SENELEC or others.

2.5.2 standardization in the Maritime Industry

The standardization process in the Maritime Industry differs somewhat from that of petroleum and land based industries.

In principle IMO Conventions and Codes provide the foundation. The Flag State or Harbour State base their regulations on IMO codes and conventions and the International Association of Classification Societies (IACS) class definitions as a minimum. The classification societies implement this into their Class Rules in general and for Arctic in particular. The building blocks of Maritime standardization can be illustrated as in Figure 2-4.

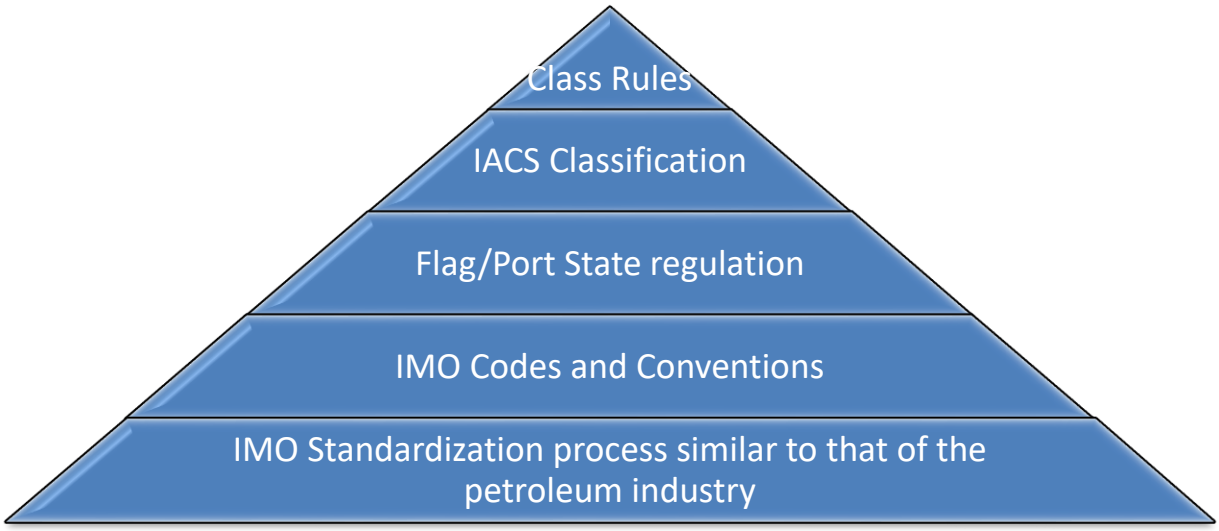

Figure 2-4 Building blocks of Maritime standardization

For the Maritime Industry, Codes and Class Rules have similar function as Standards for the Oil and Gas industry. The term standard in the report also include these terms for the Maritime Industry.

2.6 Roles and functions in standardization

The role of Petroleum and Maritime industries in the development of standards, which are applicable for the prevention of oil spills in the Arctic, is recognised as an important factor in the standardization process. It is also recognized that these industries have developed a wide range of standards, that although not directly related to the Arctic, will contribute to the prevention of oil spills.

Many individuals and organizations contribute to the development, maintenance, and use of standards, each playing unique roles in the process spanning from concept to publication. The following Table 2-1, structured alphabetically as the report, provides an overview of all organizations contained in the report and their role in standardization. The table serves as a cross reference that can be used to quickly identify those organizations that are directly responsible for standards, Class Rules and Codes etc. while also showing how various governmental and non-governmental bodies influence and/or rely upon standards etc. meant to promote safety and consistency.

The Table 2-1 below showing roles and functions of the various organizations will be updated after the EPPR meeting, according to information provided by the organizations.

Table 2-1. Cross Reference Table of Organizations versus Function. In the table, the term standards include Conventions, Codes and Class Rules used in the Maritime Industry

Level of activity			Area of operation	National / Regional / International standardization Authorty	Submit Formal Request to Develop standard	Develop standards / Class Rules	Develop Guidelines / Recommended practices	Participate in Technical Commitees / Working Groups to Develop standard	Vote on Adoption of standard	Publish Approved standard	Recommend Use of standard	Utilize standards in Business Activities	Incorporate standards into Regulations
National	Regional	Inter-national											
Arctic Council, EPPR and PAME			Arctic										
AORF - Arctic Offshore Regulators Forum			Arctic										
CEN - European Committee for standardization			Europe						member countries vote				
IOGP - International Association of Oil and Gas Producers			World wide										
IACS - International Association of Classification Societies			World wide						members vote				
IMO - International Maritime Organization			World wide						member countries vote				
ISO - International standards Organization			World wide		ISO commitees etc.		Technical reports Gudelines		member countries vote				
API - American Petroleum Institute			World wide						members vote				
ASME American Society of Mechanical Engineers			World wide						members vote				

Level of activity			Area of operation	National / Regional / International standardization Authorty	Submit Formal Request to Develop standard	Develop standards / Class Rules	Develop Guidelines / Recommended practices	Participate in Technical Commitees / Working Groups to Develop standard	Vote on Adoption of standard	Publish Approved standard	Recommend Use of standard	Utilize standards in Business Activities	Incorporate standards into Regulations
National	Regional	Inter-national											
ASTM - American Society for Testing and Materials			World wide						members vote				
NACE - National Association of Corrosion Engineers			World wide						members vote				
IADC - International Associations of Drilling Contractors			World wide						members vote				
IALA - International Association of Lighthouse Authorities			World wide						members vote				
OCIMF - Oil Companies International Marine Forum			World wide										
CGSB - Canadian General standards Board			Canada										
Canadian Shipowners Association			Canada										
CSA - Canadian standards Association			Canada										
NRCan - Department of National Resources Canada			Canada										
NEB - National Energy Board			Canada										

Level of activity			Area of operation	National / Regional / International standardization Authorty	Submit Formal Request to Develop standard	Develop standards / Class Rules	Develop Guidelines / Recommended practices	Participate in Technical Commitees / Working Groups to Develop standard	Vote on Adoption of standard	Publish Approved standard	Recommend Use of standard	Utilize standards in Business Activities	Incorporate standards into Regulations
National	Regional	Inter-national											
standards Council Canada (SCC)			Canada										
UL - Underwriters' Laboratories Inc. / ULC standards			World wide										
FSA - Finish Shipowners Association			Finland										
FSF - Finnish standards Association			Finland										
Orkustofun			Iceland										
IST Icelandic standards			Iceland										
MLSA – Mineral License and Safety Authority			Greenland										
DMA - Danish Maritime Authority			Kingdom of Denmark										
Danish standards			Kingdom of Denmark										
NCA - Norwegian Coastal Administration			Norway										

Level of activity			Area of operation	National / Regional / International standardization Authorty	Submit Formal Request to Develop standard	Develop standards / Class Rules	Develop Guidelines / Recommended practices	Participate in Technical Commitees / Working Groups to Develop standard	Vote on Adoption of standard	Publish Approved standard	Recommend Use of standard	Utilize standards in Business Activities	Incorporate standards into Regulations
National	Regional	Inter-national											
NMA - Norwegian Maritime Authority			Norway										
Norwegian Oil and Gas Association			Norway										
NSA - Norwegian Shipowner's Association			Norway										
Standards Norway			Norway										
NORSOK			Norway										
PSA - Petroleum Safety Authority			Norway										
GOST R - Federal Agency on Technical Regulation and Meteorology			Russia										
MNR - Ministry of Natural Resources and Ecology of the Russian Federation			Russia										
Runorm - Russian standards and technical regulations			Russia										
SMA - Swedish Maritime Administration			Sweden										

Level of activity			Area of operation	National / Regional / International standardization Authorty	Submit Formal Request to Develop standard	Develop standards / Class Rules	Develop Guidelines / Recommended practices	Participate in Technical Commitees / Working Groups to Develop standard	Vote on Adoption of standard	Publish Approved standard	Recommend Use of standard	Utilize standards in Business Activities	Incorporate standards into Regulations
National	Regional	Inter-national											
SIS - Swedish standards Institute			Sweden										
ANSI - American National standards Institute			U.S										
BSSE - Bureau of Safety and Environmental Enforcement			U.S										
NPC - National Petroleum Council			U.S										
U.S. Coast Guard			U.S										
ABS - American Bureau of shipping			World wide										
Bureau Veritas			World wide										
DNV-GL			World wide										
Lloyds Register			World wide										

3 International organizations and their role in standardization work

This section describes identified international organizations dealing with standardization and their work processes.

3.1 Arctic Council

Source: www.Arctic-council.org/

About

The Arctic Council is a high level intergovernmental forum for promoting cooperation, coordination and interaction among the Arctic States, with the involvement of the Arctic indigenous communities and other Arctic inhabitants. The Council works with common Arctic issues, in particular on issues of sustainable development and environmental protection in the Arctic.

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Members

Canada, the Kingdom of Denmark, Finland, Iceland, Norway, the Russian Federation, Sweden and the United States of America are Members of the Arctic Council.

In addition, six organizations representing Arctic Indigenous populations are designated as Permanent Participants. The category of Permanent Participant was created to provide for active participation and full consultation with the Arctic Indigenous populations within the Council. They include: the Aleut International Association, the Arctic Athabaskan Council, Gwich'in Council International, the Inuit Circumpolar Council, Russian Association of Indigenous Peoples of the North and the Saami Council.

Observer status in the Arctic Council is open to non-Arctic states, along with inter-governmental, inter-parliamentary, global, regional and non-governmental organizations that the Council determines can contribute to its work. Arctic Council Observers primarily contribute through their engagement in the Council at the level of working groups.

What they do

The Arctic Council regularly produces comprehensive environmental, ecological and social assessments through its working groups.

The Council has provided a forum for the negotiation of two important legally binding agreements among the eight Arctic states. The first, the Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic, was signed in Nuuk, Greenland, at the 2011 Ministerial Meeting. The second, the Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic, was signed in Kiruna, Sweden, at the 2013 Ministerial Meeting.

Arctic Council Guidelines, assessments and recommendations are the result of analysis and efforts undertaken by the working groups. Decisions of the Arctic Council are taken by consensus among the eight Arctic Council states, with full consultation and involvement of the Permanent Participants.

"The Arctic Council does not and cannot implement or enforce its Guidelines, assessments or recommendations. That responsibility belongs to each individual Arctic State". (http://www.Arctic-council.org/index.php/en/about-us).

Thus, the Arctic Council does not develop standards, but represents an important forum to agree on and promote standardization in the Arctic.

Work process

The work of the Council is primarily carried out in six working groups.

- The Arctic Contaminants Action Program (ACAP) acts as a strengthening and supporting mechanism to encourage national actions to reduce emissions and other releases of pollutants.
- The Arctic Monitoring and Assessment Program (AMAP) monitors the Arctic environment, ecosystems and human populations, and provides scientific advice to support governments as they tackle pollution and adverse effects of climate change.
- The Conservation of Arctic Flora and Fauna (CAFF) working group addresses the conservation of Arctic biodiversity, working to ensure the sustainability of the Arctic's living resources.
- The Emergency Prevention, Preparedness and Response (EPPR) working group works to protect the Arctic environment from the threat or impact of an accidental release of pollutants or radionuclides.
- The Protection of the Arctic Marine Environment (PAME) working group is the focal point of the Arctic Council's activities related to the protection and sustainable use of the Arctic marine environment.
- The Sustainable Development Working Group (SDWG) works to advance sustainable development in the Arctic and to improve the conditions of Arctic communities as a whole.

The Arctic Council working groups EPPR and PAME, working with prevention and protection of the Arctic Marine Environment, are described more thoroughly below.

The "Framework Plan for Cooperation on Prevention of Oil Pollution from Petroleum and Maritime Activities in the Marine Areas of the Arctic" is an important document in relation to the current report, as it provides the basis for the report. A shortened version of the document is presented in Appendix II.

The Governments of Canada, the Kingdom of Denmark, the Republic of Finland, Iceland, the Kingdom of Norway, the Russian Federation, the Kingdom of Sweden, and of the United States of America, (the Participants) have agreed to the framework plan.

In addition to the permanent Working Groups, the Arctic Council establishes project-specific task forces to work across working group lines on special efforts, such as the Task Force on Arctic Marine Oil Pollution Prevention (TFOPP) which has prepared the following document:

- Arctic Council Framework Plan for Cooperation on Prevention of Oil Pollution from Petroleum and Maritime Activities in the Marine Areas of the Arctic (Arctic Council, 2015)

3.1.1 EPPR - Emergency Prevention, Preparedness and Response Working Group

Emergency Prevention, Preparedness, and Response (EPPR) Working Group, is mandated to deal with the prevention, preparedness and response to environmental emergencies in addition to Search and Rescue (SAR). While not an operational response organization, members of the Working Group conduct projects to address gaps, prepare strategies, share information, collect data, and collaborate with relevant partners related to capabilities and research needs existing in the Arctic. Projects and activities include development of guidance and risk assessment methodologies, coordination of response exercises and training, and exchange of information on best practices. The goal of EPPR is to contribute to the protection of the Arctic environment from the threat or impact from an accidental release of pollutants or radionuclides, and questions related to the consequences of natural disasters.

EPPR has highlighted in their Strategic Plan Framework that prevention measures are the most effective way to reduce the risk of disasters that threaten human life, the environment and property in the Arctic. EPPR conducts projects and consults with Arctic nation governmental agencies, other Arctic Council Working Groups, industry and other international organizations to determine and recommend best prevention practices.

The EPPR working group of the Arctic council deal with the prevention, preparedness and response to environmental emergencies and in addition Search and Rescue (SAR) in the Arctic.

In their Strategic Plan Framework EPPR highlights that prevention measures are the most effective way to reduce the risk of disasters that threaten human life, the environment and property in the Arctic.

The current report was initiated by the EPPR as one response to the strategic plan's action "Promotion of standardization initiatives".

EPPR prepare Guidelines and recommended practices, but does not develop standards.

EPPR works with Arctic Council Working Groups and other organizations to ensure that the emergencies are appropriately addressed in Council products and work. EPPR also maintains liaison with the oil industry and other relevant organizations with the aim of enhancing oil spill prevention and preparedness in the Arctic.

Some relevant activities carried out by EPPR are:

- source control prevention projects;
- support the work of the Task Force established by the Arctic Council to develop an international instrument on Arctic marine oil pollution preparedness and response;
- develop recommendations and/or best practices in the prevention of marine oil pollution.

One specific report prepared by EPPR, described in Appendix II is:

- Recommended Practices in the Prevention of Marine Oil Pollution (Arctic Council, 2013)

3.1.2 PAME- Protection of the Arctic Marine Environment Working Group

The Protection of the Arctic Marine Environment (PAME) Working Group's activities are directed towards protection of the Arctic marine environment. Increased economic activity and significant changes due to climatic processes are resulting in increased use, opportunities and threats to the Arctic marine and coastal environments. These predicted changes require more integrated approaches to address both existing and emerging challenges of the Arctic marine and coastal environments.

PAME's mandate is to address policy and non-emergency pollution prevention and control measures related to the protection of the Arctic marine environment from both land and sea-based activities. These include coordinated action programs and Guidelines complementing existing legal arrangements.

The mandate of PAME is to address policy and non-emergency pollution prevention and control measures related to the protection of the Arctic marine environment from both land and sea-based activities.

These include coordinated action programs and Guidelines complementing existing legal arrangements.

There is interest in Arctic offshore petroleum resources and an anticipation of increased activities in the region. As a result, there has also been a growing concern about the potential negative effects an increase in these activities might have on the Arctic marine environment and its communities. These concerns grew even more acute following the Macondo Well (Deepwater Horizon) oil spill in the Gulf of Mexico, which began on April 20, 2010.

Relevant reports prepared by PAME, described in Appendix II are:

- The Arctic Offshore Oil and Gas Guidelines -- Systems Safety Management and Safety Culture (Arctic Council, 2014);
- Arctic Council Arctic Offshore Oil and Gas Guidelines (Arctic Council, 2009);
- Arctic Council Guidelines for Transfer of Refined Oil and Oil products in Arctic Waters (Arctic Council, 2004).

3.2 AORF - Arctic Offshore Regulators Forum

Sources: Information from PSA. Status pr. march 2016.

About

The AORF is an Arctic forum of technical and operational offshore petroleum safety regulators whose members are dedicated to the common cause of continually improving offshore safety outcomes. The primary scope will be an exchange of information, best practices and relevant experiences learned from regulatory efforts related to developing petroleum resources in the Arctic regions of the globe. Topics addressed by the group may expand beyond this scope as the organization matures and other relevant topics are raised.

AORF is a newly established forum where the Arctic nations' petroleum regulators meet to cooperate.

The primary scope will be exchange of information, best practices and relevant experiences learned from regulatory efforts related to developing petroleum resources in the Arctic regions of the globe.

The work of the AORF is intended to complement and not duplicate the work of other international bodies in the field of offshore petroleum safety or working groups associated with the Arctic Council.

The AORF may collaborate with the Arctic Council and other international fora, as appropriate.

Members

Petroleum industry regulators from the countries Canada, Finland, Kingdom of Denmark, Iceland, Norway, Russia, Sweden and USA participate in AORF.

What they do

Further the recommendations of the Arctic Council's Task Force on Arctic Marine Oil Pollution Prevention (TFOPP) to enhance the capacity of Arctic offshore petroleum safety regulators to prevent marine oil pollution through regular exchanges of knowledge and experience.

Enable an exchange of technical and operational information among Arctic offshore petroleum regulators on safety regulation, oil spill prevention, including source control and containment equipment, regulatory approaches, relevant environmental regulation and additional areas of collaboration.

Provide a network of offshore petroleum safety regulators to cooperate and facilitate the multilateral work with improvement of safety in offshore petroleum activities.

AORF does not intend to develop common regulations or standards for petroleum activities in the Arctic.

Work process

The members of the AORF meet twice a year.

More information on AORF (in Norwegian) can be found here: http://www.ptil.no/aorf/arktisk-myndighetssamarbeid-article11754-1119.html

3.3 IOGP International Association of Oil and Gas Producers

Source: http://www.iogp.org/

About

The International Association of Oil & Gas Producers (IOGP) serves industry regulators as a global partner for improving safety, environmental and social performance. They act as an upstream forum in which their members identify and share knowledge and good practices to achieve improvements in health, safety, the environment, security and social responsibility.

Its vision is to work on behalf of the world's oil & gas exploration and production (E&P) companies to promote safe, responsible, and sustainable operations.

Their mission is:

- To facilitate continuous improvement in HSE, security, social responsibility, engineering and operations.
- To undertake special projects and develop industry positions on critical issues affecting the industry.
- To create alignment between oil & gas E&P companies and with relevant national and international industry associations.
- To advance the views and positions of oil & gas E&P companies to international regulators, legislative bodies and other relevant stakeholders.
- To provide a forum for sharing experiences, debating emerging issues and establishing common ground to promote co-operation, consistency and effectiveness.

IOGP is the international oil and gas producers Association. They contribute to the petroleum industry's standard development including Arctic standards.

IOGP prepare operating Guidelines and recommended practices for both onshore and offshore Arctic operations.

IOGP strongly promotes the development and use of international standards and is temporarily hosting ISO standard development work of ISO/TC67 under its standards Solution.

The objectives are:

- To improve understanding of the industry by being a visible, accessible, reliable and credible source of information.
- To represent and advocate industry views, by developing effective proposals based on professionally established technical arguments in a societal context.
- To improve the collection, analysis and dissemination of data on HSE and security performance.
- To develop and disseminate best practice in HSE, security, engineering and operations continually improved by feedback from members, regulators and other stakeholders.
- To promote awareness and best practice in social responsibility and sustainability.
- To ensure that the membership is highly representative of the industry.

IOGP recognize the Arctic as an important area for petroleum operations and emphasize the need for good standards in these challenging areas: "*The Arctic represents a challenging operating environment for any development including oil and gas. To meet those challenges, the industry is developing and using a range of cutting-edge technologies and operating standards to ensure the integrity of facilities, the safety of personnel and the protection of the environment. Progress in Arctic design and operating standards has kept pace with new technologies and procedures. An example is the newly developed ISO standard for the safe and reliable design off offshore structures in ice. There are several other pan-Arctic standards in place or being developed. The Arctic Council has recently revised their Arctic offshore oil and gas operating*

Guidelines, which recommend voluntary standards, management policy and regulatory controls for Arctic operations."

Members

IOGP has 78 members consisting of a range of upstream oil producers, national and other oil and gas associations, and two associate members.

What they do

IOGP develops guidelines and recommended practices and publish these as IOGP Reports when the membership determines there is a gap in the standards available for oil & gas industry use. IOGP also collect data and publish performance indicators on a range of topics – environmental performance, health management, occupational safety and process safety events. IOGP's Life-Saving Rules and supporting materials raise awareness among upstream operators of those activities that are most likely to result in fatalities. The Rules also outline the simple actions individuals can take to protect themselves and others. IOGP's report on Shaping safety culture through safety leadership encourages managers at all levels need to act as safety leaders. IOGP manages a number independently-financed joint industry projects such as Sound & Marine life; Arctic Oil Spill Response and Offshore Structures that typically leads to the development of guidelines, recommended practices or standards. These reports are freely available.

The IOGP is updating and revising environmental Guidelines relevant to both offshore and onshore Arctic operations and has established a dedicated Arctic Committee to this work. On a regional level, there is work underway in the Arctic, to develop unified HSE standards to address factors such as ice load design, operational emissions and discharges and emergency response.

The IOGP support the ISO Technical Committee 67 (ISO/TC67) for "Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries" which original objective was to convert a significant proportion of the globally applicable API industry standards to equivalent ISO standards. IOGP has encouraged and supported ISO/TC67, whose work program has resulted in the publication of about 200 ISO standards, of which 85 are based on API documents.

IOGP promotes the development and use of international standards. In a period of restrictive trade measures, IOGP has temporarily taken on the role of hosting ISO standard development work of ISO/TC67 under its standards Solution, described below.

IOGP acknowledge that company requirements represent a source of practical field experience and provide valuable input to the continuing revision of the industry or international standards. Thus Companies are encouraged to make their input directly into the working groups developing international standards.

IOGP's goal is "*to foster the development of standards on an international level for the broadest possible application. The aim is to produce one set of words and:*

"Do it once, do it right, and do it internationally."

In their position paper IOGP concludes:

"*IOGP strongly supports the internationalization of key standards used by the petroleum and natural gas industries. IOGP's goal is to assist in the development of international standards that can be utilized for the broadest possible application. The following points emphasize the key issues:*

- *Development and use of international standards should be promoted;*
- *Simplicity and fitness for purpose should be guiding principles in developing international standards.*

- *International standards should be used without modification wherever possible, but they should have flexibility to recognize regional variations.*
- *The identification number of the international standard should remain visible whatever the method of publication.*
- *Priorities for development of international standards should be based on a consensus of need.*
- *Available resources should be used in the most efficient way so as to avoid duplication of effort; communication among companies should be improved to this end.*
- *Company specifications should be minimized and written, where possible, as functional requirements, with supplementary requirements in company specifications being transparent as to why they are required and by exception only.*
- *OGP encourages its members and other "users" to be well represented on all critical standardization work groups.*"

Standard Solution Work process

Sources: http://www.iogp.org/international-standards#2649409-standards-solution

http://www.iogp.org/international-standards#2649700-standards-solution-projects

In June 2012 IOGP and ISO agreed to an Interim Solution that responded to temporary industry uncertainties associated with trade regulations and their applicability to standardization in the oil and gas sector. The Interim Solution allowed the continuation of the development of prioritized ISO/TC67 work.

The Interim Solution involved the development and publication of draft standards by IOGP. It was terminated in June 2013 and replaced by the standards Solution, where IOGP continue to offer a secure environment for developing draft standards by ISO/TC67. In the standards Solution, drafts for ISO technical reports, ISO technical specifications or ISO standards are transferred back and forth between ISO/TC67 Secretariat and IOGP for technical development, hearing comments, ISO ballot and/or publication.

For TC67 SC8, the IOGP standards Solution implies that the ISO committee members perform the work under the IOGP umbrella, but without Iranian and Russian participation. However Russia was one of the drivers for these standards development initially and is chairing the committee. When the draft standards are completed, they will be transferred back to ISO for CD hearing, in which Iran and Russia participates. This provides for their positions to be incorporated when the drafts and comments are transferred back again to IOGP for further development and then finally returned to ISO for the member states hearing round and ballot. This mechanism is also applied to development of ISO 19906 and to other ISO TC67 subcommittees.

Relevant reports prepared by IOGS, described in Appendix II are:

- IOGP report 362 - Catalogue of international standards used in the petroleum and natural gas industries (IOGP, 2012)
- IOGP report 381 - Position paper on the development and use of international standards (IOGP 2010)
- IOGP report 4210 – Global standards used locally (IOGP 2011)
- IOGP report 426 - Regulators' use of standards (IOGP 2010)
- IOGP report 440 – Value of standards (IOGP 2014)
- IOGP report 447 - HSE Guidelines for Met ocean and Arctic Survey (IOGP 2011)

3.4 IACS - International Association of Classification Societies

Source: http://www.iacs.org.uk/

About

The main internationally recognized classification societies have joined together to form the International Association of Classification Societies (IACS). IACS was founded in 1968. More than 90% of the world's cargo carrying tonnage is covered by the classification design, construction and through-life compliance rules and standards set by the twelve Member Societies of IACS. The functions of IACS include the standardization of the rules for construction and survey, acting in an advisory capacity to administrations and collaborating as observer with regard to IMO conventions (SOLAS, Load Line and MARPOL), resolutions and codes.

IACS is an International umbrella organization for the classification societies.

They assist international regulatory bodies and standard organizations to develop, implement and interpret statutory regulations.

The functions of IACS include the standardization of the rules for construction and survey, acting in an advisory capacity to administrations and collaborating as observer with regard to IMO conventions (SOLAS, Load Line and MARPOL), resolutions and codes.

Members:

IACS consists of 12 member societies:. The members of ICAS are:

- American Bureau of Shipping (ABS), USA
- Bureau Veritas, France
- China Classification Society (CCS), P. R. China
- Croatian Register of Shipping (CRS), Croatia
- DNV GL, Norway
- Indian Register of Shipping (IRS), India
- Korean Register of Shipping (KR), South Korea
- Lloyd's Register (LR), United Kingdom
- Nippon Kaiji Kyokai (NK), Japan
- Polish Register of Shipping (PRS), Poland
- Registro Italiano Navale (RINA, Italy
- Russian Maritime Register of Shipping (RS), Russia.

What they do

The International Association of Classification Societies (IACS):

1. Establishes, reviews, promotes and develops minimum technical requirements in relation to the design, construction, maintenance and survey of ships and other marine related facilities.
2. Assists international regulatory bodies and standard organizations to develop, implement and interpret statutory regulations and industry.

IACS requirements are minimum requirements. Any Member or group of Members remains free to set and publicize requirements that result in an equivalent or higher safety level compared to the IACS requirements.

IACS also plays a role within the International Maritime Organization (IMO). For IMO IACS provides technical support and guidance and develops unified interpretations of the international statutory regulations developed by the member states of the IMO. Once adopted, these interpretations are applied

by each IACS member society, when certifying compliance with the statutory regulations on behalf of authorizing flag States.

IACS has consultative status with the IMO, and remains the only non-governmental organization with observer status which also develops and applies technical rules that are reflective of the aims embodied within IMO conventions. The link between the international maritime regulations, developed by the IMO and the classification rule requirements for a ship's hull structure and essential engineering systems is codified in the International Convention for the Safety of Life at Sea (SOLAS).

Work process

IACS is governed by a Council, with each Member represented on the Council by a senior management executive. The position of Chairman of the Council is rotated between the members on an annual basis. Reporting to the Council is the General Policy Group, made up of a senior management representative from each member society. The General Policy Group develops and implements actions giving effect to the policies, directions and long term plans of the Council. The chair of General Policy Group is taken by the Member holding the Council chair. Much of the technical development work of IACS is undertaken by a number of working parties, the members of which are drawn from the technical, engineering, survey or quality management staff of the member societies.

Approximate correspondence of some ice class descriptions is shown below.

<table>
<tr><th>AICS Polar class</th><th>Operation / Ice condition</th><th>DNV-GL class</th><th>Ice condition</th><th>Impact ramming</th><th>Finnish Ice classes</th><th>Ice class description</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td>III</td><td>Ships that do not belong to the ice classes I A Super, I A, I B, I C, II</td></tr>
<tr><td rowspan="3"></td><td rowspan="3"></td><td>ICE-C/E</td><td>Very light ice</td><td rowspan="6">No ramming</td><td>II</td><td>Ships that have a steel hull and that are structurally fit for navigation in the open sea and that, despite not beeing strengthened for navigation in ice, are capable of navigating in vey light ice conditions with their own propulsion machinery</td></tr>
<tr><td>ICE-1C</td><td>0,4m ice thichness, first year ice and assisted operation</td><td rowspan="3">I C</td><td rowspan="3">Ships with such structure, engine output and other properties that they are capable of navigating in light ice conditions with the assistance of ice breakers when nessecarry</td></tr>
<tr><td rowspan="2">PC 7</td><td rowspan="2">Summer/autumn operation in this first-year ice which may include old ice inclusions</td><td>ICE-1B</td><td>0,6m ice thichness, first year ice and assisted operation</td></tr>
<tr><td>ICE-1A</td><td>0,8m ice thichness, first year ice and assisted operation</td></tr>
<tr><td rowspan="2">PC 6</td><td rowspan="2">Summer/autumn operation in medium first-year ice which may include old ice</td><td>ICE-1A*</td><td rowspan="2">1m ice-thickness</td><td>1B</td><td rowspan="2">Ships with such structure, engine output and other properties that they are capable of navigating in difficult ice conditions with the assistance of ice breakers when nessecarry</td></tr>
<tr><td>ICE-1A*F</td><td rowspan="3">Occasional ramming</td></tr>
<tr><td>PC 5</td><td>Year around operation in medium first-year ice which may include old ice inclusions</td><td>ICE-05</td><td rowspan="2">First year Ice with pressure ridges</td><td>1A</td><td>Ships with such structure, engine output and other properties that they are capable of navigating in difficult ice conditions with the assistance of ice breakers when nessecarry</td></tr>
<tr><td>PC 4</td><td>Year around operation in thick</td><td>ICE-10
ICE-15</td><td rowspan="3">I A Super</td><td rowspan="3">Ships with such structure, engine output and other properties that they are normally capable of navigating in difficult ice conditions without the assistance of ice breakers</td></tr>
<tr><td>PC 3</td><td>Year around operation in second-year ice which may include multy-year ice inclusions</td><td>Polar 10</td><td rowspan="3">Multiyear ice with glacial inclusions</td></tr>
<tr><td>PC 2</td><td>Year around operation in</td><td>Polar 20</td></tr>
<tr><td>PC 1</td><td>Year around operation in polar</td><td>Polar 30
Icebreaker</td><td>Repeated ramming</td><td>Ice breaker</td><td></td></tr>
</table>

Requirements from IACS regarding Polar Class and the Polar Operational Limitations Assessment Risk Indexing System (Polaris) are described in Appendix III.

3.4.1 Classification societies

Source: http://www.environment.fi/download/noname/%7BE8AA2BDC-10AF-41BD-AA68-EE0F5E9BBD59%7D/108823

The role of classification societies is to ensure that a ship, an offshore structure, a quality management system, etc., is in compliance with the relevant rules and regulations.

For Arctic shipping Ice Class Rules are particular relevant.

The rules developed by the classification societies in principle have the same function as a standard.

The core mission of a classification society is "to protect human lives, property and the environment". The classification societies are filling this function in the marine environment, as the classification business in its current form started within sea transportation and shipping. Since then the function of the classification societies has widened to comprise shipbuilding, different kinds of offshore activities and also some onshore activities.

When fulfilling their function the classification societies are using their own classification rules as their main tool. Additionally, the classification societies are often working together with and on behalf of the flag state administrations. Here the IMO instruments such as the SOLAS and MARPOL conventions are the main basis of the work. Also, international standards, such as the EN-ISO and IEC standards and other national and international regulations, such as the Finnish-Swedish Ice Class Rules and Canadian Arctic Pollution Prevention Regulations are used by the classification societies.

Basically, the work of the classification societies is to ensure that the object in question, e.g., a ship, an offshore structure, a quality management system, etc., is in compliance with the above-mentioned relevant rules and regulations. In practice this can be done, e.g., with plan approvals, supervision of manufacturing, surveys, inspections and audits.

In the Arctic shipping, the role of the classification society is basically the same as outside the Arctic. Shipping safety is ensured by confirming compliance with the rules. However the rules to be used must be relevant for the Arctic environment.

The best known rules for Arctic shipping are the so called Ice Class Rules. There are several ice class rule sets, which can be used for the Arctic shipping or for shipping in ice-infested waters and cold environment.

For drilling rigs, class rules are the basic certification governing design and deployment of an Arctic class drilling rig (NPC, 2015). An Arctic notation will be required for conditions with low temperatures and/or sea ice.

Classification societies which have been identified to develop standards and Guidelines for Arctic maritime and petroleum activities are:

- American Bureau of Shipping (ABS, www.eagle.org)
- Bureau Veritas (www.bureauveritas.com)
- DNV GL (www.dnvgl.com)
- Lloyds Register www.lr.org

Description of the classification societies and how they develop standards and Guidelines has not been prioritised in the report. The relevant class society should be contacted for further information.

The most relevant Guidelines, recommended practices and standards regarding operations in the Arctic published by classification societies are described in Appendix II, section 8.

3.5 IMO - International Maritime Organization

Source: http://www.imo.org

About

The International Maritime Organization (IMO) is the United Nations' (UN's) organization for maritime issues with the main mission to *promote safe, secure and efficient shipping on clean oceans*.

IMO was established in 1958. IMO is based on the recognition that due to the international nature of the shipping industry the actions to improve safety in maritime operations are more effective if carried out at an international level rather than by individual countries acting unilaterally and without co-ordination.

IMO is a technical organization and most of its work is carried out in a number of committees and sub-committees.

Members

IMO has 170 Member States and three associate members. In addition Inter-Governmental Organizations (IGO's) (e.g. ESA and OECD) and Non-Governmental Organizations (NGO's) (e.g. IACS and WWF) participate as observers, in total 63 IGOs and 73 NGOs participate in various standardization activities.

IMO has a 300 staff secretariat and is based on contributions from members. Contributions are based on a flat base rate with additional components based on ability to pay and merchant fleet tonnage.

IMO is the United Nations International Maritime Organization for maritime issues with the main mission to promote safe, secure and efficient shipping on clean oceans.

IMO develop, maintain and coordinate standardization activities. They develop Conventions and Protocols, Codes, Guidelines and recommendations.

Conventions are mandatory for IMO member countries when ratified. The conventions represent laws and regulations for international shipping.

Codes and recommendations are not binding for countries. They must be made binding by the flag state by incorporation in the national regulation.

Codes may be made mandatory by including appropriate references in a convention.

For Maritime activities a Code represents the basis for standards.

What do they do

IMO has no "policing" mandate. Implementation shall be verified by Port State Control and Flag States shall carry out control on their own ships. This can be performed by classification societies.

IMO develop, maintain and coordinate standardization activities. They develop Conventions and Protocols, Codes, Guidelines and recommendations.

There are approximately 50 IMO Conventions and Protocols and hundreds of codes, Guidelines and recommendations covering aspects of shipping such as:

- Design
- Construction
- Equipment
- Maintenance
- Crew

Key IMO Conventions are:

- International Convention for the Safety of Life at Sea (SOLAS), 1974
- International Convention for the Prevention of Pollution from Ships, 1973 modified in 1978 and 1997
- International Convention on standards of Training, Certification and Watch keeping for Seafarers (STCW), including 1995 and 2010 Amendments
- International Convention on Maritime Search and Rescue (SAR), 1979
- Convention on the International Regulations for Preventing Collisions at Sea (COLREG), 1972
- International Convention on the Control of Harmful Anti-fouling Systems on Ships (AFS), 2001
- International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004

IMO conventions are mandatory and binding for IMO member countries when they have been accepted and ratified by individual governments.

Codes contain regulations with recommendations, which can be made binding by the flag state.

Some relevant key IMO Codes presented in Appendix II are:

- Polar Code – International Code for Ships Operating in Polar Waters
- LSA – Life Saving Appliances
- MODU – Construction and Equipment of Mobile Offshore Drilling Units
- IOSVCC – International Offshore Support Vessel Chemical Code

Resolutions contain recommendations that are not binding. As is the case for codes, these resolutions can be made binding by the flag state.

Although recommendations – whether in the form of codes or otherwise – are not usually binding on Governments, they provide guidance in framing national regulations and requirements. Some Codes have been made mandatory under the relevant provisions of SOLAS and/or MARPOL.

Many Governments do, in fact, apply the provisions of the recommendations by incorporating them, in whole or in part, into national legislation or regulations. In some cases, important codes have been made mandatory by including appropriate references in a convention.

Work process

IMO's organization consists of:

- an assembly
- a council with 40 members
- several committees

The IMO committees are:

- Maritime Safety Committee (MSC)
- Marine Environment Protection Committee (MEPC)
- Legal Committee (LEG)
- Facilitation Committee (FAL)
- Technical Cooperation Committee (TCC)

The Marine Environment Protection Committee (MEPC) is responsible for co-ordinating the Organization's activities in the prevention and control of pollution of the environment from ships.

Developments in shipping and other related industries are discussed by Member States in these bodies, and the need for a new convention or amendments to existing conventions can be raised in any of the committees.

In addition to the committees mentioned above there are also a set of sub-committees. These are:

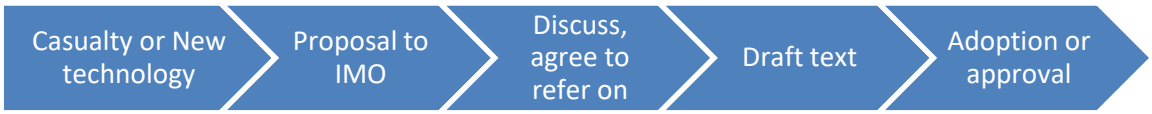
- Sub-Committee on Ship Design and Construction (SDC)
- Sub-Committee on Pollution Prevention and Response (PPR)
- Sub-Committee on Human Element, Training and Watch keeping (HTW)
- Sub-Committee on Ship Systems and Equipment (SSE)
- Sub-Committee on Navigation, Communication and Search and Rescue (NCSR)
- Sub-Committee on Carriage of Cargoes and Containers (CCC)
- Sub-Committee on Implementation of IMO Instruments (III)

All member countries and observers are allowed to participate in all meetings arranged by committees and sub-committees.

The following bullets describe the main work progress in IMO:

- Members submit documentation prior to the meetings in sub-committees according to the agenda for the meeting
- An annual meeting with plenary discussions
- The main issues are prepared for plenary discussions in working groups
- A report from the annual meeting is prepared before the closure of the meeting
- The report is sent to MSC or MEPC for resolution
- In between meetings work is carried out on specific topics via correspondence groups.

The work process of IMO can be illustrated as follows:



The adoption of a convention marks the conclusion of only the first stage of a long process. Before the convention comes into force - that is, before it becomes binding upon Governments which have ratified it - it has to be accepted formally by individual Governments.

The terms signature, ratification, acceptance, approval and accession refer to some of the methods by which a State can express its consent to be bound by a treaty.

3.6 ISO - International standardization Organization

Source: www.iso.org

About

ISO is the global independent, non-governmental membership standardization organization and a large developer of voluntary international standards.

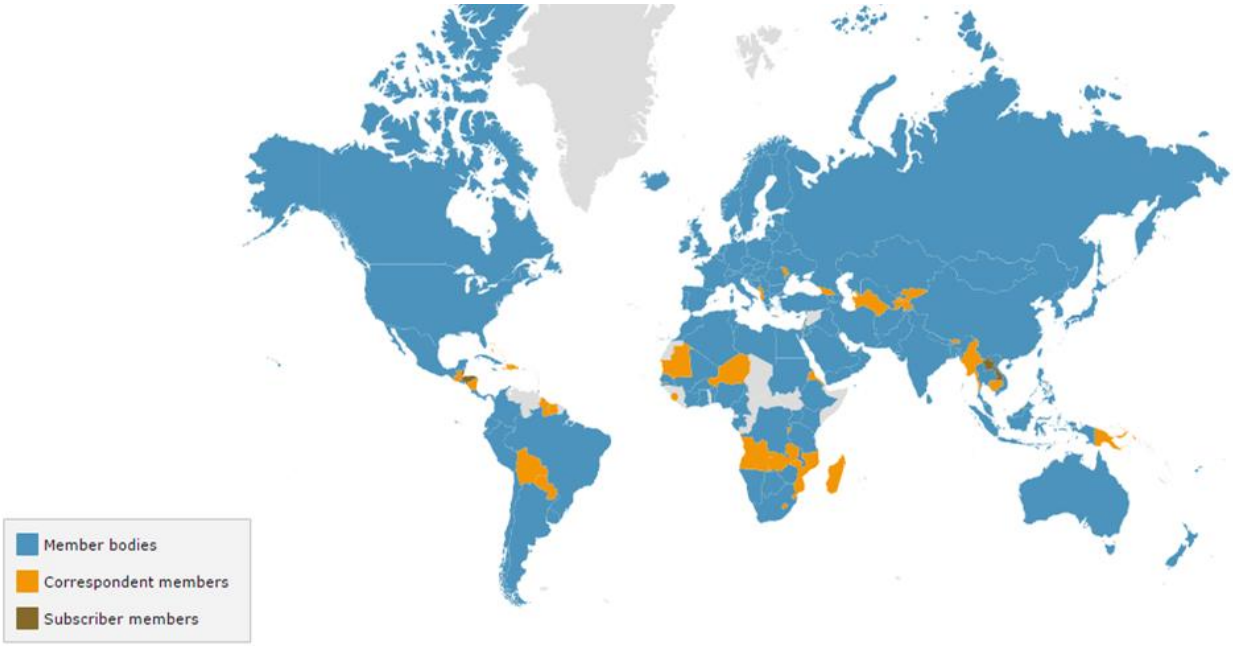
Members

ISO has 162 member countries who are the national standards bodies around the world, with a Central Secretariat that is based in Geneva, Switzerland.

ISO member states are shown on the map below.

ISO is the global International standardization Organization and a large developer of voluntary international standards.

ISO standards are developed by technical committees. The standardization is based on consensus between committee members and voting between member countries.



What they do

ISO has published more than 19,500 international standards covering almost every industry, from technology, to food safety, to agriculture and healthcare. In addition ISO make different types of documents, among others, technical specifications.

Work process

An ISO standard is developed by a panel of experts, within a technical committee. Once the need for a standard has been established, these experts meet to discuss and negotiate a draft standard. As soon as a draft has been developed it is shared with ISO's members who are asked to comment and vote on it. If a consensus is reached the draft becomes an ISO standard, if not it goes back to the technical committee for further edits. See Figure 3-1 for an illustration of the ISO standard development process.

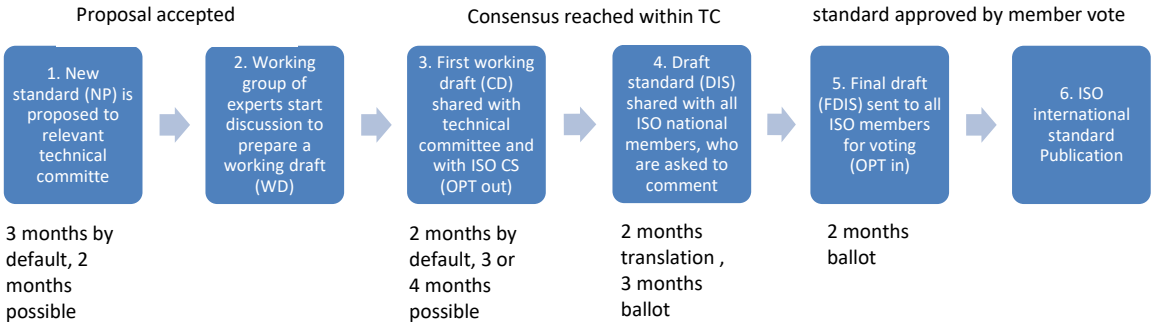


Figure 3-1 ISO standard development process. CD and FDIS are optional and may be skipped if certain criteria are met

Comments to the ISO standard development process:

1. **ISO** standards **respond to a need in the market.** ISO does not decide when to develop a new standard, but responds to a request from industry or other stakeholders such as consumer groups. Typically, an industry sector or group communicates the need for a standard to its national member who then contacts ISO.
2. **ISO** standards **are based on global expert opinion.** ISO standards are developed by groups of experts from all over the world, which are part of larger groups called technical committees. These experts negotiate all aspects of the standard, including its scope, key definitions and content. ISO's full members (member bodies) can decide if they would like to be a participating member (P-member) of a particular TC or an observing member (O-member). P-members participate actively in the work and have an obligation to vote on all questions submitted to vote within the technical committee. O-members follow the work as observers; they receive committee documents and have the right to submit comments and to attend meetings, but cannot vote.
3. **ISO** standards **are developed through a multi-stakeholder process.** The technical committees are made up of experts from the relevant industry, but also from consumer associations, academia, NGOs and government. ISO has over 250 technical committees.
4. **ISO** standards **are based on a consensus.** Developing ISO standards is a consensus-based approach and comments from all stakeholders are taken into account.

More than 200 ISO standards have been developed for the petroleum industry by the technical committee ISO/TC67 (focal point in ISO for development of petroleum standards). Also other ISO technical committees (e.g. ISO/TC 28 is on petroleum products) develop Standards for the petroleum industry. Many of these are based on national standards, e.g. NORSOK and API standards.

Typically standards may be developed either by the national standardization bodies or by ISO. In principle there is a flow of standards both ways between the national and international standardization bodies. The standards flow between the Arctic countries and ISO is illustrated in Figure 3-2 below.

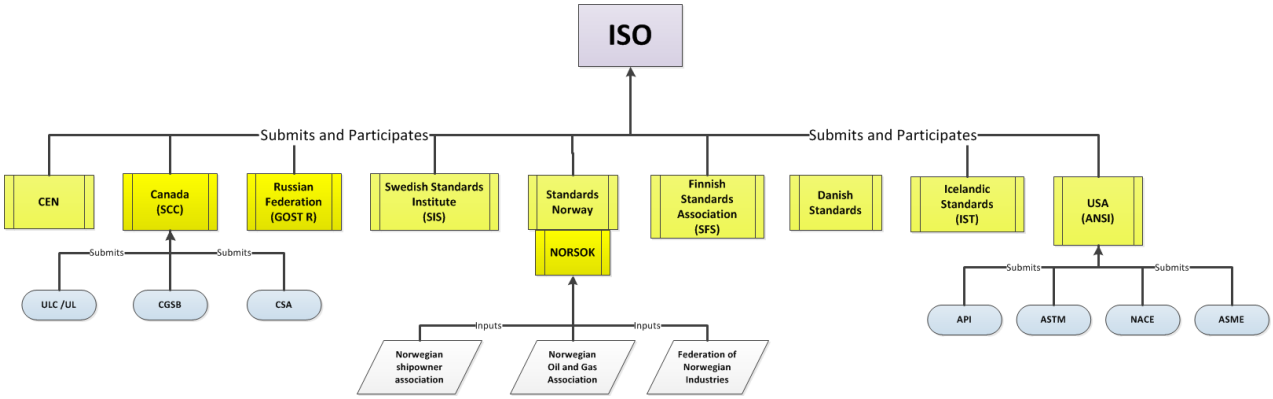


Figure 3-2. Illustration of the standardization process of ISO. Note: Figure not complete, only Arctic country national bodies are included. A total of 162 member countries contribute to the standard development of ISO.

Being identified as the most relevant standards for Arctic petroleum activities through this project, some Arctic standards developed by ISO are described in Appendix II, including the development status.

Note that none of the standards listed in this section are directly attending the prevention of oil spills, however they all represent standards that aim towards improved safety of Arctic operations.

ISO 19906:2010 Arctic offshore structures

ISO/AWI 19906 - Petroleum and natural gas industries -- Arctic offshore structures

The ISO 19906:2010 standard is currently under revision, in particular for calculating ice loads. Draft International standard (DIS) version is planned for mid-2016.

ISO/TC 67/SC 8 Arctic Operations

Based on recommendations from the Barents 2020 project (see section 5.1), a new international standardization Arctic operations subcommittee ISO/TC 67/SC 8 Arctic operations was established in 2012, where the Barents 2020 Phase 4 report, among others, formed a background for the work. Russian standardization authorities took leadership to develop the suggested standards under ISO/TC 67/SC 8 and Russia serves as secretary for the subcommittee.

Russia is chairing the ISO/TC 67/SC 8, Norway is vice-chairing. There are a total of eleven participating countries in the ISO/TC 67/SC 8; Canada, Finland, France, Germany, Italy, Kazakhstan, Republic of Korea, the Netherlands, Norway, Russian Federation and the United States. Four countries are observers; India, Singapore, Spain and United Kingdom.

The scope of the ISO/TC 67/SC 8 is standardization of operations associated with exploration, production and processing of hydrocarbons in onshore and offshore Arctic regions, and other locations characterised by low ambient temperatures and the presence of ice, snow and/or permafrost. Requirements for offshore pipelines and offshore structures are excluded from ISO/TC 67/SC 8 as they are included under ISO/TC 67/SC2 and ISO/TC 67/SC7, respectively.

A total of six working groups have been established under SC 8 developing a new set of standards for Arctic operations (see workprogramme). The ISO/TC 67/SC 8 Arctic offshore operations standard structure is shown in Table 3-1.

Table 3-1 ISO/TC 67/SC 8 Arctic offshore operations

Working group	standard ID	Title (	Chair
ISO/TC 67/SC 8 WG1	ISO 35101	Working environment	Norway
ISO/TC 67/SC 8 WG2	ISO 35102	Escape, evacuation and rescue from offshore installations	Russia
ISO/TC 67/SC 8 WG3	ISO 35103	Environmental monitoring	Russia
ISO/TC 67/SC 8 WG4	ISO 35104	Ice management	Canada
ISO/TC 67/SC 8 WG5	ISO 35105	Material requirements for Arctic operations	Norway
ISO/TC 67/SC 8 WG6	ISO 35106	Arctic metocean, ice and seabed data	Norway

Recently, the present sanctions create legal challenges for western countries participation, where sharing technology with Russian participants may take place. The work in SC8 therefore continued the work under the IOGP standards Solution, while Russia maintains leadership for WG2 and WG3. See section 3.3 for a description of the IOGP standards Solution.

The ISO/TC 67/SC 8 standards (status as of primo 2016) are described in Appendix II.

Status (may 2016)

Mirror commitee hearings (CD) ballots for ISO/CD 35101, ISO/CD 35102, ISO/CD 35103, ISO/CD 35104 and ISO/CD 35106 are closed and the working groups are currently resolving the comments to prepare the Draft International standard (DIS) that will be published for public enquiry. ISO 35105 CD are out for committee hearing.

3.7 Other international organizations working with standardization

3.7.1 IADC - International Association of Drilling Contractors

Source: http://www.iadc.org/

About

The International Association of Drilling Contractors (IADC) represents the worldwide oil and gas drilling industry.

Members

Membership is open to any company involved in oil and gas exploration, drilling or production, well servicing, oilfield manufacturing or other rig-site services. IADC's members own most of the world's land and offshore drilling units that drill the vast majority of the wells producing the planet's oil and gas. IADC's membership also includes oil-and-gas producers, and manufacturers and suppliers of oilfield equipment and services.

What they do

Through conferences, training seminars, print and electronic publications, and a comprehensive network of technical publications, IADC fosters education and communication within the upstream petroleum industry.

IADC represents the worldwide oil and gas drilling industry.

IADC has developed a wide range of Guidelines that are referred to by a range of regulators worldwide. To some extent these have the same function as standards.

The Guidelines aim to provide the drilling industry with a means of harmonizing global health, safety and environmental principles applicable to drilling units into a single methodology tailored to the drilling contractor community.

IADC maintain a large library Guidelines and best practices relevant to the drilling industry, e.g. HSE Guidelines for both offshore and onshore drilling rigs. The Guidelines provide a framework for developing an integrated health, safety and environmental management system for use in reducing the risks associated with offshore and onshore drilling activities.

The Guidelines aim to provide the drilling industry with a means of harmonizing global health, safety and environmental principles applicable to drilling units into a single methodology tailored to the drilling contractor community. They assist regulatory bodies, drilling contractors, and oil and gas producers in achieving higher degrees of personnel safety and environmental protection worldwide.

The IADC does not develop standards, however, their Guidelines are widely referenced. The Guidelines are referred to in regulations by regulators in Australia, Cuba, Kingdom of Denmark, Faroe Islands Germany, Ireland, the Netherlands, New Zealand, Norway, and United Kingdom. Furthermore they are required as best practice in Angola, Brazil, Canada, India, Malaysia, Oman, Qatar, Senegal, South Africa, and Trinidad and Tobago.

Their safety management system represents a voluntary, set of principles which can be applied to any drilling unit regardless of geographic location. Regulatory authorities can use the Guidelines when evaluating drilling contractors' safety management programs, providing them assurance that the program encompasses a series of best industry practices designed to minimize operating risks.

Work process

IADC has a number of committees that cover a wide range of issues and topics critical to the global drilling industry. The committees are IADC's principal forums for pursuing its mission of improving industry

health, safety and environmental practices; advancing drilling and completion technology; and championing responsible standards, practices, legislation and regulations that provide for safe, efficient and environmentally sound drilling operations worldwide.

As an example of their committees, the Health, Safety and Environment (HSE) Committee is to provide a forum to exchange the best practices of committee members and to disseminate those practices to the IADC membership.

IADC organize conferences focusing on the critical issues facing the global drilling industry such as enabling and cutting-edge drilling technology, well control; health, safety, environment; training, industry economics and financial outlook.

3.7.2 IALA – International Association of Lighthouse Authorities

The International Association of Marine Aids to Navigation and Lighthouse Authorities brings together representatives of the aids to navigation services of about 80 countries for technical coordination, information sharing, and coordination of improvements to aids to navigation throughout the world. It was established in 1957 to provide a permanent organization to support the goals of the Technical Lighthouse Conferences, which had been convening since 1929. The General Assembly of IALA meets about every 4 years. The Council of 24 members meets twice a year to oversee the ongoing programs.

Four committees maintain work programs established for four year periods:

IALA is an international organization working with technical coordination, information sharing, and coordination of improvements to aids to navigation throughout the world.

Achievements of IALA are development and implementation of the IALA Maritime Buoyage System, the AIS (Automatic Identification System), DGNSS (Differential Global Navigation System) and others.

- ENAV – e-Navigation;
- ARM – Aids to Navigation Requirements and Management – concentrating on management issues experienced by members;
- ENG – Engineering and Sustainability – concentrating on the engineering aspects of all aids to navigation and their impact on the environment, the Committee is also in charge of overseeing the IALA activities regarding the preservation of historic lighthouses and equipment;
- VTS – Vessel Traffic Services – concentrating on all issues surrounding VTS

IALA committees provide important documentation to the International Hydrographic Organization and other international organizations, while the IALA Secretariat acts as a clearing house for the exchange of technical information, and organizes seminars and technical support for developing countries.

Its principal work since 1973 has been the implementation of the IALA Maritime Buoyage System. This system replaced some 30 dissimilar buoyage systems in use throughout the world with 2 major systems. This rationalized system was introduced as a result of two accidents in the Dover Straits in 1971 when the *Brandenburg* and later the *Niki* hit the wreck of the *Texaco Caribbean* off Folkestone and sank although the wreck was accurately buoyed. The combined loss of lives in these two accidents was 51 persons.

Although the international agreement of 1982 implementing a harmonized buoyage system is a major achievement for IALA, the Organization, through its committees carried out a lot of work in other directions resulting in innovating techniques being adopted, such as the AIS (Automatic Identification System), DGNSS (Differential Global Navigation System) and many others.

A future achievement is assumed to be the implementation of the e-navigation. e-navigation aim at gathering and displaying all navigation information through connected sources of information and harmonized data exchange.

3.7.3 OCIMF - Oil Companies International Marine Forum

Source: http://www.ocimf.org/

About

The Oil Companies International Marine Forum (OCIMF) is a voluntary Association of oil companies with an interest in the shipment and terminals for crude oil, oil products, petrochemicals and gas.

The Oil Companies International Marine Forum (OCIMF) has prepared a report with the purpose to provide guidance to operators and charterers of offshore support vessels employed for use in areas impacted by ice or severe sub-zero temperatures with the aim of encouraging high standards of safety and environmental protection for those operating in Arctic and Sub-Arctic regions.

Offshore vessel operations in Ice and/or severe sub-zero temperatures – in Arctic and sub-Arctic regions (OCIMF, 2014):

Source: http://www.ocimf.org/media/53160/Offshore_Vessel_Operations_in_Ice_and_or_Severe_Sub-Zero_Temperatures_in_Arctic_and_Sub-Arctic_Regions.pdf

Source: http://www.green4sea.com/offshore-vessel-operations-in-Arctic-and-sub-Arctic-regions/

3.8 Regional standardization organizations

3.8.1 CEN - European Committee for standardization

Source: https://www.cen.eu/

About

CEN, the European Committee for standardization, is an Association that brings together the National standardization Bodies of 33 European countries.

CEN is one of three regional European standardization Organizations (together with CENELEC – Electric standardization and ETSI – Telecommunication standardization) that has been officially recognized by the European Union and by the European Economic Area (EEA) as being responsible for developing and defining voluntary standards at European level.

CEN is the relevant common standardization organization for the EU and the EFTA countries.
When CEN standards are developed within a harmonization regime and with a background in a market directive they become mandatory for the EU and associated countries when approved.

Members

CEN's National Members are the National Standardization Bodies (NSBs) of the 28 European Union countries, the Former Yugoslav Republic of Macedonia, and Turkey plus three countries of the European Free Trade Association (Iceland, Norway and Switzerland). There is one member per country.

What they do

CEN provides a platform for the development of European standards and other technical documents in relation to various kinds of products, materials, services and processes.

Additionally it supports standardization activities in relation to a wide range of fields and sectors including: air and space, chemicals, construction, consumer products, defence and security, energy, the environment, food and feed, health and safety, healthcare, ICT, machinery, materials, pressure equipment, services, smart living, transport and packaging.

Besides European standards, CEN produces other reference documents, which can be developed quickly and easily: Technical Specifications, Technical Reports and Workshop Agreements.

CEN's 33 National Members work together to develop European standards and other deliverables. More than 50.000 technical experts from industry, associations, public administrations, academia, and societal organizations are involved in the CEN network that reaches over 600 million people.

The CEN Technical Board (CEN/BT) is responsible for co-ordinating and managing the standards development work that is being carried out in more than 320 Technical Committees. In addition to overseeing these activities, as well as their related processes, the CEN Technical Board is also responsible for evaluating and addressing requests for standardization on new subjects.

The Vienna Agreement provides a framework for technical cooperation between CEN and the International Organization for standardization (ISO). It provides provisions relating to the exchange of information between ISO and CEN, mutual representation at meetings, and parallel approval of standards.

Figure 3-3 illustrate Arctic Council countries contribution to standardization in CEN.

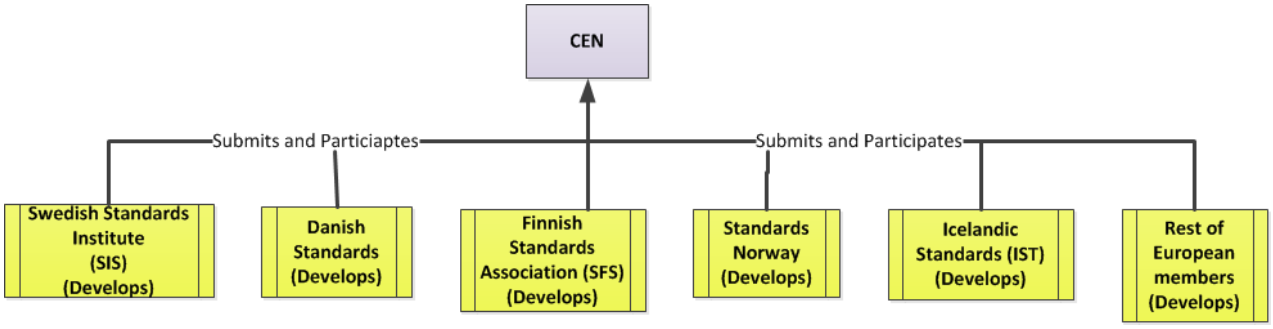


Figure 3-3. Arctic Council countries contribution to standardization in CEN. Note that the diagram is not complete. All European countries and members of CEN provide input to standardization in CEN.

In addition to CEN, the EU lawmakers play an important part in standards development and use of (harmonized) standards in Europe.

Work process

The development of a European standard (EN) is governed by the principles of consensus, openness, transparency, national commitment and technical coherence and follows several steps, see Figure 3-4.

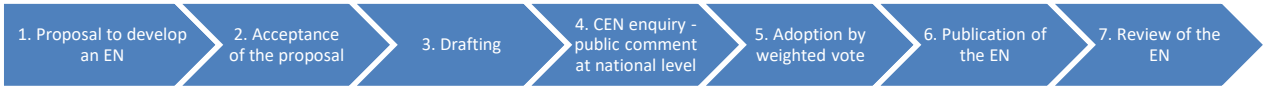


Figure 3-4 CEN standard development process.

European standards (ENs) are based on a consensus, which reflects the economic and social interests of 33 CEN Member countries channelled through their National standardization Organizations. Most standards are initiated by industry. Other standardization projects can come from consumers, Small and Medium-sized Enterprises (SMEs) or associations, or even European legislators.

CEN, CENELEC, ETSI, the European Commission and EFTA have a common understanding that standardization plays an important role for the European market, for the competitiveness of enterprises and that it constitutes an important instrument in support of European policy reflecting the public interest. Therefore they request the member states to participate in the European standardization processes.

The standardization system in Europe is based on the national pillars, which are the National standardization Bodies or the members of CEN. A National standardization body is the one stop shop for all stakeholders and is the main focal point of access to the concerted system, which comprises regional (European) and international (ISO) standardization. It is the responsibility of the CEN National Members to implement European standards as national standards. The National standardization bodies distribute and sell the implemented European standards and must withdraw any conflicting national standards (not applicable for NORSOK standards, as these are industry standards and not formal Norwegian standards published by Standards Norway).

All EU countries are required to comply with CEN standards. Usually these standards are implemented in each country with CEN / EN and their national identity (e.g. NS, BS).

Harmonized standards are not necessarily mandatory for the EU and associated countries when approved, but they will provide presumption of compliance with the directive to which they are harmonized. Other standards may be used provided it can be proven that they comply with the directive.

3.8.2 EASC Euro-Asian Council for standardization, Metrology and Certification

Source: http://www.easc.org.by/english/mgs_org_en.php

https://runorm.com/gost-gost-r-standards

Standards in Russia are administered by the Euro-Asian Council for standardization, Metrology and Certification (EASC) in the Commonwealth of Independent States.

EASC is the Intergovernmental body for formulation and carrying out of coordinated policy in the field of standardization, metrology and certification.

Russian standards are available at the Runorm store. Russian standards are defined by the terms GOST R and GOST.

About:

Standards in Russia are administered by the Euro-Asian Council for standardization, Metrology and Certification (EASC), chartered by the Commonwealth of Independent States of the former Soviet union. It was established in 1992.

The Interstate EASC is the Intergovernmental body for formulation and carrying out of coordinated policy in the field of standardization, metrology and certification.

The mandate is the realization of a coherent policy, to coordinate the works and to define the main directions in the field of standardization, metrology, certification and accreditation in the Commonwealth.

Members:

The following states are members of the EASC: The Republic of Azerbaijan, The Republic of Armenia, The Republic of Belarus, Georgia, The Republic of Kazakhstan, The Kirghyzian Republic, The Republic of Moldova, The Russian Federation, The Republic of Tajikistan, Turkmenistan, The Republic of Uzbekistan and Ukraine.

How they work:

The Interstate Council members meet twice a year. This is a high level meeting. The Chairman manage a Council work between meetings. His functions are carried out by national leaders of standardization, metrology and certification bodies.

The Council's working body is the Bureau for standards, consisting of experts group and the Regional Information Center. More than 230 interstate technical committees for standardization operate under the Council.

The Council is recognized by ISO as the Euro Asian Council for standardization, Metrology and Certification (ISO Council Resolution of 26/1996).

In Russia several types of technical standards are used: national standards (GOST R), interstate standards (GOST) and other standards (OST, TU, etc.). The national and interstate standards have designations GOST R (or GOST) plus a numeric designator, consisting of a serial number and a year the standard becomes effective. GOST is an acronym for "gosudarstvennyy standart", (state standard). The GOST standards serve as the regulatory basis for government and private-sector certification programs throughout the Commonwealth.

Runorm Store is the source for Russian industry codes and standards both in Russian language and translated into English. Qualified staff of technical translators offer high quality translations of standards, codes and regulations. Runorm guarantee that the standards and translations from their site include all changes and corrections which are adopted at the moment.

The standards collection includes GOST and GOST R standards (national standards of the Russian Federation) as well as Russian and CIS countries standards and technical regulations for all major industries, including Building Codes (SNiP, SN, GESN), Industry Codes and Safety Rules (RD, PB), Sanitation Regulations (SanPiN, GN, SP), Fire Codes (NPB, PPB), norms, instructions, methods, cost estimate standards, Russian federal and regional legislation and many others.

At present, the collection of GOST standards includes over 20,000 titles used extensively in conformity assessment activities in 12 countries. There are about 3000 GOST Standards for the Oil and Gas Industry.

3.9 National standardization organizations working internationally

3.9.1 API - American Petroleum Institute

Source: http://www.americanpetroleuminstitute.com/.

About

API represents United States' Oil and Natural Gas Industry.

The American Petroleum Institute (API) is a trade Association that represents all aspects of United States' oil and natural gas industry. Although API's advocacy focus is domestic, their standards program, established in 1924, includes a growing international dimension.

API is an industry trade association representing the U.S. Oil and Gas Industry.

They develop and maintain petroleum industry standards and Guidelines.

API sells their standards globally and API experts also participate in international standardization work within ISO and other organizations.

The petroleum industry has widely adopted API standards in their management systems.

Members

Made up of more than 600 corporate members, from the largest major oil company to the smallest of independents, come from all segments of the industry in the USA. The members are producers, refiners, suppliers, pipeline operators and marine transporters, as well as service and supply companies that support all segments of the industry. Corporate API membership is not required for companies to participate in API's standards development activities.

What they do

API develops petroleum and petrochemical equipment and operating standards. These represent the industry's collective wisdom on everything from drill bits to environmental protection and embrace proven, sound engineering and operating practices and safe, interchangeable equipment and materials. API maintains more than 600 standards, specifications, recommended practices, technical reports, and bulletins. Many have been incorporated into US state and federal regulations and other national governments; and in the past, API standards have served as the basis of many standards published by the International Organization for standardization (ISO).

For monogrammed products and companies that hold an API Q1 or Q2 certificate API verifies that manufacturers are operating in compliance with industry standards and provides quality, environmental, and occupational health and safety management systems.

API offers many quality and certification programs to include a certification of manufacturers that fabricate equipment in accordance with API standards and a certification for inspectors of refinery equipment who are knowledgeable about industry inspection codes and are performing their jobs in accordance with those codes. They provide experienced witnesses to observe critical material and equipment testing and

verification. API also provides third-party certification for a variety of Oil and Gas Industry training courses, further ensuring that training provided meets industry needs.

According to API they provide more than 160 standards that are safety related, or have been incorporated into federal regulation.

Work process

API's standards Committees are made up of subcommittees and task groups made up of industry experts who develop API standards. These groups identify the need, then develop, approve, and revise standards and other technical publications. New projects must be justified by valid business and safety needs. The standards-writing subcommittees and task groups are open to representatives of groups that are materially affected by the standards. These include oil and gas companies, manufacturers and suppliers, contractors and consultants, and representatives of government agencies and academia.

- **The Committee on standardization of Oilfield Equipment & Materials** provides development and maintenance of standards that meet the priority needs of the domestic and global oil and gas exploration and production industry by minimizing needs for individual company standards, promoting broad availability of safe, interchangeable oilfield equipment and materials, and, promoting broad availability of proven engineering and operating practices
- **The Drilling and Production Operations Subcommittee** conducts advocacy and promotes sound practices on drilling and production operational matters. In this role, the DPOS acts on existing and emerging issues, and develops consensus industry standards to support safe drilling and production operations.
- **The API Committee on Refinery Equipment** promotes safe and proven engineering practices in the design, fabrication, installation, inspection, and use of materials and equipment in refineries and related processing facilities.
- **The API Pipeline standards Committees** develop, revise, and approve consensus Standards for the pipeline industry. These committees are comprised of technical experts, operating companies, vendors, consultants, academia, and regulators to create standards that facilitate safe operation and maintenance of pipelines.
- **The API Safety and Fire Protection Committee** provides proactive safety and occupational health expertise to the industry, API committees and member companies. The SFPS seeks to advance and improve the industry's overall safety and occupational health performance by combining resources to identify and address important public, employee and company issues.
- **The API Committee on Petroleum Measurement** provides developing and maintaining cost effective hydrocarbon measurement standards and programs based on technical principles consistent with current measurement technology, recognized business accounting and engineering practices, and industry consensus.

3.9.2 ASME - American Society of Mechanical Engineers

Source: https://www.asme.org/

About

ASME is a non-profit membership organization that enables collaboration, knowledge sharing, career enrichment, and skills development across all engineering disciplines, with a goal of helping the global engineering community develop solutions to benefit lives and livelihoods.

ASME is a non-profit international standard development organization that develops and revises consensus based standards within a wide range of Industrial sectors globally.

The ASME process includes a broad public review for all of its standards actions.

Members

Founded in 1880 by a small group of leading industrialists, ASME has grown through the decades to include more than 140,000 members in 151 countries. Thirty thousand of these members are students.

What they do

ASME provides the technical community with services within education, training and professional development, codes and standards, research, conferences and publications, government relations and other forms of outreach.

Work process

ASME develops and revises standards based on market needs through a consensus process whose meetings, dealing with standards-related actions, are open to all members of the public. ASME consensus committees are comprised of volunteer subject matter experts from a diverse range of interests, including manufacturers, users, government, and general interest. ASME standards and subsequent revisions are based upon review of reliable technical data by the consensus committee and its sub-tier committees.

The ASME process includes a broad public review for all of its standards actions. Any interested member of the general public may review and comment on proposed ASME standards or revisions, as well as initiate an appeal based on previously submitted concerns. ASME's voluntary standards may be adopted by jurisdictional authorities as a means of complying with their governing regulatory requirements.

Within ASME, the Council on standards and Certification reports to the Board of Governors. Under this Council, there are five standards developing supervisory boards that manage over 70 consensus committees with 4700 volunteer members and four advisory boards. The supervisory boards are responsible for pressure technology, nuclear installations, safety codes and standards, standardization and performance test codes and conformity assessment. The supervisory boards in turn have standards committees, each responsible for an area of standards development. The advisory boards deal with strategic initiatives, energy and environmental standards, hearings and appeals and council operations.

The standards committees are composed of volunteers from various segments of the particular industry. The volunteers are dedicated people from many walks of life.

ASME standards committees are required to maintain a balance of members in various interest groups so that no one group dominates. Some examples of the various interest groups are: users, manufacturers, consultants, insurance interests, universities, testing laboratories, and government regulatory agencies.

Volunteers must agree to adhere to the ASME Policy on Conflict of Interest, the Engineer's Code of Ethics and standards and Certification's copyright policies.

A search for "petroleum" under ASME returned 49 standards which is partly relevant for safety in petroleum production, transport and refinery. "Prevention" returned 5 standards, however not relevant to this work. "Spill Prevention" or "Arctic" yielded no results.

3.9.3 ASTM - American Society for Testing and Materials

Source: http://www.astm.org/

About

ASTM International, until 2001 the United States Society for Testing and Materials (ASTM), is an international standards organization that develops and publishes voluntary consensus technical standards for a wide range of materials, products, systems, and services. Some 12,575 ASTM International voluntary consensus standards operate globally. The organization's headquarters is in Pennsylvania US. ASTM International has offices in Belgium, Canada, China, Mexico and Washington, D.C.

ASTM is an international standardization organization.

ASTM International has no role in requiring or enforcing compliance with its standards, but offers technical training, testing and certification.

ASTM standards may become mandatory when referenced by an external contract, corporation, or government.

Members

As of 2015, ASTM has more than 30,000 members, including over 1,150 organizational members, from more than 140 countries. The members serve on one or more of 140+ ASTM Technical Committees. Membership in the organization is open to anyone with an interest in its activities.

What they do

ASTM International standards are the tools for companies across a wide range of markets. Through more than 140 technical standards-writing committees, they serve a broad range of industries: metals, construction, petroleum, consumer products and many more.

ASTM standards are developed in accordance with the guiding principles of the World Trade Organization. ASTM offers technical training programs, as well as proficiency testing, and certification and declaration.

Work process

Standards are developed within committees, and new committees are formed as needed, upon request of interested members. Membership in most committees is voluntary and is initiated by the member's own request, not by appointment nor by invitation. Members are classified as users, producers, consumers, and "general interest". The latter include academics and consultants. Users include industry users, who may be producers in the context of other technical committees, and end-users such as consumers. In order to meet the requirements of antitrust laws, producers must constitute less than 50% of every committee or subcommittee, and votes are limited to one per producer company. Because of these restrictions, there can be a substantial waiting-list of producers seeking organizational memberships on the more popular committees. Members can, however, participate without a formal vote and their input will be fully considered.

ASTM International has no role in requiring or enforcing compliance with its standards. The standards, however, may become mandatory when referenced by an external contract, corporation, or government.

- In the United States, ASTM standards have been adopted, by incorporation or by reference, in many federal, state, and municipal government regulations. The National Technology Transfer and Advancement Act, passed in 1995, requires the federal government to use privately developed consensus standards whenever possible. The Act reflects what had long been recommended as best practice within the federal government.
- Other governments (local and worldwide) also have referenced ASTM standards.
- Corporations doing international business may choose to reference an ASTM standard

3.9.4 NACE - National Association of Corrosion Engineers

Source: www.nace.org

About

The National Association of Corrosion Engineers (NACE) International was established in 1943 by eleven corrosion engineers from the pipeline industry as the "National Association of Corrosion Engineers." The founding engineers were originally part of a regional group formed in the 1930s when the study of cathodic protection was introduced.

NACE is an international standardization organization working with standards for corrosion prevention and control.

Members

NACE International, serves nearly 35,000+ members in 130 countries and is recognized globally as the premier authority for corrosion control solutions. Headquartered in Houston, Texas, with offices in San Diego, California; Kuala Lumpur, Malaysia; Shanghai, China and Al-Khobar, Saudi Arabia.

What they do

NACE International has become a global provider in developing corrosion prevention and control standards, certification and education. The organization offers technical training and certification programs, conferences, industry standards, reports, publications, technical journals, government relations activities and more.

Work process

NACE is a standards-writing organization accredited by the American National standards Institute (ANSI). There are three categories of NACE standards:

- standard Practices (SPs)
- Material Requirements (MRs)
- Test Methods (TMs)

4 National standardization systems and organizations

This section describes the standardization work of the member nations of the Arctic Council including China (observer to the Council), their national standardization bodies and their work processes. Furthermore, national standards identified to prevent oil pollution from offshore petroleum and maritime activities in the Arctic have been identified.

4.1 Canada

Canada's National standards System (NSS) is the framework for developing, promoting and implementing national standards in Canada. The standards Council of Canada (SCC), a federal Crown corporation, oversees the NSS, accrediting more than 250 organizations involved in standards development, product or service certification, testing and management systems registration in Canada.

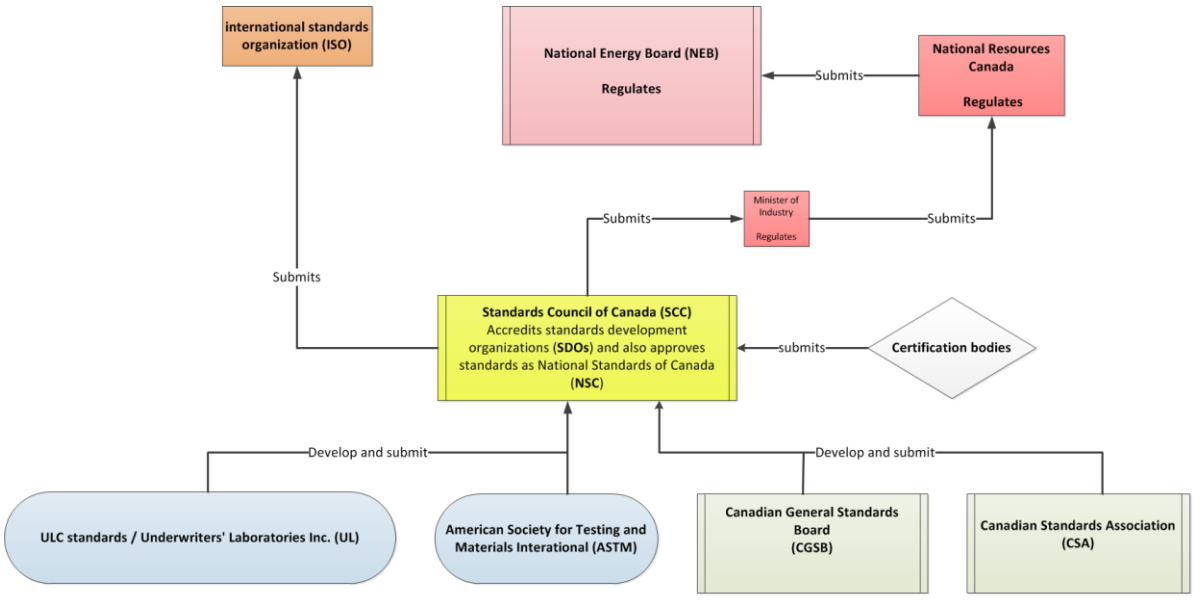


Figure 4-1. Illustration of the different standardization organizations and regulatory bodies which develop and implement standards in Canada.

4.1.1 CGSB - Canadian General standards Board

Source: http://www.tpsgc-pwgsc.gc.ca/ongc-cgsb/index-eng.html

The Canadian General standards Board (CGSB) is a federal government organization that offers client-centred, comprehensive standards development and conformity assessment services in support of the economic, regulatory, procurement, health, safety and environmental interests of their stakeholders — government, industry and consumers. As an active participant in the National standards System of Canada, CGSB offers a wide range of standards development services, including development of National standards of Canada (NSC), CGSB standards, Government of Canada

CGSB is a federal government organization that offers comprehensive standards development and conformity assessment services. They offer a wide range of standards development services, including development of National standards of Canada (NSC), CGSB standards, Government of Canada (GC) standards, and support to the development of International (ISO) standards.

(GC) standards, and support to the development of International (ISO) standards.

CGSB currently has approximately 350 standards in English and in French. Of these 115 standards are related to petroleum and petroleum products.

The standards Division staff administers the standards-development process using balanced committees to arrive at voluntary consensus standards.

National standards of Canada (NSC), CGSB standards and Government of Canada (GC) standards are developed by the CGSB. A NSC is a standard prepared or reviewed by an accredited Canadian standards Development Organization (SDO) such as the CGSB and approved by SCC. A CGSB standard is a document prepared in accordance with CGSB policies and procedures and approved by the CGSB. A GC standard is a standard developed to state the particular requirements of government for a material, a product or a service, it may or may not meet the requirements of an NSC or CGSB standard.

The following table shows the sequence through which NSC's and CGSB standards are developed and provides a brief description of the stages.

Table 4-1. Development sequence of NSC and CGSB standards.

Development Stage	Description
Stage 00 – Preliminary Stage	CGSB evaluates requests for new work items to develop or maintain standards.
Stage 10 – Proposal Stage	CGSB further evaluates and finalizes the proposed new work item and required funding in discussions with the requester.
Stage 20 – Drafting Stage	The public is advised of the existence of the new work item and the first drafts are prepared.
Stage 30 – Committee Development Stage	The draft is further developed and reviewed by the TC.
Stage 40 – Public Enquiry Stage	The draft is made available for public comment while the TC continues to review the draft
Stage 50 – Committee Approval Stage	The draft is approved by letter-ballot by the TC.
Stage 55 – Ratification Stage	The approved draft and the documented steps leading to its approval, are reviewed by the PPA. Proposed CGSB standards are ratified at this stage; and NSCs are submitted to SCC for ratification.
Stage 60 – Publication Stage	The standard is published, public notification is given, and distribution is initiated.
Stage 90 – Review Stage	standards are reviewed in accordance with applicable schedules or needs and a decision is made to amend, revise, reaffirm, or withdraw.
Stage 95 – Withdrawal Stage	Public notification of withdrawal is given, a letter ballot or consultation is held, PPA approval is sought, and a withdrawal notice is published.

4.1.2 Canadian Shipowners Association

Source: http://www.shipowners.ca/

About:

The Canadian Shipowners Association (CSA) has been representing the interests of Canadian companies with domestically flagged vessels for more than 100 years.

CSA advocates in the development of marine policy, regulations and operational matters for ship owners operating vessels in the Great Lakes, St. Lawrence Waterways, the Arctic and the eastern seaboard of the United States and Canada.

The mandate of CSA is to promote safe, sustainable, and competitive domestic Short Sea Shipping in Canada. In keeping with this mandate, the Association supports a national policy conducive to the development and maintenance of the Canadian-flagged fleet in the inland, coastal and Arctic waters in Canada, in an effort to foster the growth of a Canadian marine transport industry.

CSA represents Canadian flag vessels and their ship owners. They advocates the development of marine policy, regulations and operational matters for ship owners operating Canadian waters including the Arctic.

The CSA is a member of the International Chamber of Shipping and is part of the Canadian Delegation to IMO.

The CSA monitors Canadian and U.S. government legislative and regulatory actions, initiatives by various international marine organizations, political trends and public policy relating to navigation, safety and the Canadian shipping environment. The CSA is a member of the International Chamber of Shipping and is part of the Canadian Delegation to IMO.

Members:

Canadian companies with domestically flagged vessels.

What they do:

The Canadian short sea shipping industry is highly regulated by International (IMO), Federal (Canadian and United States), provincial and state jurisdictions. The CSA is active in the development and management of regulations which include environmental, equipment, vessel design, personnel, air emissions and ballast water regulations. The CSA works closely with government and stakeholders and CSA committees to inform appropriate regulatory solutions.

Key regulations area the CSA is involved in:

- Ballast Water Regulations
- Air Emission Regulations
- Domestic vessel design – SOLAS Amendment
- IMO Polar Code
- No Discharge Zones
- Dry Cargo Residue
- Water levels

The International Maritime Organization is responsible for leading much of the regulatory development that Canadian Shipowners eventually comply with through Canadian and United States Regulations.

Work Process:

The CSA has two committees; the Marine Environment Committee (MEC) and the Marine Operations Committee (MOC). The committees meet regularly to collectively discuss relevant policy or regulatory developments. Each CSA member is entitled to a representative on each committee. In addition working groups are often used.

4.1.3 CSA - Canadian standards Association

Source: http://www.csagroup.org/global/en/services/codes-and-standards and https://en.wikipedia.org/wiki/CSA_Group

For more than 45 years, the Canadian standards Association (CSA) Group has developed and maintained an internationally-recognized portfolio of standards-based solutions for the petroleum and natural gas sectors. These standards have become benchmarks for the design, construction, operation and maintenance of pipelines in Canada.

CSA petroleum and natural gas standards are developed using a consensus-based, multi-stakeholder approach that helps ensure balanced solutions and greater public confidence. They are regularly reviewed and updated to reflect current technology, best practices & emerging requirements, and are widely referenced in provincial and federal regulations in Canada – a reflection of the strength of the development process.

CSA develop and maintain a portfolio of standards-based solutions for the petroleum and natural gas sectors.

CSA petroleum and natural gas standards are developed using a consensus-based, multi-stakeholder approach that helps ensure balanced solutions and greater public confidence. They are regularly reviewed and updated to reflect current technology, best practices & emerging requirements and are widely referenced in provincial and federal regulations in Canada.

Areas of focus:

- Oil and gas pipeline systems
- Land use planning
- Storage of hydrocarbons in underground formations
- Pipeline materials
- Steel pipe coatings
- Liquefied natural gas
- Emergency and security management
- Training and education

The CSA Group (formerly the Canadian standards Association or CSA), is a not-for-profit standards organization which develops standards in 57 areas CSA is composed of representatives from industry, government, and consumer groups.

CSA is accredited by the standards Council of Canada. The accreditation verifies that CSA is competent to carry out standards development and certification functions, and is based on internationally recognized criteria and procedures.

The CSA registered mark shows that a product has been independently tested and certified to meet recognized standards for safety or performance.

CSA exists to develop standards. Among the fifty-seven different areas of specialization are climate change, business management and safety and performance standards, including those for electrical and

electronic equipment, industrial equipment, boilers and pressure vessels, compressed gas handling appliances, environmental protection, and construction materials.

Most standards are voluntary, meaning there are no laws requiring their application. Adherence to standards is beneficial to companies because it shows products that have been independently tested to meet certain standards. The CSA mark is a registered certification mark, and can only be applied by someone who is licensed or otherwise authorized to do so by the CSA.

CSA developed the CAN/CSA Z299 series of quality assurance standards, which are still in use today. They are an alternative to the ISO 9000 series of quality standards.

Laws and regulations in most municipalities, provinces and territories require certain products to be tested to a specific standard or group of standards by a Nationally Recognized Testing Laboratory (NRTL). Currently forty percent of all the standards issued by CSA are referenced in Canadian legislation.

4.1.4 NRCan - Department of National Resources Canada

Source: http://www.canada.ca/en/natural-resources-canada/index.html

The Department of Natural Resources Canada (NRCan) seeks to enhance the responsible development and use of Canada's natural resources and the competitiveness of Canada's natural resources products. The department is responsible for the Natural Resources portfolio, which includes:

- one Crown Corporation: Atomic Energy of Canada Limited (AECL);
- two independent regulators: the National Energy Board (NEB) and the Canadian Nuclear Safety Commission (CNSC);
- two offshore petroleum boards: the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) and the Canada-Nova Scotia Offshore Petroleum Board (CNSOPB);
- a not-for-profit foundation: Sustainable Development Technology Canada (SDTC); and
- two boards that report to the Minister as required: the Energy Supplies Allocation Board (ESAB) and the Northern Pipeline Agency (NPA).

NRCan is the superior regulatory body for Oil and Gas resources on the Canadian territory and its waters. However, the provinces and 2 of the 3 territories also have the responsibility for resource management within their borders.

The NRCan does not generally develop standards. In some cases they may incorporate externally developed standards by reference in the regulations.

National Resources Canada is the superior regulatory body for Oil and Gas resources on the Canadian territory and its waters. However, the provinces and 2 of the 3 territories have the responsibility for resource management within their borders. Neither is the NRCan the sole regulatory body in areas outside the provinces and territories. On 'Frontier Lands' and the offshore areas, NRCan and Department of Aboriginal Affairs and Northern Development (AANDC) manage the creation and maintenance of legislation and regulations.

The NEB, and the two OPBs, are the regulators of oil and gas operations, the NEB is the regulator at Norman Wells Proven Area, in the land part of the Inuvialuit Settlement Region in the Northwest Territories, and for several designated sites within the Northwest Territories.

The NRCan does not generally develop standards. An exception may be that the Governor in Council may make regulations prescribing energy efficiency standards for energy-using products or classes of energy-using products. In this case they may incorporate externally developed standards by reference in the regulations.

Canadian organizations contributing to the standard development process, develop standards or apply standards in regulations are:

- National Energy Board (NEB)
- standards Council of Canada (SCC)
- Canadian General standards Board (CGSB)
- Canadian standards Association (CSA)
- Eight organizations accredited by the standards Council of Canada to develop standards (CGSB, CSA, Bureau de normalisation du Québec, Underwriters' Laboratories of Canada, and others listed on the SCC's website (https://www.scc.ca/en) .

Information on the Canadian standards System has been provided by NEB through the documents "standards System - a guide for Canadian Regulators" (DLFE-580/2004) regarding who 'coordinates' and 'develops' standards in Canada and "Participating in the standards System - a handbook for consumer representatives" (C2-509/2000).

4.1.5 NEB - National Energy Board

Source: https://www.neb-one.gc.ca/index-eng.html

The main responsibilities of the National Energy Board (NEB), Canada, are established in the National Energy Board Act (NEB Act) and include regulating:

- The construction, operation, and abandonment of pipelines that cross international borders or provincial boundaries, as well as the associated pipeline tolls and tariffs,
- The construction and operation of international power lines and designated inter-provincial power lines; and
- Imports of natural gas and exports of crude oil, natural gas liquids, natural gas, refined petroleum products and electricity.

Additionally, NEB has regulatory responsibilities for oil and gas exploration and production activities in Canadian Lands not otherwise regulated under joint federal/provincial accords. These regulatory responsibilities are set out in the Canada Oil and Gas Operations Act and the Canada Petroleum Resources Act.

According to NEB, regulating in the Canadian public interest means factoring economic, environmental and social considerations into its decision-making process. By considering evidence that is presented on these factors, the NEB make decisions representing the

The main responsibilities of NEB, are regulation according to the National Energy Board Act (NEB Act) and include regulating pipelines, power lines and import & export of petroleum products and electricity.

NEB also has regulatory responsibilities for oil and gas exploration and production in Canadian Lands.

NEB personnel may participate in standards development as members of technical working groups and steering committees for CSA.

NEB may refer to standards in regulations. Incorporation of standards by reference in the regulations is expressly provided for in the *Canada Oil and Gas Operations Act.*

interests and concerns of Canadians. This is critical to achieving NEB's vision of being active and effective in Canada's pursuit of a sustainable energy future.

NEB does not develop standards. They do however use standards by incorporating them by direct reference into regulations, refer to them in Guidelines, filing requirements, etc.

Any standards development organization in Canada may initiate new standard development, i.e. any of the 8 accredited standards development organizations and some government departments may also develop and maintain standards.

4.1.6 SCC standards Council of Canada

Source: https://www.scc.ca/en

The standards Council of Canada (SCC) is a federal Crown corporation with the mandate to promote voluntary, efficient and effective standardization in Canada, where standardization is not expressly provided for by law. The SCC oversees the National standards System (NSS). The standards Council has a 13-member governing Council and a staff of approximately 90. The organization reports to Parliament through the Minister of Industry and oversees Canada's national standardization network. A federal crown corporation are shielded from constant government intervention and legislative oversight and thus enjoy greater freedom from direct political control than government departments.[1]

The SCC is the coordinating body for standard development in Canada and oversees the National standards system. It has mandate to promote voluntary, efficient and effective standardization in Canada.

SCC also represents Canada in ISO and other international standardization organizations.

In Canada, standardization is the development and application of standards publications that establish accepted practices, technical requirements and terminologies for products, services and systems. Standards help to ensure better, safer and more efficient methods and products, and are an essential element of technology, innovation and trade. The SCC defines a standard as a document, established by consensus and approved by a recognized body, that provides for common and repeated use, rules, Guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree or order in a given context.

The SCC carries out a variety of functions intended to ensure the effective and coordinated operation of standardization in Canada. It also represents Canada's interests on standards-related matters in foreign and international forums.

Two Standing committees (Audit and Corporate Governance) play an important role in supporting governance approaches and two Advisory (Provincial Territory and standards Development Organizations) committees ensure the Council maintains access to a wide variety of advice, information and perspectives.

The Audit Committee oversees the financial management of the organization. Members are also responsible for assessing and making recommendations on the effectiveness of internal controls and areas of potential risk or exposure, for reviewing and providing advice to Council on any internal audits or special examinations, and for monitoring any management responses to these plans or reports.

[1] Tupper, Allan, Crown Corporation", The Canadian Encyclopedia (Historica-Dominion)

The Corporate Governance Committee oversees and improves the functioning of the Council and its advisory committees. Members also ensure that the organization keeps attuned to emerging governance issues requiring consideration by Council.

The Provincial-Territorial Advisory Committee (PTAC) looks at standardization issues from the perspective of the provincial and territorial governments. It promotes cooperation and communications between the provinces, the territories and the standards Council of Canada, and provincial and territorial participation in Canada's national standardization network. The committee's membership consists of representatives appointed by each provincial and territorial government.

The standards Development Organizations Advisory Committee (SDOAC) looks at standardization issues from the perspective of the standards development organizations accredited by the standards Council. It also promotes cooperation and communications between the standards Council and the standards development organizations. The committee's membership consists of representatives appointed by each accredited standards development organization.

In Canada there are eight accredited standards development organizations which together with the SCC form the National standards System of Canada. These are:

1. Air-Conditioning, Heating & Refrigeration Institute (No relevant information identified, not further described)
2. ASTM International, section 3.9.3
3. Bureau de normalisation du Québec (Information only in French, not further described)
4. Canadian General standards Board (CGSB), (section 4.1.1)
5. Canadian standards Association (CSA Group), (section 4.1.2)
6. NSF International (No relevant information identified, not further described)
7. ULC standards, (Section 4.1.7)
8. Underwriters' Laboratories Inc. (UL), (Section 4.1.7)

Of these 2, 4, 5, 7 and 8 work with standards relevant to petroleum activities and / or the Arctic.

Note that some of these organizations are described as international organizations in chapter 3.

The Canadian standard development process is shown in Figure 4-2.

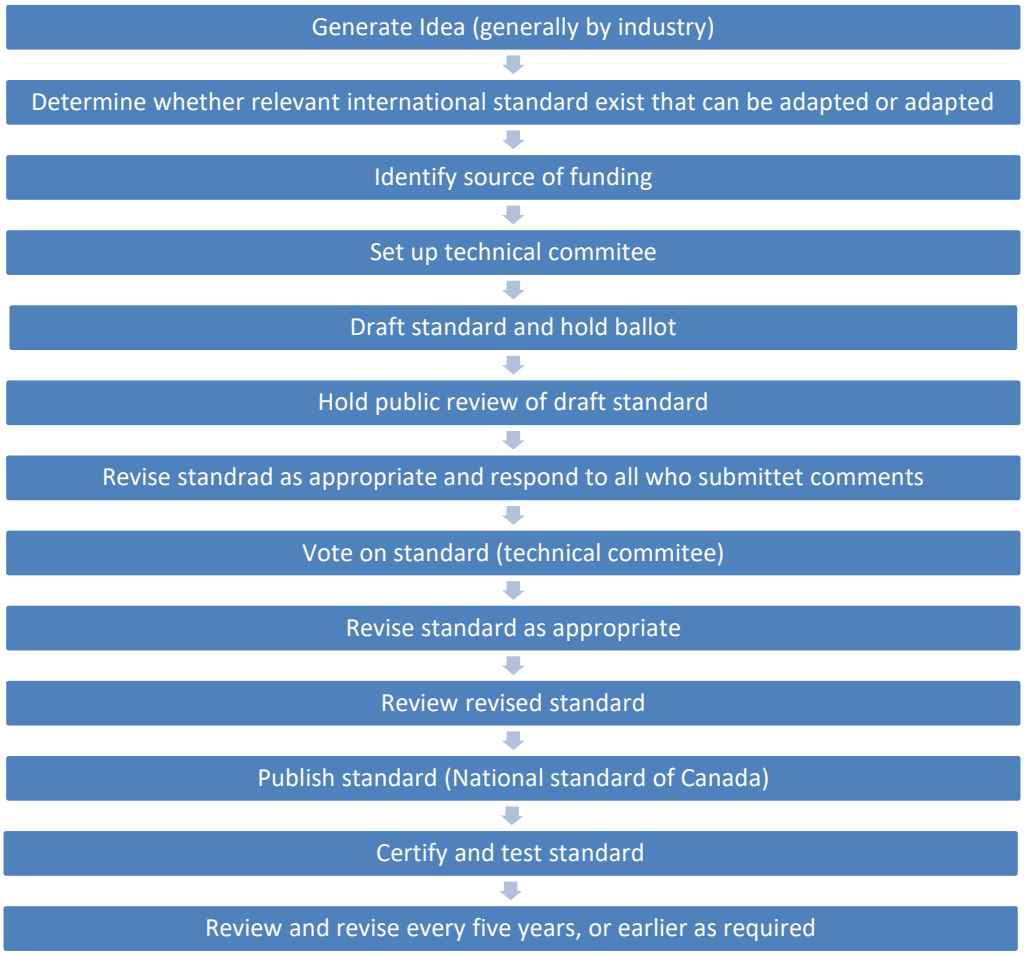


Figure 4-2. Canadian standards development process (from standards System – A guide for regulators, Government of Canada 2004).

The Canadian National standards System (NSS) is the system for developing, promoting and implementing standards in Canada. The NSS includes more than 400 organizations accredited by the standards Council of Canada. These organizations are involved in several activities: standards development, product or service certification, product testing and quality and environmental management systems registration.

The NSS does not include all such activity in Canada: there are organizations performing each of these services that are not accredited by the standards Council of Canada and that operate outside the NSS. Nor is the system static: organizations can and do join and leave the system.

The NSS is a dynamic and complex rule-setting and rule-enforcing system with explicit formal processes to govern the relationships among its many member organizations. These processes are designed to ensure the effectiveness and credibility of the NSS. As a result of the increasing importance of standards, Canadian standards development organizations (SDOs) are broadening their services to offer “one-stop shopping” to their customers, and are reaching out to the international market by seeking accreditation in foreign countries and offering services to international clients.

Figure 4-3 below illustrates the main components of the NSS in Canada.

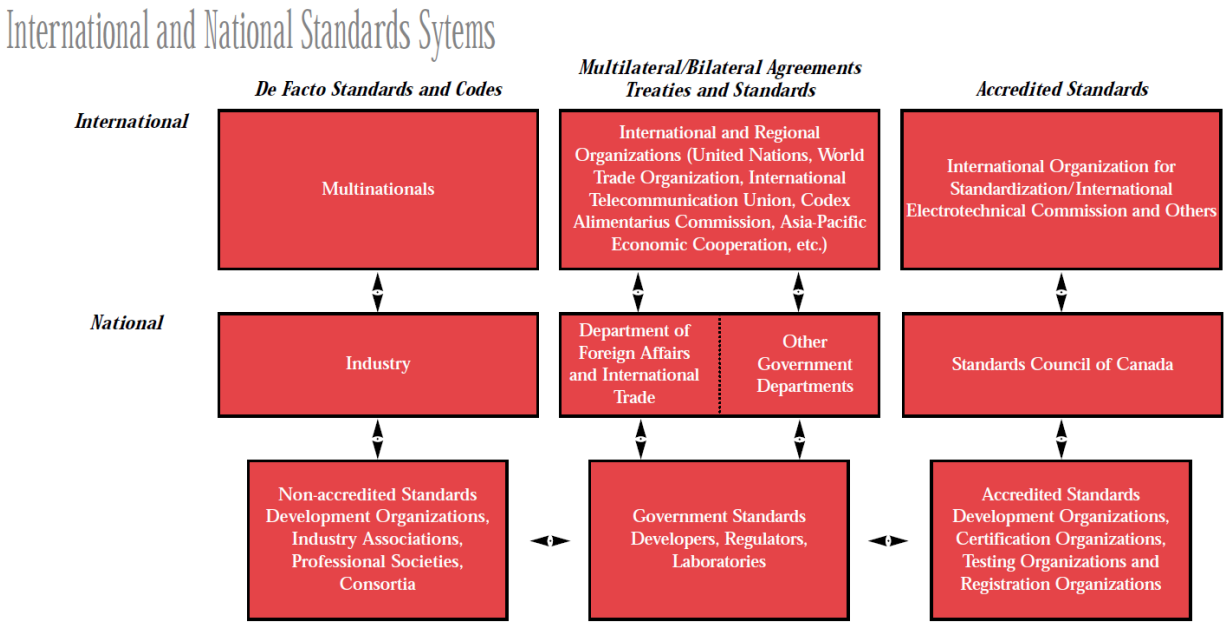


Figure 4-3. Canadas International and National standards Systems. From "standards System - a guide for Canadian Regulators" (DLFE-580/2004).

4.1.7 UL - Underwriters' Laboratories Inc. / ULC standards

Source: http://canada.ul.com/ulcstandards/

Underwriters laboratory (UL) is a global independent safety science company with more than a century of expertise in development of safety solutions.

UL is a point of global expertise and experience for hazardous locations stakeholders involved in the offshore Oil and Gas Industry. They work closely with the U.S. Coast Guard (USCG) and the Bureau of Safety and Environmental Enforcement (BSEE), connecting critical knowledge, standards and services to energy exploration. UL certifies, validates, tests, inspects, audits, and advises and trains.

UL is a global independent safety science company. They certifies, validates, tests, inspects, audits, and advises and trains.

ULC develops and publishes standards and specifications for products with a bearing on fire, life safety and security, crime prevention, energy efficiency, environmental safety, security of assets and facilities, live working and workplace safety.

It is actively involved in standards development committees, including API, IEC, IEEE and NFPA, and is globally respected for testing, certification and auditing services. UL provide response to offshore certifications needs with a team of engineering experts versed in IEC- and NEC-based certification and technical requirements.

ULC standard stands for the Underwriters' Laboratories of Canada standards. ULC standards develops and publishes standards and specifications for products having a bearing on fire, life safety and security, crime prevention, energy efficiency, environmental safety, security of assets and facilities, live working and workplace safety and other areas. ULC standards is accredited by the standards Council of Canada as a consensus based standards Development Organization under the National standards System of Canada.

4.2 Finland

4.2.1 FSA - Finnish Shipowners Association

Source: http://www.shipowners.fi/en/etusivu/

About:

The Finnish Shipowners' Association (FSA) is a trade Association with an interest in industrial and labour market policies. The FSAs aim is to safeguard the competitiveness and operating conditions of Finnish shipping companies in all sectors.

The objective of the Finnish Shipowners' Association is to improve maritime safety and develop maritime technology.

Members:

The FSA has 27 Finnish shipping companies as members with 101 ships.

What they do:

The Finnish Shipowners' Association (FSA) takes part in maritime policy-making both in Finland and internationally. FSA cooperates with the Finnish Transport Safety Agency (TraFi) and the Finnish Ministry of Transport and Communications. FSA also promote the interests of the international shipping industry in technological and safety matters through international maritime organizations.

FSAs objective is to improve maritime safety and develop maritime technology. Their aim is to safeguard the competitiveness and operating conditions of Finnish shipping companies.

FSA take part in maritime policy-making both in Finland and internationally. They promote the interests of the international shipping industry in technological and safety matters through international maritime organizations.

FSA follows the preparation of environmental standards, and the development of environmental technology, making maritime transport greener.

The Finnish Shipowners' Association (FSA) works nationally and internationally to support its members in being environmentally friendly and competitive. FSA follows the preparation of environmental standards, the development of environmental technology and the solutions that research provides for meeting the increasingly high environmental standards and making maritime transport greener.

The FSA is aware of the special characteristics of the Baltic Sea and cooperates with the entire maritime cluster, including the transport chain, equipment manufacturers, authorities, researchers and organizations working to protect the Baltic Sea.

The Finnish Shipowners' Association (FSA) works to ensure that maritime education and training is safe and competitive. The FSA has its own education policy program that takes into account international provisions on the competences required in the sector, such as the IMO STCW Convention and the EU directive on the training of seafarers. FSA has participated for years in the preparation and development of the STCW Convention in the IMO, the EU and our own international organizations. FSA has for long been involved in the work of the Finnish National Education and Training Committee for the Maritime Sector which has the key task of transposing international conventions and laws into national legislation.

4.2.3 The Finnish Transport Agency

Source: http://www.liikennevirasto.fi/web/en/about

About:

The Finnish Transport Agency is responsible for the state-owned transport network, i.e roads, railways and the majority of the waterways. The transport system is maintained and developed in cooperation with other actors.

The Finnish Transport Safety Agency is responsible for transport system regulation and supervision tasks, develops transport system safety and security, and mitigates and prevents adverse environmental impacts of transport.

4.2.2 Finnish standards Association SFS

Source: http://www.sfs.fi/en

About

The Finnish standards Association SFS is the central standardization organization that controls and co-ordinates national standardization work in Finland.

SFS is the central standardization organization that controls and co-ordinates national standardization work in Finland.

SFS develops, approves, publishes and sell national Finnish standards. They are the Finnish member of CEN and ISO.

The Finnish Petroleum and Biofuels Association is an affiliate of SFS, and is responsible for standardization across the Finnish oil and natural gas industries. They monitor standardization in CEN and ISO.

There are 12 standard writing bodies in Finland.

Members

Standards-writing bodies, which are engaged in standardization and which draft SFS standards under the guidance of SFS.

Industry associations:

- Kemesta
- Mechanical Engineering and Metals Industry standardization in Finland
- The Finnish Plastics Industries Federation
- Finnish Association of Construction Product Industries
- Finnish Electrotechnical standards Association
- standards Association of Textile and Clothing Industry
- General Industry Federation
- Finnish Petroleum and Biofuels Association (http://www.oil.fi/en)
- The Finnish Petroleum and Biofuels Association is an affiliate of the Finnish standards Association SFS, and it is in that capacity responsible for standardization across the Finnish oil and natural gas industries. The Association is responsible for monitoring 30 European committees of CEN and nine international ISO committees.

Membership will be awarded to a collective body or institution which is competent before the law and represents comprehensively its line of business and for whom standardization is of significance, and the state of Finland, which is represented by Finnish ministries.

What they do

- SFS develops, approves and publishes national SFS standards. It also sells standards and communicates information about the standards and standardization to the public.
- SFS is a member of the International Organization for standardization (ISO) and the European Committee for standardization (CEN).

- The majority of SFS standards are based on international or European standards. SFS prepares standards together with its 12 affiliates called 'standards writing bodies'.
- Founded in 1924, the central organization of SFS currently employs some 50 people.

Work process

Anyone can participate in developing standards. Standardization work is voluntary and consensus based.

In Finland, standardization activities have been distributed among the 12 affiliates of SFS, and, as the central organization, SFS supports their standardization work. SFS and its affiliates co-ordinate the participation of Finnish stakeholders in the international standardization work.

Participation is open to anyone with an interest in a specific standardization activity. Most of the standards are drawn up by the standards writing bodies of SFS, because they have the needed expertise in their respective fields. SFS itself is also responsible for some areas of standardization such as management system standards, information technology, fire safety, safety of toys, packaging, office documents, etc.

Currently, the focal point in Finnish standardization is in the drafting of European standards, but international standards are utilized whenever possible. Finnish experts participate actively in standardization and thus contribute to the contents of standards at both European and international level.

Formal approval by SFS is required for all national SFS standards. At present there are over 25 000 SFS standards ranging from nuts and bolts to brand evaluation, from electrical installations to quality management.

4.3 Iceland

4.3.1 IST - Icelandic standards

Source: https://www.stadlar.is/english

Icelandic standards (IST) is the national standards body of Iceland. It is an independent Association whose role, by law, is the publication of Icelandic standards and the representation of Iceland in international and regional standards bodies.

IST is the national standards body of Iceland, representing Iceland in international and regional standards bodies including CEN and ISO.

Four sector committees operate under the auspices of Icelandic standards: BSTR, in the building sector, FIF in the fishing sector, FUT in the information technology sector, and RST in the electro-technical sector.

IST is a member of the European standards organizations CEN, CENELEC and ETSI and of the international standards organizations ISO and IEC.

4.3.2 Orkustofnun

Source: http://www.nea.is/

About

Orkustofnun is a government agency under the Ministry of Industries and Innovation. Its main responsibilities are to advise the Government of Iceland on energy issues and related topics, license and monitor the development and exploitation of energy and mineral resources, regulate the operation of the electrical transmission and distribution system and promote energy research. Orkustofnun represent Iceland in AORF.

The main responsibilities of Orkustofnun are to advise the Government of Iceland on energy issues and related topics. They grant licences for prospecting, exploration and production of hydrocarbons.

What they do

Orkustofnun grants licences for prospecting, exploration and production of hydrocarbons. Applications for non-exclusive, prospecting licences are accepted at any time, whereas applications for exclusive, exploration and production licences are accepted in licensing rounds.

Exploration for oil and gas on the Icelandic Continental Shelf is in an early phase.

Legal framework:

- EU legislation has been transposed in many important areas into Icelandic law, as Iceland belongs, with Norway, Liechtenstein and the EU countries, to the European Economic Area (EEA).
- Icelandic Parliamentary Act No.13, 2001, on Prospecting, Exploration and Production of Hydrocarbons applies to petroleum activities. - Transposes into Icelandic law EU directive 94/22/ EC on the conditions for granting and using authorizations for the prospection, exploration and production of hydrocarbons.
- Other relevant EU legislation, including issues of health, safety and environment (HSE), have been transposed into Icelandic law.
- Iceland has ratified the OSPAR convention on the protection of the marine environment of the Northeast Atlantic as well as the international MARPOL protocol for the prevention of pollution from ships.

4.4 Kingdom of Denmark

Source: http://www.dma.dk/

With Greenland as a part of the Danish realm, Kingdom of Denmark is an Arctic coastal state with a strong interest in a safe and sustainable development of the region. Danish and Grenlandic authorities are closely involved in the development of the Arctic region through Kingdom of Denmark's membership of the Arctic Council. The Kingdom of Denmark is actively influencing rules and regulations for navigation in the Arctic through the International Maritime Organization (IMO).

With Greenland as a part of the Danish realm, Kingdom of Denmark is an Arctic coastal state with a strong interest in a safe and sustainable development of the region.

4.4.1 DMA - Danish Maritime Authority

The Danish Maritime Authority (DMA) consists of the central authority, eight survey offices, including the office in Nuuk, Greenland, as well as the Centre of Maritime Health and Safety on the island of Fanø.

DMA has the responsibility for:

- The construction, equipment and operation of Danish ships (including safety, terror prevention, navigational regulations, manning, occupational health and environmental protection) as well as port State control of foreign ships calling at Danish ports.
- Ship registration.
- Seafarers' employment, health and conditions of social security.
- Shipping policy, maritime law as well as industrial policy, both nationally and internationally.
- Tasks related to aids to navigation at sea and ashore (lighthouses and buoys), including ships and repair workshops.
- Navigational information in the form of navigational analyses, warnings, GIS and specialist publications.
- The national pilot authority.

4.4.2 MLSA – Mineral License and Safety Authority

Sources:

https://govmin.gl/

http://www.ptil.no/getfile.php/Presentasjoner/2013%20-%20Myndighetsm%C3%B8te%20Arktis/Greenland%20-%20Agenda%20item%203%20and%204.pdf

https://www.govmin.gl/petroleum/approval-of-activities/exploration-drilling

About
The Government of Greenland's Mineral Licence and Safety Authority (MLSA) is a government body subordinated to the Ministry of Mineral Resources. The MLSA is the one-door administrative authority in Greenland for licences and mineral resources activities, and is the authority for safety matters, including supervision and inspections. MLSA represents Greenland in AORF.

The MLSA is the overall administrative authority in Greenland for licences and mineral resources activities, and is the authority for safety matters including supervision and inspections.

What they do

The MLSA has been given the authority to prescribe, provide guidance and approve drilling and related activities according to the Mineral Resources Act (Greenland Parliament Act on mineral resources and mineral resource activities) which is providing for a flexible regime that allow Greenland to continuously deploy the best international practices and standards as these develop.

The MLSA has developed the Exploration Drilling Guidelines to assist operators planning to conduct drilling operations within Greenland by providing information and explanation of the requirements contained in the Greenland Minerals Resources Act.

The Exploration Drilling Guidelines align and follow how the MLSA interprets; the legislative requirements governing the offshore area as described in the Minerals Resources Act, the Guidelines for Submitting

Applications for Approval of Offshore Installations for Hydrocarbon Exploration in Greenland and other accepted Guidelines such as the Arctic Council Guidelines.

The operators shall provide a number of contingency plans, including oil spill but also comply to the IMO Guidelines (2010) Guidelines for Ships Operating in Polar Waters (A 1024) regarding type and classification of a vessel depending on operational climate. The operator shall also have a planned and approved Ice Management Plan in place. The latter is to ensure the integrity of the drilling unit i.e. that it is not struck by an iceberg which could damage it.

In approving the exploration drilling activities; the MLSA adhere to the most recently updated of the following NORSOK standards:

- NORSOK D-010: NORSOK standard D-010, June 2013, Well Integrity in Drilling and Well operations.
- NORSOK D-SR-007: NORSOK standard D-SR-007, January 1996, System Requirements - Well Testing Systems.
- NORSOK R-003: NORSOK standard R-003, July 2004, Safe use of lifting equipment.
- NORSOK S-001: NORSOK standard S-001, February 2008, Technical Safety.
- NORSOK S-003: NORSOK standard S-003, December 2005, Environmental Care.
- NORSOK Z-013: NORSOK standard Z-013, October 2010, Risk and emergency.

4.4.3 Danish standards

Source: http://www.ds.dk/

About

Danish Standards is a non-profit commercial foundation. Earnings are invested back into the development of new activities for the benefit of society.

Danish standards is the national standardization organization in Denmark. They contribute to the work of the European organizations CEN, CENELEC, IEC and ETSI, (the three latter organizations not relevant to the report) and ISO. Danish standards choose to implement most of the standards from these organizations in Denmark. When a European or international standard has been implemented in Denmark, this is reflected in the title, e.g. DS/EN or DS/ISO. The contents are similar to those in the EN or ISO standard that can be purchased in another country. They are available in either English or Danish.

Danish standards is a non-profit commercial foundation. It is the national standardization organization in Denmark.

They contribute to the work of the European standardization organizations and chose to implement most of the standards from these organizations in Denmark.

What they do

Primary fields of activity include:

- standardization
- Sale of standards and handbooks
- Courses and conferences
- Ecolabelling

Within their core activity of standardization, Danish standards has concluded a performance contract with the Ministry of Business and Growth. The contract sets out the framework and objectives for their activities as a national standardization organization.

According to the Defence Command Denmark, Danish standards does not develop and implement Standards for the European Arctic states, e.g. Greenland.

4.5 Norway

4.5.1 NCA - Norwegian Coastal Administration

The Norwegian Coastal Administration (NCA) is an agency of the Norwegian Ministry of Transport and Communications responsible for services related to maritime safety, maritime infrastructure, transport planning and efficiency, and emergency response to acute pollution.

NCA's activities encompass the maritime sector of the National Transport Plan (NTP), as well as exercising authority and administrative tasks related to the laws and regulations for ports, fairways and compulsory pilotage.

The Norwegian Coastal Administration's most important tasks are:

- Development and maintenance of fairways and fishing ports
- Aids to navigation services
- Vessel Traffic Services
- Pilot services
- Reporting services and navigational warnings and services
- National preparedness against acute pollution
- Exercising maritime legislation
- Transport planning
- Port Facility Security (ISPS)

NCA exercising authority and administrative tasks related to the laws and regulations for ports, fairways and compulsory pilotage.

In addition, NCA has the responsibility for emergency response to acute pollution along the coast and to implement measures that can prevent the occurrence of acute pollution incidents.

The main objective of the NCA is to ensure safe and efficient navigation in the fairways along the coast and into ports, as well as national preparedness for acute pollution.

The most important part of NCA's contingency planning is to implement measures that can prevent the occurrence of acute pollution incidents. Several departments within the Norwegian Coastal Administration is responsible for the prevention of acute pollution, e.g., through marine safety measures.

Prevention objectives:

- Enhance international cooperation on preparedness against acute pollution, especially in the Arctic , by initiating and participating in assessments and development work, and by developing and strengthening bilateral relations with Russia and the other stakeholders in the region through participation in the Arctic Council and other relevant forums.
- Survey and assure the quality of ports of refuge along the entire coast of Norway, including Svalbard, and integrate these in the Coastal Administration's contingency plan.
  Provide public access to information about the location and suitability of these ports via the online map service "Kystinfo kartløsning".
- Improve the Environmental Sensitivity Index (ESI) maps for Svalbard.
- Secure access to relevant resources for efficient surveillance of acute pollution incidents, make new aerial surveillance contracts, ensuring that the aircraft is equipped with the best technology available, and facilitate the co-utilisation of the aircraft by other public agencies and the petroleum industry.

- Establish sufficient, nationwide emergency towing preparedness based on hired vessels, make agreements with the tugboat industry, the petroleum industry and neighboring countries, and ensure the further improvement of emergency towing services.
- Make recommendations for how to deal with shipwrecks containing oil or other harmful substances that pose an unacceptable environmental risk, to avoid any future threat to the environment by the wreck.

The NCA represents Norway in the Arctic Council and is coordinating the work with "Standards for the Prevention of Oil Spills from Offshore Oil and Maritime Industry in the Arctic" on behalf of the Arctic council.

4.5.2 NMA - Norwegian Maritime Authority

Source: https://www.sjofartsdir.no/en/about-the-norwegian-maritime-authority/

About

The Norwegian Maritime Authority (NMA) is a government body subordinated to the Ministry of Trade and Industry and the Ministry of Climate and Environment, and is the national shipping administration.

What they do:

The NMA has the main responsibility for maritime safety and environment with regard to vessels and crews, and performs inspection and supervision of Norwegian and foreign vessels and crews. The Norwegian Maritime Authority is also responsible for ensuring legal protection for Norwegian registered vessels.The NMA has jurisdiction over ships registered in Norway and foreign ships arriving at Norwegian ports. The Authority manages the Norwegian International Ship Register-NIS and the Norwegian Ordinary Ship Register-NOR (including the Shipbuilding register). Registration secures legal protection for ship-owners and mortgages.

In cases concerning environmental issues that are connected to a specific ship, and the protection of the marine environment, the authority operates under the Ministry of Climate and Environment.

The NMA also assists the Norwegian Petroleum Safety Authority (PSA) related to application of maritime rules for facilities operating according to the maritime regime as provided for in the petroleum safety regulation.
The main goal is for Norway to be an attractive flag state with high standards of safety at sea for personnel, vessels and the marine environment.

NMA has the main responsibility for maritime safety and environment with regard to vessels and crews.

NMA has jurisdiction over ships registered in Norway and foreign ships arriving at Norwegian ports.

The NMA assists the Norwegian Petroleum Safety Authority (PSA) related to application of maritime rules for facilities operating according to the maritime regime as provided for in the petroleum safety regulation.

The main goal is for Norway to be an attractive flag state with high standards of safety at sea for personnel, vessels and the marine environment.

NMA is an active part in the development of international rules and regulations at sea, and these rules concerning IMO, ILO, Paris MoU or Norwegian obligations in the EEA-agreement are implemented into Norwegian law.

Objectives:

- To have competent seafarers with good working and living conditions
- To have safe and eco-friendly ships

- Maintaining NIS and NOR as quality ship registers
- Provide coherent, user-friendly and accessible legislation
- Quality in all aspects of the industry.

As one of the world's leading maritime nations, Norway strives to be a leader for safe and environmentally friendly shipping. The Norwegian Ministry of Trade, Industry and Fisheries is together with NMA an initiator in the development of new international regulations. Norway is an active participant in International organisations such as IMO and ILO, promoting Norway's view on shipping policies and legislation Decisions in the EU and other shipping organisations are increasingly important for the Norwegian maritime legislation. The Authority has an important task with, for instance, ensuring proper follow-up and national adaption of international rules that are to be implemented in Norwegian law.

4.5.3 Norwegian Oil and Gas Association

About:

The Norwegian Oil and Gas Association (Norwegian Oil and Gas) is a professional body and employer's Association for oil and supplier companies engaged in the field of exploration and production of oil and gas on the Norwegian Continental Shelf (NCS).

Norwegian Oil and Gas Association represents the oil companies operating on the Norwegian Continental Shelf and their supplier companies. It has been involved in standard development since the early 1990'ies and took the initiative to develop the NORSOK standards in 1994. Now it is one of the owners of NORSOK, contributing to upgrade of the standards under the umbrella of Standards Norway.

Members

Most of the oil companies operating on the NCS as well as a wide range of their supplier companies, a total of 96 companies.

What they do

The Norwegian Oil and Gas Association works to solve common challenges for the members and to strengthen the competitiveness of the Shelf.

The Norwegian Oil and Gas Association has been involved in standard development since early 1990'ies. The NORSOK standard was initiated in 1994 with the purpose to reduce the cost level of development projects by 50% and in operations by 25%. At that time 88 standards were developed and the goal was that the NORSOK standards should be replaced by International standards in ISO. Of these 88 NORSOK standards 47 are referred to in the Norwegian regulations by PSA.

The NORSOK standards were developed by the Norwegian petroleum industry to ensure adequate safety, value adding and cost effectiveness for petroleum industry developments and operations. Furthermore, NORSOK standards are as far as possible intended to replace oil company specifications and serve as Guidelines referred to in the petroleum safety regulations.

Presently the NORSOK standards are owned by the Norwegian Oil and Gas Association, the Federation of Norwegian Industries, and the Norwegian Shipowners' Association. The standards are maintained by Standards Norway. For information on NORSOK and the ongoing update, see section 4.5.5. and 4.5.5.1.

4.5.4 NSA - Norwegian Shipowners' Association (NSA)

Source: https://www.rederi.no/en

About

Norwegian Shipowners' Association (NSA) is an employers' organization and interest group for Norwegian shipping and offshore companies. The organization's primary fields are national and international industry policies, employer issues, competence and recruitment, environmental issues and innovation in addition to safety at sea.

NSA represents the Norwegian shipping, offshore vessels and drilling rig companies.

NSA participates in Norwegian delegations to both IMO and ILO committee meetings and working group meetings.

NSA was one of the driving forces behind IMO's Polar Code initiative and has contributed to the work from the beginning.

NSA contribute to the development of shipping industry standards.

Members

Norwegian Shipowners' Association has approximately 160 member companies.

What they do

International:

NSA believes it is important that the basic rules of UNCLOS (United Nations Convention on the Law of the Sea) are recognised and adhered to by all relevant states. Agreement between IMO (International Maritime Organization) and ILO (International Labour Organization), as well as the actual implementation of international regulations, is important in order to maintain the international rule of law. In addition, a set of global rules that come into force as quickly as possible is important in preventing the emergence of regional solutions.

Environment and safety:

NSA's objective is to help Norwegian shipping companies in being frontrunners in the development of a safe, environmentally and socially responsible international maritime industry and therefore supports ambitious means of ensuring progress in safety and environmental protection in shipping.

The environmental vision is that Norwegian shipping and offshore entrepreneur operations shall not have any environmentally damaging emissions to sea or air. One of the objectives is that climate emissions from shipping will be regulated through international regulations, preferably administrated by IMO.

Arctic shipping:

NSA's Arctic Business vision is: "Committed to improving the state of the Arctic". Their Arctic Business mission is: "Engaging, educating and committing the business community to a sustainable development of the Arctic". They believe that the development of commercial activity in the Arctic requires an incremental, cautious approach based on scientific, empirical and practical knowledge.

To ensure that increasing commercial activity in the Arctic is conducted in a way that is well ordered, sustainable and responsible, the following conditions are according to NSA essential:

- relevant international rules for Arctic maritime operations must be in place
- there has to be a comprehensive development of relevant infrastructure
- adequate industrial standards must be developed

The Arctic Business initiative was launched by NSA in 2013 with the following rationale:

- the consequences of global climate change are more apparent and dramatic in the Arctic than anywhere else in the world
- the business community has a responsibility for contributing to a safe and sustainable development of the Arctic
- there is a need for the business community to engage more forcefully in a coordinated dialogue on the future of the Arctic.

Among other existing Arctic fora, NSA saw the need to gather senior business leaders to discuss both the limitations of and the opportunities for economic growth in the Arctic. The initiative is two-fold, consisting of the Arctic Business conference and the Arctic Business Council. The conference is a bi-annual event. The council meets more often, but only consist of a smaller group of business executives.

As a result of the Arctic Business collaborative efforts, the Arctic Leadership Program for Executives (ALPEX) was launched. The ALPEX program explores the Arctic from different angles and aims to provide a knowledge based approach to both operating and understanding the different aspects of Arctic maritime operations. It teaches best practices in safe maritime operations, as well as necessary organizational and leadership- strategies that enable companies with maritime activities in the Arctic.

Work process

The organization is led by boards and councils appointed by its members, and an important part of the operations is carried out by groups and committees. The member organizations are divided into five different segments:

- Deep Sea
- Short Sea
- Underwater contractors
- Offshore contractors
- Offshore Service companies

NSA has the following Boards and committees:

- Committees for Employment Issues and Negotiations Shipping
- Insurance Committee
- Operations and Environment Committee
    - Marine Operations Forum
    - Asset Integrity Forum
    - GOE Health, Security, Environment and Quality
- Competence Committee
    - Environment - Safety and Management Committee for Ships
- Chemical Carrier Panel
- Legal Committee
- Tax and Capital Committee

4.5.5 Standards Norway

Source: https://www.standard.no/

About

In Norway, relevant standardization work is organized according to:

- NORSOK - Standards for the Norwegian Oil and Gas Industry, Norwegian Industry Association and Norwegian Shipowners Association
- National - by Standards Norway
- Inter Nordic – by INSTA
- European – by CEN
- International – by ISO

Standards Norway is the Norwegian standardization organization. They represent Norway in CEN and ISO.

standardization in Norway is a private activity initiated by the private sector associations and is performed in close contact with the public sector due to tight relations between regulations and standards.

standardization in Norway is a private activity initiated by the private sector associations and is performed in close contact with the public sector due to tight relations between regulations and standards. Private sector experts participate in the standardization work and determine the content of each individual standard. The process is regulated by rules for standardization work issued by Standards Norway and is based on a national strategy for standardization.

Norwegian standards:

- Provide Guidelines for requirements to goods and services
- Regulate how testing, certification and accreditation are to be conducted
- Represent a proposal for standards solution
- Contribute to expedient and safe products, production processes and services
- Are usually used voluntarily
- Provide more detailed descriptions to EU directives, national laws and regulations.

For European and international standardization work, a “Norwegian mirror committee” is appointed with the mandate to take care of Norwegian interests and monitor, participate in and follow up, the work in the European or International committee. The mirror committee, shall according to Norwegian interests, contribute to consensus on CEN and ISO standards, give recommendations to standard Norway regarding voting in the European and International committees and propose new standardization activities and withdrawal of a standard. The mirror committee will, according to the detailed rules for standardization, amongst others, assess if a standard is conflicting with Norwegian laws and regulations, or will create problems for Norwegian industry and commerce or other vital Norwegian interests. If so, ISO standards cannot be established as a Norwegian standard and for CEN standards a national deviation must be notified.

Standards Norway support the IOGP standards Solution and consider this an acceptable and good mechanism to move the standard processes forward in the present embargo situation. However they also find that other ISO projects develops well within ISO without the IOGP standards solution.

Standards Norway strongly supports ISO to be the International standardization organization for petroleum standards.

4.5.5.1 NORSOK standards

The NORSOK standards were developed by the Norwegian petroleum industry to ensure adequate safety, value adding and cost effectiveness for petroleum industry developments and operations. Furthermore, NORSOK standards are as far as possible intended to replace oil company specifications and serve as references in the regulations by the Petroleum Safety Authority (PSA).

The NORSOK standard were initiated in 1994 with the purpose to reduce the cost level of development projects by 50% and in operations by 25%. At that time 88 standards were developed and the goal was that the NORSOK standards should be replaced by International standards in ISO. Of these 88 NORSOK standards 47 are referred to in the Norwegian regulations by PSA.

NORSOK was established in 1994 by the Norwegian Oil and Gas to develop standards to ensure adequate safety, value adding and cost effectiveness for petroleum industry developments and operations.

NORSOK standards are as far as possible intended to replace oil company specifications and serve as references in the authorities' regulations.

Presently, Norwegian Oil and Gas, The Federation of Norwegian Industries and the Norwegian Shipowners' Association are the owners of NORSOK standards. Standard Norway is assigned to administer, maintain, develop and publish NORSOK standards on behalf of the owners. Thus NORSOK is no longer an organization, but a brand name for Norwegian Petroleum standards.

NORSOK standards have a slogan "Bridging the gap". This implies that NORSOK standards may contain additions or deviations from international standards such as ISO, necessary for operations in the rough climatic conditions of the Norwegian Continental Shelf.

The aim for NORSOK is to:

- Increase the use of international standards
- Develop standards that contribute to cost efficient solutions
- Develop and maintain standards that will contribute to the national and international competitive ability of Norwegian companies
- Contribute to industrialization through standardization
- Contribute to a reduced need for company specific requirements
- Contribute to an improved safety level on the Norwegian Continental Shelf

The strategy for NORSOK is:

- The industry must strengthen their involvement in the standardization work within ISO/CEN
- Proposal for new standards shall be proposed to the international standardization bodies such as ISO/CEN
- The member companies top management must provide their standards working representatives clear guidance for the work to contribute to cost effective solutions.
- standards referred to in the regulations, shall be formulated to avoid requirements which increase costs and result in over specification within the regulations.
- The owners agreed to conduct a review to either propose NORSOK-standards as international standards, or determine which should be withdrawn, or revised and maintained.
- Development and use of NORSOK-standards where ISO/CEN standards cannot be established is to be supported.

In 2012-2013 the owners of NORSOK standards; the Norwegian Oil and Gas Association, the Federation of Norwegian Industries and the Norwegian Shipowners' Association concluded that many NORSOK

standards had led to increased requirements when they were referred to in the regulations. In addition company specific requirements had added to the cost increase of the Norwegian Petroleum Industry. This led to a review of the NORSOK standardization work, where many standards were adopted for revision, with the aim of once again achieving cost-effective standards and increased use of international standards.

The strategic elements in revitalisation of the NORSOK standard work are:

- New standards should be aimed primarily at the international level
- Industry involvement in ISO is a prerequisite for improving and strengthening international standardization work
- Cost effective standards should be ensured by effective processes and quality of NORSOK standards
- standards referred to in the regulations must be formulated to avoid unnecessary tightening of the rules or adverse cost increases

In the ongoing project all existing NORSOK standards will be reviewed to determine whether they should be withdrawn, maintained unchanged, revised or be proposed as international standards.

4.5.6 PSA Petroleum Safety Authority

Source: http://www.ptil.no/?lang=en_US

About

The Petroleum Safety Authority (PSA) is an independent government regulator with responsibility for safety, emergency preparedness and the working environment in the Norwegian petroleum industry.

Members

The PSA is an independent government regulator.

What they do

The PSA's regulatory authority covers petroleum activities on the Norwegian continental shelf (NCS) as well as onshore petroleum-related plants and the associated pipeline systems. The PSA serves as the regulator for technical and operational safety, emergency preparedness and the working environment in all phases of petroleum activity.

The PSA has been given the following duties:

- Through their own audits and in cooperation with other health, safety and environmental (HSE) regulators, to ensure that the petroleum industry and related activities are supervised in a coherent manner.
- To supply information and advice to the players in the industry, to establish appropriate collaboration with other HSE regulators nationally and

PSA is the Norwegian regulator with responsibility for safety, emergency preparedness and working environment in the Norwegian petroleum industry.

The aim of the Norwegian regulations is to minimize the threat of accidents, personal injuries, occupational illness and environmental damage.

The regulations are largely formulated as performance-based (functional) requirements.

The Guidelines to the HSE regulations provide recommended safety levels for fulfilling the functional requirements. These usually take the form of recognized norms, for instance industry standards such as ISO, API and NORSOK standards.

PSA participates with representatives in standard development, amongst others ISO, NORSOK.

internationally, and to contribute actively to conveying knowledge about HSE to society in general.
- To provide input to the supervising ministry on matters being dealt with by the latter, and support with issues on request.

In Norway, it has been opted for a single, coherent set of regulations that impose the same requirements on the whole of the shelf.

Norway's regulations for petroleum operations onshore and offshore are risk-based, and give emphasis to principles for reducing risk related to health, safety and environment (HSE). The aim is to minimize the threat of accidents, personal injuries, occupational illness and environmental damage.

The regulations are largely formulated as performance-based (functional) requirements indicating a safety level that is to be achieved.

Regulations and Guidelines must be viewed collectively in order to acquire the best possible understanding of the safety level which the regulations seek to achieve. The Guidelines to the HSE regulations provide recommended norms for fulfilling the specific requirements. These usually take the form of recognized industry standards such as ISO, API and NORSOK standards. A total of 47 NORSOK standards are referred to as Guidelines to the PSA regulations. When a recommended standard is applied, the requirement can be considered to be met. Should an alternative (recognized) solution be chosen, it must be possible to document that the requirement has been fulfilled as well as or better than with the recommended option.

Work process

The PSA participates with representatives in standard development, amongst others ISO, NORSOK etc..

The Safety Forum is the central arena for cooperation among the parties in the industry, including the workforce, and the authorities as regards health, safety and environment in the petroleum activities on the Norwegian shelf and on land. The forum was established in 2001 to initiate, discuss and follow up relevant safety, emergency preparedness and working environment issues in the petroleum industry in a tripartite perspective. The forum is led by the director general of the PSA.

The Safety Forum is an arena for consultation on and follow-up of a number of key projects and processes. The forum's strategic agenda assigns a central place to major accident and working environment risks as well as tripartite collaboration between employers, employees and government. In addition, the forum will discuss other industry conditions which are significant for safety and the working environment. These include such aspects as capacity, expertise and operating parameters.

The PSA has, in dialogue with the parties, established a tripartite cooperation called the Regulator Forum. Amongst others themes on the agenda for the Regulator Forum are plans for and collaboration on regulatory development, in addition to information on standardization work.

The PSA participates in the Arctic Offshore Regulators' Forum (AORF). See section 3.2 for a description of AORF.

4.6 Russian Federation

4.6.1 GOST R - Federal Agency on Technical Regulation and Meteorology

Sources:

http://www.gost.ru/wps/portal/en/main

http://www.iso.org/iso/about/iso_members/iso_member_body.htm?member_id=2176

http://www.strategicstandards.com/files/Russia.pdf

About

The USSR Committee for standardization was created on 15 September 1925. The state standards (GOST) were compulsory documents for all enterprises and organizations regardless of their rank within various branches of industry until 1992.

In May 2004, the State Committee for the Russian Federation for standardization and Metrology was transformed into the Federal Agency on Technical Regulating and Metrology (GOST R).

GOST R is the Federal Executive Body, implementing inter-industry coordination and functional regulating in the fields of standardization, metrology and conformity assessment.

GOST R holds the function of National standards Body in the Russian Federation and represents Russia in international (and regional) organizations for standardization.

Members

GOST R is the federal executive body that realizes the functions on rendering state services, administration of public estate in the field of technical regulating and metrology.

What they do

GOST R is the Federal Executive Body, implementing inter-industry coordination and functional regulating in the fields of standardization, metrology and conformity assessment.

GOST R holds the function of National standards Body in the Russian Federation and represents Russia in international (and regional) organizations for standardization.

Work process

Historically, Russian standards have been prescriptive, rather than goalsetting and thus provide detailed approaches to engineering design. As a result incentives to apply new technology or to implement new research findings have not been prioritized through these standards.

4.6.2 MNR - Ministry of Natural Resources and Ecology of the Russian Federation

Source: http://www.kslaw.com/imageserver/kspublic/library/publication/russianoilgas.pdf
(King&Spalding 2012)

The licensing regime of Russian subsoil resources included oil and gas is administered by the Ministry of Natural Resources and Ecology of the Russian Federation (MNR) and federal agencies under its jurisdiction. The Federal Agency for Subsoil Use (Rosnedra) is the central administrative agency.

MNR administers the licensing regime of Russian Petroleum resources.

The Federal Agency for Subsoil Use (Rosnedra) is the central administrative agency.

Rosnedra is responsible for the issuance, suspension and revocation of subsoil use licenses, the approval of deposit development plans; and the transfer and storage of geological information.

Oversight of compliance with the legislation regulating subsoil use and protection of the environment is conducted by the Federal Service for Supervision of Nature Use (Rosprirodnadzor). Russian environmental legislation establishes a pay-to-pollute regime administered by the Russian Federal Service for Ecological, Technological and Nuclear Supervision (Rostechnadzor).

Offshore hydrocarbon operations on the continental shelf within a 200-nautical-mile zone fall under the jurisdiction of the agencies operating under the auspices of the MNR, as well as several other governmental entities, including the Federal Security Service and the Federal Agency for Fisheries. The exclusive economic zone of the Russian Federation is the marine area located from Russia's 12-mile territorial sea up to 200 nautical miles from the coastal state baseline, including all islands located within the area.

The Exclusive Economic Zone Law sets up a framework for protective measures with regard to dumping, accidents at sea, and protection and conservation of icebound areas and specially designated areas.

4.7 Sweden

4.7.1 SMA - Swedish Maritime Administration

Source: http://www.sjofartsverket.se/en/

About:

The Swedish Maritime Administration (SMA) offers modern and safe shipping routes with 24 hour service. SMA is a governmental agency and enterprise within the transport sector and is responsible for maritime safety and availability.

SMA is a governmental agency and enterprise within the transport sector and is responsible for maritime safety and availability.

The Swedish Maritime Administration's primary mission is to promote favorable conditions for the maritime sector in Sweden and for Swedish shipping. This includes:

- Promoting safe, environmentally sound and efficient shipping.
- Meeting the needs of the maritime sector for infrastructural services in the form of sea routes, pilotage, icebreaking, nautical information, communications and service.
- Managing maritime and aeronautical search and rescue operations.
- Safeguarding the competitiveness of the Swedish maritime sector

What they do:

The Swedish Maritime Administration is responsible for State obligations with regard to fairways, including hydrographic surveys and buoyage in fairways, icebreaking and hydrographic information (production of navigational charts).

The Administration assigns to this area the mainly regionally oriented operational areas of maritime traffic information (Vessel Traffic Service, VTS), pilotage and maritime and aeronautical search and rescue connected to the Joint Rescue Coordination Centre (JRCC) in Göteborg and the operational activities of the maritime traffic areas.

Through its sector responsibility, the Swedish Maritime Administration also has the important task of developing measurable objectives and indicators and of reporting the progress of the Administration and the maritime sector as a whole towards attaining transport policy objectives.

4.7.2 SIS - Swedish standards Institute

Sources:

http://www.iso.org/iso/about/iso_members/iso_member_body.htm?member_id=2101

http://www.sis.se/

About

In Sweden, standardization is carried out by three standardization bodies: SIS, the Swedish standards Institute, for business areas covered by ISO and CEN; ITS (Informationstekniska standardiseringen) for all telecom standardization and SEK (Svensk Elstandard) for all standards concerning electrical, electronic and related technologies.

SIS is the Swedish standards Institute, for business areas covered by ISO and CEN. They develop standards and represents Sweden in International standardization.

SIS being a non-profit organization, works closely with the private sector, Swedish authorities, consumer representatives and other stakeholders.

Members

SIS, the Swedish standards Institute, is open to all companies, agencies, non-profit organizations and cooperative societies. As of 2014 had approximately 1,700 companies, authorities and organizations as members.

What they do

SIS represents Sweden in international standardization within ISO and CEN. The organization comprises two main areas: SIS, Swedish standards Institute, which develops Swedish standards and contributes to the development of International standards, and SIS Förlag AB, a wholly-owned subsidiary of SIS which publishes and sells standards and handbooks and offers training and consulting services.

SIS works closely with the private sector, Swedish authorities, consumer representatives and other stakeholders.

As a non-profit organization, SIS promotes Swedish participation in international standardization activities in order to give Swedish organizations the opportunity to influence the content of international standards.

Work process

A standardisation project can be initiated in several different ways. It may be triggered by a proposal from European CEN or international ISO, whereupon SIS gauges the level of interest on the Swedish market.

Individual companies in Sweden can contact SIS and suggest a project or an entire sector may experience a mutual need to develop standards. The work is carried out by committees with a chairperson appointed by the group. The role SIS plays involves project management and administration of the committee, including the formal steps that are part of the standardisation process.

SIS contacts CEN and ISO, and supports members who are involved in international work. SIS is also responsible for about 200 international secretariats on behalf of CEN and ISO.

The standardization process consist of the following steps:

1. **Idea.** SIS receives an idea or proposal for a standard, either from the international organizations CEN and ISO, or from those of who work for a business, government agency or other organization in Sweden.
2. **Decision.** After SIS has gauged market interest, they make a decision to start a standardization project. All interested parties are welcome to take part. SIS sets up a committee consisting of participants who want to influence and benefit from standardization within their field.
3. **Start** The committee starts its work. It is led by a chairperson appointed by the committee and a project manager from SIS. Other participants and experts contribute their expertise. The group creates a plan and a program for its work. While work is in progress, new members are welcome to join the committee at any time.
4. **Proposal for a standard.** The committee develops a proposal for a standard.
5. **Consultation.** The finalized proposal is sent to stakeholders and other interested parties for consultation. The consultation proposal is also published at www.sis.se. If a Swedish national standard is involved, interested parties in Sweden are consulted. If a standard proposal comes from CEN or ISO, there will also be an international consultation process in all member states.
6. **Comments.** The committee studies the comments it receives and develops a new revised proposal.
7. **Voting.** If the proposal is for a Swedish national standard, it is the members of the SIS committee in question who take the decision to approve the standard. If it is an international proposal from CEN or ISO, the members of the international committee – in Sweden's case SIS – take a vote.
8. **standard ratified.** If members vote to approve the proposal, the standard can be ratified by SIS. A European standard from CEN is automatically ratified as a Swedish standard. An international ISO standard will usually be ratified as a Swedish standard.
9. **standard ready for use and evaluation.** Once the standard has been published, it is ready for use. Evaluation and continual improvement are important aspects of ongoing standardization efforts. After a number of years, the standard is evaluated and, if necessary, revised and reissued.

4.8 United States of America (USA)

The United States standardization system is illustrated in Figure 4-4.

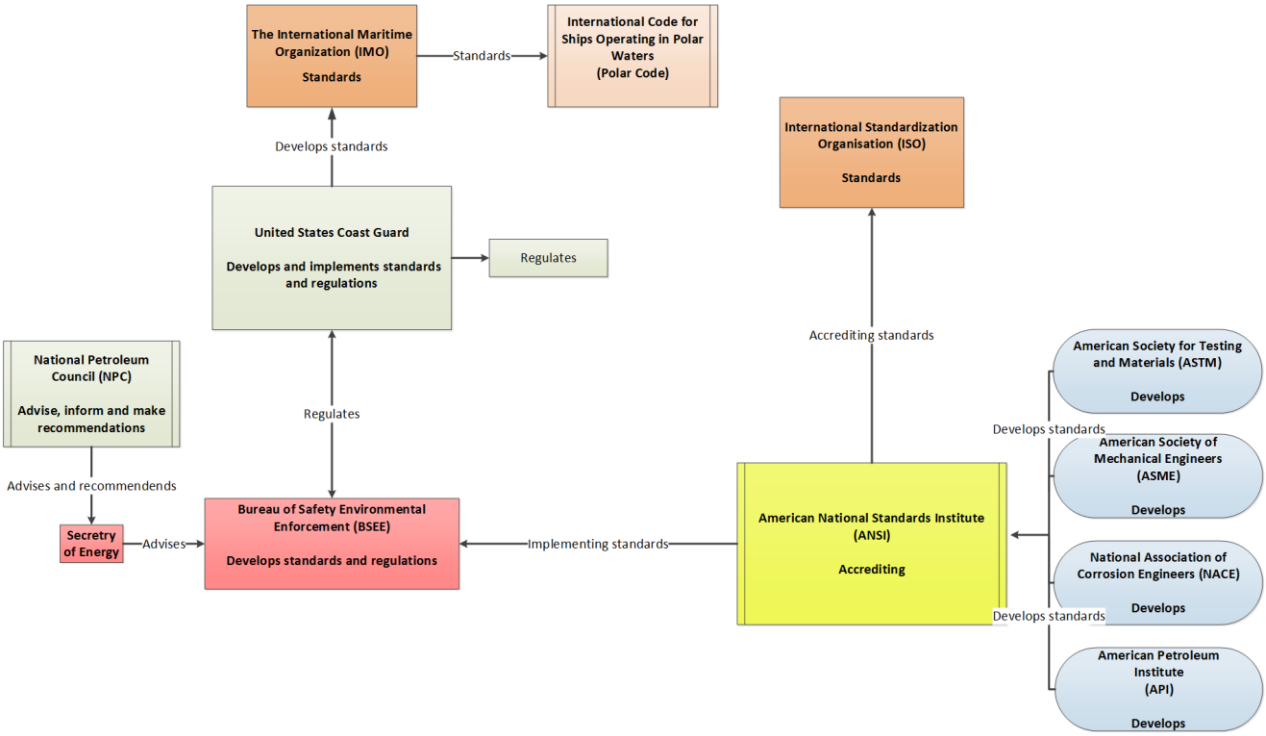


Figure 4-4. Flow chart showing the different standardization organizations and regulatory bodies which develop and implement standards in the USA

4.8.1 ANSI - American National standards Institute

Source: http://www.ansi.org/

About

American National standards Institute encourages its members and constituents to strengthen the U.S. marketplace position in the global economy while helping to assure the safety and health of consumers and the protection of the environment.

Members

Comprised of government agencies, organizations, companies, academic and international bodies, and individuals, the American National standards Institute (ANSI) represents the interests of more than 125,000 companies and 3.5 million professionals.

What they do

The Institute oversees the creation, promulgation and use of thousands of norms and Guidelines that directly impact businesses in nearly every sector: from acoustical devices to construction equipment, from dairy and livestock production to energy distribution, and many more. ANSI is also actively engaged in accreditation - assessing the competence of organizations determining conformance to standards.

ANSI is the official U.S. representative at the International Organization for standardization (ISO) and, via the U.S. National Committee, the International Electro-technical Commission (IEC). ANSI is also a member of the International Accreditation Forum (IAF).

Regionally, the Institute is the U.S. member of the Pacific Area standards Congress (PASC) and the Pan American standards Commission (COPANT). ANSI is also a member of the Pacific Accreditation Cooperation (PAC) and via the ANSI-ASQ National Accreditation Board (ANAB), a member of the Inter American Accreditation Cooperation (IAAC).

ANSI facilitates the development of American National standards (ANS) by accrediting the procedures of standards developing organizations (SDOs). These groups work cooperatively to develop voluntary national consensus standards. Accreditation by ANSI signifies that the procedures used by the standard body in connection with the development of American National standards meet the Institute's essential requirements for openness, balance, consensus and due process.

ANSI is the central standardization body in the U.S. It is the official U.S. representative at the International Organization for standardization (ISO) and other standardization bodies.

ANSI is the only accreditor of U.S. voluntary consensus standards developing organizations.

Accreditation by ANSI implies that the standard development body meet ANSI's essential requirements for openness, balance, consensus and due process.

Approval of standards is intended to verify that the principles of openness and due process have been followed and that a consensus of all interested stakeholder groups has been reached.

Work process

In order to maintain ANSI accreditation, standards developers are required to consistently adhere to a set of requirements or procedures known as the "ANSI Essential Requirements", that govern the consensus development process. Due process is the key to ensuring that ANSs are developed in an environment that is equitable, accessible and responsive to the requirements of various stakeholders. The open and fair ANSI process ensures that all interested and affected parties have an opportunity to participate in a standard's development. It also serves and protects the public interest since standards developers accredited by ANSI must meet the Institute's requirements for openness, balance, consensus and other due process safeguards.

That is why American National standards are usually referred to as "open" standards. In this sense, "open" refers to a process used by a recognized body for developing and approving a standard. The Institute's definition of openness has many elements, but basically refers to a collaborative, balanced and consensus-based approval process. The content of these standards may relate to products, processes, services, systems or personnel.

In its role as the only accreditor of U.S. voluntary consensus standards developing organizations, ANSI helps to ensure the integrity of the standards developers that use our ANSI Essential Requirements: Due process requirements for American National standards. A separate process, based on the same principles, determines whether standards meet the necessary criteria to be approved as American National standards. The process for approval of these standards (currently numbering approximately 10,000) is intended to verify that the principles of openness and due process have been followed and that a consensus of all interested stakeholder groups has been reached.

The hallmarks of this process include:

- Consensus must be reached by representatives from materially affected and interested parties
- Standards are required to undergo public reviews when any member of the public may submit comments

- Comments from the consensus body and public review commenters must be responded to in good faith
- An appeals process is required

ANSI's use of the terms "open" and "openness" to describe standards is meant to characterize documents that have undergone this kind of consensus-based, transparent process. All ANSI-accredited standards developers follow the Essential Requirements which embrace globally-accepted principles of standardization implemented by well-recognized, international standards bodies such as the International Telecommunication Union (ITU), International Organization for standardization (ISO), and International Electrotechnical Commission (IEC).

The terms and conditions used in the development of "open standards" should balance the interests of those who will implement the standard with the interests and voluntary cooperation of those who own intellectual property rights that are essential to the standard. Such terms and conditions should readily promote, and not unreasonably burden, accessibility to the standard for the communities of interested implementers. To achieve such balance, the payment of reasonable license fees and/or other reasonable and non-discriminatory license terms may be required by the intellectual property rights holders. This balance of licensing rights (rather than waiver thereof) is consistent with an open standard. The word "open" does not imply "free" from monetary compensation or other reasonable and non-discriminatory license terms.

The ANSI process serves all standardization efforts in the United States by providing and promoting a process that withstands scrutiny, while protecting the rights and interests of every participant. In essence, ANSI standards quicken the market acceptance of products while making clear how to improve the safety of those products for the protection of consumers.

International standardization

ANSI promotes the use of U.S. Standards internationally, advocates U.S. policy and technical positions in international and regional standards organizations, and encourages the adoption of international standards as national standards where they meet the needs of the user community.

The Institute is the sole U.S. representative and dues-paying member of the two major non-treaty international standards organizations, the International Organization for standardization (ISO), and, via the U.S. National Committee (USNC), the International Electrotechnical Commission (IEC). As a founding member of the ISO, ANSI plays a strong leadership role in its governing body while U.S. participation, via the USNC, is equally strong in the IEC.

Through ANSI, the U.S. has immediate access to the ISO and IEC standards development processes. ANSI participates in almost the entire technical program of both the ISO and the IEC, and administers many key committees and subgroups. Part of its responsibilities as the U.S. member body to the ISO include accrediting U.S. Technical Advisory Groups, whose primary purpose is to develop and transmit, via ANSI, U.S. positions on activities and ballots of the international Technical Committee. U.S. positions for the IEC are endorsed and closely monitored by the USNC Technical Management Committee (TMC).

In many instances, U.S. Standards are taken forward to ISO and IEC, through ANSI or the USNC, where they are adopted in whole or in part as international standards. For this reason, ANSI plays a part in creating international standards that support the worldwide sale of products, which prevent regions from using local standards to favour local industries. Since volunteers from industry and government, not ANSI staff, carry out the work of the international technical committees, the success of these efforts often is dependent upon the willingness of U.S. industry and government to commit the resources required to ensure strong U.S. technical participation in the international standards process.

4.8.2 BSEE - Bureau of Safety Environmental Enforcement

Source: http://www.bsee.gov/

About

BSEE, a bureau within the U.S. Department of the Interior (DOI), is the United States' regulator of offshore energy exploration, production, and development. BSEE's jurisdiction and regulatory responsibilities are defined by the Outer Continental Shelf Lands Act (OCSLA), which outlines federal responsibility over the submerged lands of the Outer Continental Shelf. BSEE promotes safety, protects the environment, and conserves energy resources offshore through vigorous regulatory oversight and enforcement. BSEE ensures compliance with provisions of other federal laws, including the National Environmental Policy Act, the Clean Air Act, the Clean Water Act, the Federal Oil and Gas Royalty Management Act, and Oil Pollution Act of 1990. BSEE uses the full range of authorities, policies, and tools to compel safety, emergency preparedness, environmental responsibility, and appropriate development of offshore oil and natural gas resources.

BSEE is the central regulatory body in the U.S for the offshore petroleum industry.

BSEE operations are governed by a wide variety of laws, regulations, and other communications with the offshore industry. The Bureau enforces compliance with these regulations and periodically updates rules to reflect advancements in technology and new information.

Presently BSEE incorporates over 100 technical standards into its regulatory program. The standards are related to equipment specifications, operating practices, equipment manufacturing, and hydrocarbon measurement.

What they do

BSEE uses the full range of authorities, policies, and tools to compel safety, emergency preparedness, environmental responsibility, and appropriate development of offshore oil and natural gas resources. Key functions include:

- An offshore regulatory program develops regulations and participates in standards development, and emphasizes a culture of safety in all offshore activities;
- Oil spill preparedness including evaluation of industry oil spill response plans to ensure compliance with regulatory requirements;
- Funding scientific research to enhance the information and technology needed to better carry out the BSEE mission;
- Investigations of serious incidents and allegations of unsafe and/or illegal conduct during offshore operations; and
- Enforcement of all applicable environmental and operational regulations, as well as ensuring that operators adhere to the stipulations of their approved leases, plans, and permits.

BSEE's mission is supported by national offices and divisions located in the Washington, D.C., metro area and three regional offices located in Anchorage, Alaska; New Orleans, Louisiana; and Camarillo, California. The regional offices review and grant permits, perform inspections, issue citations, prepare and refer civil penalties, and investigate incidents. The three headquarters-based divisions—Office of Offshore Regulatory Programs, Oil Spill Preparedness Division, and Environmental Compliance Division—work with the regional offices to ensure that BSEE's regulatory responsibilities are carried out effectively. The Office of Offshore Regulatory Program develops regulations that incorporate relevant standards by reference, to enhance operational safety and environmental protection for the exploration, production, and development of oil and natural gas on the Outer Continental Shelf (OCS). The Oil Spill Preparedness Division develops and enforces requirements for offshore operators' Oil Spill Response Plans, conducts research, and oversees the oil spill response exercise programs. The Environmental Compliance Division

provides sustained regulatory oversight to ensure compliance with all applicable environmental regulations, as well as lease, plan, and permit terms.

BSEE standards Development Program has a long history of collaboration with standards Development Organizations (SDOs) (http://www.standardsportal.org/usa_en/resources/sdo.aspx) and the international community to develop new or revised standards for safety and environmental.

In addition to addressing federal requirements, industry standards provide efficiencies for the agency. Industry standards are developed faster than new regulatory requirements are promulgated. Therefore, by incorporating industry standards into the regulations, BSEE can minimize the time needed to update their regulations to include the most up to date safety and environmental protections.

At the present time, BSEE incorporates over 100 technical standards into its regulatory program. The standards are related to equipment specifications, operating practices, equipment manufacturing, and hydrocarbon measurement. Currently, BSEE is working with industry on a variety of standards-related issues key to enhancing safety on the OCS. These include, but are not limited to, deep-water operations, Safety and Environmental Management Systems, cementing, cranes, high pressure high temperature, and safety valves.

Work process

When consultation and participation is in the public interest and is compatible with the agency's missions, authorities, priorities, and budget resources BSEE must consult with voluntary consensus standards bodies, both domestic and international and participate with such bodies in the development of voluntary consensus standards. Standards developed by voluntary consensus standard bodies are often appropriate for use in achieving BSEE policy objectives and in conducting federal activities, including procurement and regulation. Participation in the standards development process provides BSEE with information on how a specific standard should be interpreted by the agency or used to address regulatory needs. Participation aids in the decision-making process of whether to incorporate a standard or an updated standard into the regulations.

4.8.3 NPC - National Petroleum Council

Source: http://www.npc.org/

About

The National Petroleum Council (NPC), a federally chartered and privately funded advisory committee, established by the Secretary of the Interior. When the U.S. Department of Energy was established and the NPC's functions were transferred to the Department. The purpose of the NPC is solely to advise, inform and make recommendations to the Secretary of Energy with respect to any matter relating to oil and natural gas. The NPC does not concern itself with trade practices, nor does it engage in any of the usual trade Association activities.

NPC advise, inform and make recommendations to the Secretary of Energy with respect to any matter relating to oil and natural gas.

The advice of NPC is transmitted to the Secretary in the form of approved reports and is rendered to the government as a public service. NPC has prepared over 200 reports, which deal with virtually every aspect of oil and gas operations. Their reports form the basis for regulations and / or standard development.

Members

The Council of NPC has approximately 200 members selected and appointed by the Secretary of Energy. Individual members serve without compensation as representatives of their industry or associated interests as a whole, not as representatives of their particular companies or affiliations. In selecting the membership, special attention is given by the Secretary to assure a well-balanced representation from all segments of the oil and gas industries, all sections of the country, and from large and small companies. The Council also has members with interests outside of oil or gas operations, including representatives from academic, financial, research, Native American, and public interest organizations and institutions.

What they do

The advice of the NPC is transmitted to the Secretary in the form of reports approved by the Council and is rendered to the government as a public service. The cost of providing this service is borne by voluntary contributions from the Council members. The NPC conducts studies in response to specific requests originating from or approved by the Secretary of Energy.

Since its formation, the Council has prepared over 200 reports, which deal with virtually every aspect of oil and gas operations. NPC reports include: examinations of the ongoing and future operations and requirements of the U.S. oil and gas industries; statistical studies descriptive of these industries; delineations of the U.S. oil and gas resource base; and comprehensive analyses of the domestic energy supply/demand situation. On numerous occasions, the Council has provided advice on governmental response to emergency situations, both prospective and actual. Other studies have focused on environmental and energy conservation, technology, and legal issues.

Work process

NPC does not develop standards, but their reports form the basis for regulations and / or standard development. Of particular interest to the current report is the NPC research and report on the Arctic potential. Realizing the promise of U.S. Arctic Oil and Gas Resources.

4.8.4 U.S. Coast Guard

Source: http://www.uscg.mil/hq/cg5/cg521/

About

The U.S. Coast Guard is one of the five armed forces of the United States and the only military organization within the Department of Homeland Security. Since 1790 the Coast Guard has safeguarded U.S. maritime interests and environment around the world. The Coast Guard is an adaptable, responsive military force of maritime professionals whose broad legal authorities, capable assets, geographic diversity and expansive partnerships provide a persistent presence along U.S. navigable waterways, in the ports, littoral regions and on the high seas Coast Guard operations, and their impacts, occur in the local, regional, national and international arenas. The Coast Guard is the U.S. instrument of maritime safety, security and environmental stewardship.

The U.S. Coast Guard is the U.S. instrument of maritime safety, security and environmental stewardship.

The Office of Design and Engineering standards develop and promulgate national regulations and standards that govern the safe design and construction of ships and shipboard equipment.

It represents the U.S. on several committees and sub-committees at the International Maritime Organization (IMO) and is engaged with various standards committees and classification society rules committees.

What they do

The Director of Commercial Regulations and standards (CG-5PS) develops national regulations, standards, and policies; develops and executes an engagement plan for international standards development; and administers a technical compliance program to ensure uniform application of design and operating standards on commercial vessels. Furthermore, it represents the United States on several committees and sub-committees at the International Maritime Organization (IMO) and is actively engaged with various standards committees (e.g., ASTM, IEEE, NFPC, etc) as well as classification society rules committees (e.g., ABS, LR, DNV, etc.). The Directorate coordinates Coast Guard efforts in industry consensus standards development and integration into United States regulations.

Work process

Within the Directorate, experts in the areas of ship design & engineering (CG-ENG), vessel & facility operating & environmental standards (CG-OES), and standards development & evaluation (CG-REG) work collaboratively to enhance maritime safety, security and stewardship.

The Office of Design and Engineering standards (CG-ENG) is responsible for developing and promulgating national regulations and standards that govern the safe design and construction of ships and shipboard equipment, including hull structure, stability, electrical & mechanical systems, lifesaving & fire safety equipment, and related equipment approval and laboratory acceptance.

The Office of Operating and Environmental standards (CG-OES) develops standards regulating maritime industry through international treaties and U.S. statutes, regulations, and policy.

The Office of standards Evaluation and Development (CG-REG) provides project management and economic and environmental analyses in coordination with other RDP partners and in support of program offices which oversees the relevancy of regulations for their respective Coast Guard mission.

4.8.5 State of Alaska, Department of Environmental Conservation

Source: www.dec.alaska.gov

ABOUT

The Alaska Department of Environmental Conservation (ADEC), is a regulatory agency for the State of Alaska tasked with setting standards for preventing pollution in the lands and waters of the State which generally extend three nautical miles from shore. In the US Arctic, the State of Alaska establishes standards for exploration, production, and transportation of oil and other hazardous substances on land and up to 3 miles off shore.

WHAT THEY DO

Similar to the USCG and BSEE, the State of Alaska publishes standards in regulations and guidance documents which are updated frequently. State regulations cannot conflict with federal rules but in some cases, states can have additional requirements or stricter standards. ADEC has taken those steps in two key areas related to oil spills. Specifically, ADEC requires operators to demonstrate preparedness within a quicker time frame, and ensure they have additional resources at their disposal to address a spill if it occurs. Areas regulated by the state include:

- Oil spill prevention, preparedness and response through contingency planning
- Wastewater discharges
- Air pollution
- Sold waste disposal

WORK PROCESS

The State of Alaska's work process for establishing standards is identical to US federal agencies. The public can petition the state to make changes to requirements. Proposed regulatory changes go through a rigorous public process before becoming mandatory.

5 Other input to standard development

There is a huge wealth of books and papers which collectively represent the gathered knowledge of industry and academia over time, forming the basis of standard development.

Below a few examples of projects and various input to standard development are mentioned, to illustrate that standardization also could have other origins than the standardization development processes elsewhere described in the report.

5.1 Barents 2020 project

Source: https://www.dnvgl.com/oilgas/barents-2020-reports.html

The Barents 2020 project was initially aimed at creating a dialogue between relevant Norwegian and Russian stakeholders regarding safety of petroleum related activities in the Barents Sea. The aim was to arrive at common acceptable standards for safeguarding people, environment and asset values in the Oil and Gas Industry in the Barents Sea, including transportation of oil and gas at sea. The project was funded by Russian and international companies with support from the Norwegian Government's Barents 2020 program. The project was conducted in four phases:

- **Phase 1 (October 2007-October 2008)** produced five 'position papers' and established the Norwegian – Russian partnership model for the project (Barents 2020, 2012).
- **Phase 2 (November 2008-March 2009)** prioritised and selected from a range of topics, seven key areas for further work in seven specialist working groups;
  1. Co-ordination of deliverables
  2. Design of floating structures in ice
  3. Risk management of major hazards
  4. Escape, evacuation and rescue of people
  5. Working environment
  6. Ice management – state of the art
  7. Operational discharges to air and water
- **Phase 3 (May 2009-March 2010)** identified 130 standards recommended for common use of which 64 can be applied "as is" and the remaining 66 can be applied provided special considerations are made for low temperatures and/or ice loading. The phase 3 final report was published in 2009 (Barents 2020, 2009).
- **Phase 4 (May 2010-May 2012)** brought forward from phase 3 those issues and topics in greatest need of completion, revision and detailed guidance. The recommendations provided by five of the seven working groups (2, 4, 5, 6 and 7) were submitted to the relevant standardization body, primarily ISO technical committee (TC) 67's 19906 standard, and to the new TC 67 subcommittee (SC) 08 on Arctic operations. Working group 1 was tasked with recommending and guiding the process to format and channel the deliverables and results to the correct standardization addresses, while working group 3 risk management, did not recommend any new standards, though was tasked with running seminars. The phase 4 final report published in 2012 (Barents 2020, 2012, included recommendations and guidance to improve ISO 19906 as well as recommendations to develop best practice for ice management, recommendations on evacuation, escape and rescue and recommendations on working environment.

Through the Barents 2020 project, Russian and Norwegian engineers worked together to identify needs for standardization of the oil and gas developments in Arctic areas. The work of the Barents 2020 project is recognized by EPPR as an important contribution to standardization of oil and gas operations in the Arctic.

Technical areas covered in the phase 4 report:

1. Arctic technology (incl. Ice management, ice loading) (RN02)
2. Civil and structural engineering
3. Completion (mechanical completion and commissioning)
4. Drilling and well
5. Electrical
6. Emissions and discharges to air and water (RN07)
7. Environmental conditions, loads and load effects
8. Evacuation and rescue of people (RN04)
9. Geo-technology & foundations
10. Instrumentation and automation
11. Life cycle information (LCI)
12. Lifting appliances
13. Materials technology
14. Mechanical (mechanical static and rotating, HVAC, piping engineering, valves and layout)
15. Operation and maintenance (incl. regularity & criticality)
16. Pipeline technology
17. Platform technology
18. Process technology, incl. Cold climate protection of process plants and flow assurance / fiscal measurement
19. Riser technology
20. Risk management of major hazards (e.g. Fires, explosions, blow-outs) (RN03)
21. Safety, health and environment (she)
22. Ship transportation (RN06)
23. Station keeping (mooring)
24. Subsea technology
25. Telecommunication
26. Working environment and safety related to human factors (RN05)

In the report, a wide range of existing standards have been evaluated and recommendations have been provided for updates / preparation of new standards applicable for operations in the Arctic.

Recommendations from Barents 2020, among others, form the basis for the work presently ongoing in ISO TC 67 SC8, described in section 3.6.

5.2 Arctic operations handbook

Source: http://www.Arctic-operations-handbook.info/

The Arctic operations handbook was a joint industry project to enhance safe, reliable and sustainable operations in the Arctic. The JIP was set up by 16 participating companies in February 2012, consisting of offshore contractors, engineering companies, knowledge institutes and Arctic consultants, under a subsidy from the Dutch Ministry of Economic Affairs. The results were made public in December 2013.

The Arctic operations handbook JIP focused on the operational activities for transport and installation of fixed, floating and subsea units, as well as for dredging, trenching, pipe laying and floating oil and gas production in Arctic and cold weather conditions. The prime purpose of the JIP was to identify gaps in the existing standards and Guidelines. Specific recommendations were subsequently proposed with the intention to contribute to the development of internationally accepted standards and Guidelines.

The Arctic marine operations challenges and operations report (2013) documents the output from the JIP, including the results of the gap analysis and of three pilot projects. The report provides the offshore

industry an overview of identified gaps and proposes a large number of recommendations in order to close the gaps. The identified gaps and recommendations could support the further development of ISO/TC 67/SC 8 Arctic operations standard, ISO 19906 SC7 Offshore structures standard, ISO 19901-6 Marine operations standard and future JIPs. Wiersema et al. (2014) describe the Arctic operations handbook JIP.

In the follow-up from the Arctic operations handbook JIP, several JIPs were suggested; the IceStream, IceTower, PractICE and SALTO JIPs. However, only the SALTO JIP was initiated for various reasons.

5.3 Assurance companies

Assurance companies is another example of organizations that may have interest in development of Standards for the prevention of oil spills in the Arctic.

The information in this section has been received from the insurance company Gard, as an example on how insurance companies evaluate the challenges of maritime activities in the Arctic and contribute to standards development.

One of the main problems for the insurance industry is the lack of reliable statistical data which makes it difficult to prepare an overall risk assessment of Arctic voyages.

The Polar Code is a major step forward, and especially with regard to Arctic trade in ice infested waters the Polar Water Certificate and the Polar Water Operation Manual will provide insurers with valuable input regarding the preparedness of the ship and the owners. For all ships, including the ships with lower or no ice classes trading in the Arctic during the summer season, the Polar Code is a risk-based standard; more stringent standards are applied as the risk associated with operating increases (e.g., higher ice concentration, lower air temperature). The Polar Code raises the standard for international shipping in the Arctic based on a ship-specific risk assessment including voyage planning requirements, increased ice navigation training and equipment, and protection for tanks carrying oil and hazardous substances in addition to current MAPROL requirements.

Classification societies may have different ice class notations, and ice class is not part of the main class. It is a voluntary additional class. The classification societies' rules as such do not regulate the way in which a vessel may be operated in ice infested areas. This means that the vessel's class will not be withdrawn or suspended if the vessel is operating in ice conditions for which it is not designed. Hence, there will be no ground for arguing that a vessel's insurance cover is prejudiced because it has lost its class. There is therefore a general need for insurers to evaluate the risk and set requirements with regard to the vessel's ice class, winterization and general suitability to trade in ice and cold climates in particular.

Both the Nordic Insurance Plan as well as the English Institute Warranties 1/7/76 (and the International Navigating Conditions 1/11/2003) exclude Arctic Waters. Hence, Hull & Machinery insurance ceases if a ship proceeds into an excluded trading area unless the underwriters have given prior permission.

Cover may be reinstated for ships/owners that mitigate the Arctic risks and challenges to an acceptable level. Insurers most often receive this information via the technical ship management of the ship in question. Insurers experience a number of cases that the chartering department is eager to enter into contracts to the Arctic, but they have not cleared this internally with their own technical departments. And, when insurers ask for the ship owner/ manager to show us their internal risk analysis and contingency plan, the chartering department involves a larger part of their own organization and conclude that they do not want to go through with the contract.

For voyages that are performed in the Arctic, additional insurance premiums are charged according to the perceived risk, and deductibles are increased to a level where insurance covers what is “unexpected and unforeseen”. For some voyages, damages below a certain amount as well as the risk of off hire may be transferred to charterers.

Unlike H&M underwriters, P&I clubs do not generally impose any trading limits in their policies. However, if trading in the Arctic does not fall within a vessel’s normal trading pattern the P&I Club should be consulted and notified beforehand. Gard’s Rule 7 (Alteration of Risk) requires that Members notify the Association of any circumstances that may alter the risks covered by the Club. For reasons described below, Arctic voyages may well represent an alteration of risk.

Challenges for navigation in the Arctic

Navigating in the Arctic presents some unique risks and challenges. AIS tracking of vessels in the area show that a large number of vessels are subject to deviation from direct routes as a result of ice. Many areas cannot be navigated safely without the presence of large powerful icebreakers capable of providing assistance such as leading through to clearer/open waters.

Thus, when evaluating the Arctic the following uncertainties/circumstances should be borne in mind:

- Possible harsh and fast-changing conditions and less reliable weather forecasts than most other places.
- Restricted visibility up to 90% of the time.
- Is the ship suitably constructed or adapted for trading in ice (ice class and winterization) and the crew ice trained for the possible challenges, including trading in ice and the ability to operate in low temperature?
- Challenges with insufficient charts – ensure that the latest updates are available.
- Challenges of inadequate and old hydrographic surveys for the area, making chart data quality poor.
- Navigational challenges: GPS and GLONASS positioning might give a certain error, and compasses (both magnetic and gyro) are unreliable in high latitudes.
- Navigational challenges: For GNSS (GPS, GLONASS and Galileo in the future), the performance in the Arctic region is reduced compared to the performance obtained by users at mid latitudes. The reasons are mainly the satellite-receiver geometry and the ionospheric effects on the satellite signals, but also the fact that users do not have the benefit of satellite based augmentation systems (SBAS) on a larger scale. Other factors contributing to reduced safety in the area are rough weather, drifting sea ice and ice bergs, the remoteness of the area, poor maps and charts, lower accuracy of magnetic and gyro- compasses etc. All of the above issues make positioning and navigation in the area difficult.)
- Limited access to communication links. In many areas VHF or MF is the only way to communicate. VSAT is expected to work in up to 75 degrees latitude, but in reality very often ceases to work around 71 degrees. Additionally, only short size messages can be transmitted due to limited bandwidth if any at all.
- Lack of reliable ice and weather forecasts and the means to obtain such information on board.
- The emergency response infrastructure is largely under-developed. This may make an emergency response complicated and expensive, since people and equipment will probably have to be brought to the site – which could be extremely remote. Additionally, there is a significant lack of resources, no repair facilities and limited salvage equipment along the route. There are no deep water quays or safe havens, and a smaller incident may therefore well develop into a major casualty.
- Logistical problems for the delivery of spare parts. There are very few ports where spare parts can be obtained or flown in.
- The extent to which the national authorities will allow and facilitate the involvement of professional foreign sailors is uncertain.

- Communication in a distress situation may be a challenge as much of the communication i.e. in NSR is likely to be in Russian via the Russian ice breaker.
- Due to the remoteness, even towage to repair yards may be challenging.

Casualty response

The Arctic is both an ecologically sensitive and extremely remote region. Although the level of traffic is still relatively limited, both these aspects are of concern to insurers, as they increase the risk that an incident or casualty in the Arctic could lead to serious consequences.

One of the main risks and challenges from a casualty perspective is the need for salvage services and at worst, the potential of a wreck removal. The combination of extreme cold conditions, ice, remoteness and lack of available winterized assets creates particular challenges. Although a vessel may be assisted by an ice breaker, which may have some emergency equipment on board, it should be remembered that an ice-breaker's purpose is to break ice, not to provide salvage services. While towing a vessel whose main engine may have failed might, in extremis, be possible, such vessels are unlikely to have either the equipment or training and experience necessary to carry out a more complex procedure, such as the removal of bunkers. Personnel and equipment will, therefore, have to be brought in from abroad, sometimes to extremely remote and inhospitable locations. Bearing in mind the fact that the mobilization time could well be considerable, there is concern that an "ordinary" machinery failure might end up as a wreck removal.

5.4 Public opportunities to influence standard development

Non-governmental organizations (NGO's) have opportunities to influence the development of standards. A couple examples related to standard development in the Arctic are:

The WWF has engaged in the standardization work of ISO at least in the last decade and has discussed with ISO that that a broader range of stakeholders could make a valuable contribution to sustainable development. It has also contributed constructively with inputs to the work in ISO TC 67/SC 8 regarding Arctic standards.

Pew Institute in U.S. has prepared several reports addressing the need for standard on the prevention of acute oil spills in the Arctic:

- Pew Environment Group, Nuka Research and Planning Group & Pearson Consulting 2010: OIL SPILL PREVENTION and RESPONSE IN THE U.S. ARCTIC OCEAN: Unexamined Risks, Unacceptable Consequences.
- Pew Environment Group, Policy Recommendations. Oil Spill Prevention and Response in the U.S. Arctic Ocean

It should be noted that several other NGO's contribute to standard development, either in national or international standardization bodies. The above are only examples.

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Appendix I. Abbreviations

ABS	American Bureau of Shipping
ACAP	Arctic Contaminants Action Program – an Arctic Council Working Group
AMAP	Arctic Monitoring and Assessment program – an Arctic Council Working Group
ANSI	American National standards Institute
AOPPS	Arctic Oil Pollution Prevention standards
AORF	Arctic Offshore Regulators' Forum
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATC	Arctic Technology Conference
BOEM	Bureau of Ocean Energy Management (US)
BSEE	Bureau of Safety and Environmental Enforcement (US)
CAFF	Conservation of Arctic Flora and Fauna Working Group (Arctic Council)
CD	Committee Draft
CGSB	Canadian General standards Board
CEN	European Committee for standardization
CSA	Canadian standards Association
DIS	Draft International standard
DMA	Danish Maritime Authority
EN	European Norm
EPPR	Emergency, Prevention, Preparedness, and Response Working Group (Arctic Council)
EU	European Union
E&P	Exploration & Production
FDIS	Final Draft International standard
FSA	Finnish Shipowners Association
GOST R	Federal Agency on Technical Regulation and Meteorology
HSE	Health, Safety and Environment
IACS	International Association of Classification Societies

IADC	International Association of Drilling Contractors
IALA	International Association of Lighthouse Authorities
IEC	International Electrotechnical Commission
IMO	International Maritime Organization
IOGP	International Association of Oil and Gas Producers
IOSVCC	International Offshore Support Vessel Chemical Code
ISO	International standardization Organization
IST	Icelandic standards
LRFD	Load and Resistance Factor Design
LSA	Life Saving Appliances
LTE	Low Temperature Environment
MLSA	Mineral Licence and Safety Authority (Greenland)
MNR	Ministry of Natural Resources and Ecology of the Russian Federation
MODU	Mobile Offshore Drilling Unit
NACE	National Association of Corrosion Engineers
NCA	Norwegian Coastal Administration
NEB	National Energy Board (Canada)
NMA	Norwegian Maritime Authority
NPC	National Petroleum Council (US)
NPRA	Norwegian Public Road Administration
NRC	National Research Council (Canada)
NRCan	Department of National Resources Canada
NSA	Norwegian Shipowners Association
OCIMF	Oil Companies International Marine Forum
OORP	Office of Offshore Regulatory Programs
OSPD	Oil Spill Preparedness Division
OTC	Offshore Technology Conference
PAME	Protection of the Arctic Marine Environment - Working Group of the Arctic Council
PAS	Publicly Available Specification

PSA	Petroleum Safety Authority (Norway)
RP	Recommended Practice
Runorm	Russian standards and Technical Regulations
SAC	standardization Administration of the People's Republic of China
SC	Sub-Committee
SCC	standards Council of Canada
SDWG	Sustainable Development Working Group of the Arctic Council
SFS	Finnish standards Association
SMA	Swedish Maritime Administration
SOLAS	Safety of Life at Sea
TC	Technical Committee
UiS	University of Stavanger
UL	Underwriters Laboratories
USA	United States of America
USCG	US Coast Guard
USGS	U.S. Geological Survey
WG	Working group
WMO	World Meteorological Organization

Appendix II. International organizations - relevant standards, Guidelines and reports

In this section some relevant international standards, Guidelines and Recommended practices for offshore petroleum and maritime activities in the Arctic have been identified.

API –Relevant standards and Guidelines

A wide range of API standards are directly or indirectly relevant for the prevention of oil spills, although few are directed toward prevention of oil spills or to the Arctic. Only one Arctic related standard (API RP 2N) was identified when searching at API. In addition the API Specification 4F:2013 and the API RP 2MET/ISO 19901-1:2005 recommended practice is relevant for design and operations in cold regions.

API RP 2N Recommended practice for planning, designing and constructing structures and pipelines for Arctic conditions

Source: http://www.api.org/Publications-standards-and-Statistics/standards/WhatsNew/Publication-Updates/New-Exploration-And-Production-Publications/API_RP_2N

The API RP 2N Recommended Practice for planning, designing and constructing structures and pipelines for Arctic conditions was first published in 1982. API RP 2N served as the basis for ISO 19906 Arctic offshore structures, which was published in 2010. In April 2015, a new edition of API RP 2N was published. The new edition is a modified adoption of the ISO 19906:2010.

The main observed differences between the ISO 19906:2010 and the API RP 2N standards are:

- API RP 2N uses the wording ‘loads’ and ‘loads effects’ rather than ‘actions’ and ‘actions effects’ used by ISO 19906.
- API RP 2N does not mention a reliability target expressed as annual failure probability at 1E-5 for L1 structures as given in Table A.7-1 of ISO 19906.

API Specification 4F:2013 Specification for drilling and well servicing structures

Source: http://www.api.org/publications-standards-and-statistics/standards/whatsnew/publication-updates/new-exploration-and-production-publications/api_spec_4f

This specification states requirements and gives recommendations for suitable steel structures for drilling and well servicing operations in the petroleum industry, provides a uniform method of rating the structures, and provides two Product Specification Levels. This specification that addresses the fabrication of such structures used in cold climate.

ANSI/API Recommended Practice 2MET - Derivation of Metocean Design and Operating Conditions. API RP 2MET/ISO 19901-1:2005

Arctic Council reports that highlight prevention

Framework Plan for Prevention of Oil Pollution in the Arctic

Source: Arctic Council Framework Plan for Cooperation on Prevention of Oil Pollution from Petroleum and Maritime Activities in the Marine Areas of the Arctic (Arctic Council, 2015)

The "Framework Plan for Cooperation on Prevention of Oil Pollution from Petroleum and Maritime Activities in the Marine Areas of the Arctic" is an important document in relation to the current report, as it, forms the basis for the report. A shortened version of the document is presented below.

The Governments of Canada, the Kingdom of Denmark, the Republic of Finland, Iceland, the Kingdom of Norway, the Russian Federation, the Kingdom of Sweden, and of the United States of America, (the Participants) have agreed on the framework plan.

The objective of the Framework Plan for Cooperation on Prevention of Oil Pollution from Petroleum and Maritime Activities in the Marine Areas of the Arctic (Framework Plan) is to strengthen cooperation and exchange of information, among the Participants in the field of prevention of marine oil pollution in order to protect the Arctic marine environment. In these areas the Participants intend to cooperate in accordance with relevant rules of international law, their national legislation (laws and regulations) and, as appropriate, policies.

The Framework Plan applies to petroleum and maritime activities in the marine areas of the Arctic that entail a risk of oil pollution to the Arctic marine environment.

Regarding processes, regulations, policies and practices related to the prevention of oil pollution of the Arctic marine environment the participants may:

a) request such information from other Participants;
b) respond to such requests from other Participants, either directly or through existing fora
c) share any relevant information they consider of interest to other Participants.

The Arctic Council Task Force on Arctic Marine Oil Pollution Prevention (TFOPP) prepared the Framework Plan for Cooperation on Prevention of Oil Pollution from Petroleum and Maritime Activities in the Marine Areas of the Arctic.

The governments of the Arctic Council countries have agreed to the Framework Plan.

The objective is to strengthen cooperation and exchange of information, in the field of prevention of marine oil pollution in the Arctic.

Among other, the countries intend to:

- Cooperate with the private sector in order to improve standards and best practices for the prevention of oil pollution of the Arctic marine environment;
- Promote the development of standards and/or best practices;
- Assess whether existing and proposed standards for petroleum activity are sufficient to meet Arctic challenges;
- Improve methods, standards and systems for detecting and monitoring metocean and ice related conditions.

The Participants may withhold information that may be unreasonably difficult or costly to discover or provide.

The Participants intend to:

- Carry out impact assessments including environmental impact and risk assessments of petroleum and maritime activities which may result in oil pollution of the Arctic marine environment.

- Protect and conserve the Arctic marine environment, including wildlife, vulnerable ecosystems and ecosystem services, while regulating or engaging in petroleum and maritime activities in the marine areas of the Arctic.
- Strengthen cooperation between their competent national authorities in order to implement this Framework Plan.
- Cooperate with the private sector in order to improve standards and best practices for the prevention of oil pollution of the Arctic marine environment.
- Have their competent national authorities implement this Framework Plan. The implementation may be discussed during the meetings of the relevant bodies of the Arctic Council.
- Cooperate to develop an overview of the existing and potential technical and operational safety measures specifically designed to prevent oil pollution in the Arctic marine environment from offshore petroleum activity.
- Promote the development of standards and/or best practices relevant to the prevention of oil pollution in the Arctic, e.g., well design, source control, capping, containment and other technical and operational measures.
- Assess whether existing and proposed standards for petroleum activity are sufficient to meet Arctic challenges.
- Support participation of technical experts in the efforts referred to in this section.
- Promote cooperation between competent national authorities on issues concerning the prevention of Arctic marine oil pollution from petroleum activities.

Regarding remote and aerial surveillance, the Participants intend to:

- Share lessons learned and best practices from responding to/monitoring pollution incidents and operating in harsh Arctic environments.
- Develop operational procedures for pollution patrol, ice patrol, etc. in the Arctic.
- Explore possible exchange of personnel for familiarization tours as part of the crew.
- Explore the possibility of coordination of earth observation satellites to acquire/share imagery over contiguous waters.

Regarding enhancing cooperation on maritime risk assessments the Participants intend to:

- Exchange experience and best practices of data collection and analysis for maritime risk assessments.
- Exchange maritime traffic and environmental sensitivity data and associated methodologies.
- Explore the possibility of developing a common and publicly accessible database of Arctic maritime traffic and environmental sensitivity data.

Regarding navigational charts the Participants intend to:

- Explore coordination of hydrography and mapping surveys to improve the safety of Arctic shipping.
- Exchange experiences and best practices on hydrography and nautical charting in the Arctic.

Regarding meteorological and oceanographic forecasts the Participants intend to:

- Exchange experience and best practices in the field of forecasting meteorological, oceanographic and ice related conditions and hazards as well as regarding climatological ice and metocean information.
- Improve methods, standards and systems for detecting and monitoring metocean and ice related conditions, and distributing this information.

Regarding broadband and satellite communications the Participants intend to:

- Exchange information on relevant systems of broadband and satellite communication to improve safety of navigation in the Arctic.

Regarding prevention of marine incidents that could result in oil pollution the Participants intend to:

- Develop a catalogue of existing resources (tug boats, tow packages, ship arrestors, mooring buoys, etc.) that may play a role in minimizing the potential for, and the environmental impact of, a marine incident that could result in oil pollution, and to assess the adequacy of such resources.

Regarding navigation in ice conditions the Participants intend to:

- Exchange best practices and any other relevant information on national requirements and, when appropriate, industry standards for navigating in marine areas of the Arctic in ice conditions.

Regarding icebreaking and ice-management services the Participants intend to:

- Exchange best practices and information on existing icebreaking and ice-management services.

Regarding reduced risks associated with use and transport of heavy fuel oil the Participants intend to:

- Explore and pursue ways to reduce the environmental risk posed by transportation, storage or use of heavy fuel oil by ships in the Arctic.

Arctic Oil and Gas Guidelines; Systems Safety Management and Safety Culture

Source: PAME report Arctic Oil and Gas Guidelines. Systems Safety Management and Safety Culture. Avoiding Major Disasters in Arctic Offshore Oil and Gas Operations. (Arctic Council, 2014). https://oaarchive.Arctic-council.org/handle/11374/418

PAME has prepared the guideline on "Systems Safety Management and Safety Culture" and other relevant reports.

The guideline includes a separate section on regulatory regimes and Standards for the Arctic with recommendations to the Arctic Countries.

Arctic States have an important role to play in both regulating and influencing the safety of oil and gas operations in the Arctic. Recognizing this, the PAME Working Group undertook to prepare the guideline on "Systems management and Safey Culture". Its purpose was to provide more targeted guidance on protecting the marine environment from major accidents, by improving safety management systems and safety culture in Arctic offshore petroleum operations. The associated issues, challenges and suggested actions for creating and improving a positive 'safety culture' were examined closely. To that end, in preparing the guideline, PAME drew on investigations and recommendations from the Deepwater Horizon accident, as well as numerous other investigations, hearings as well as expert and stakeholder workshops.

The guideline includes a separate section on regulatory regimes and Standards for the Arctic with recommendations to the Arctic Countries.

Recommended practices for Arctic Oil Spill Prevention

Source: EPPR report Recommended Practices in the Prevention of Marine Oil Pollution (Arctic Council, 2013). https://oaarchive.Arctic-council.org/handle/11374/614

In the 2011 Nuuk Declaration, Arctic Council Ministers called on EPPR to develop "recommendations and/or best practices in the prevention of marine oil pollution".

The EPPR established the project "Recommended Practices in the Prevention of Marine Oil Pollution" to fulfil the Arctic Council's tasking. The report (Arctic Council, 2013) include references to

- Conventions, regulations, standards, Guidelines and plans
- Relevant prevention programs and development projects
- Experience from designed and installed projects
- Accident reports
- Identification of hazards, risks, existing safeguards barriers and risk mitigating measures
- Human resources and competence

The EPPR working group prepared the recommended practices on "Prevention of Marine Oil Pollution".

The report recognize that "the sharing of best practices between operators may contribute to a safer operation" as a best practice "goes beyond mandatory requirements described in rules and regulations".

The report pointed to the need to coordinate research and development work and to sharing data and results between operators, companies and countries.

The report addresses the prevention of marine oil pollution in the Arctic from offshore oil and gas activities, transport of oil, and land based activities. Only the additional challenges experienced in the Arctic are included in this work. Best practices developed to address these challenges outside the Arctic are off course relevant for identical challenges found inside the region, but these are not further discussed in the report.

The report is based on a literature review of available studies, projects, accident reports etc. relevant to EPPR's mandate. Mapping of experience from Arctic projects under development or in operation represents valuable information with regard to identifying the main hazards and how they are mitigated.

The main goal of the work was to identify possible "best practices" as defined below:

- Best practice effective prevention management strategies aimed at completely eliminating the potential for the accidental release of pollutants into the marine environment.

Very often, a best practice goes beyond mandatory requirements described in rules and regulations; hence, the sharing of best practices between operators may contribute to a safer operation.

According to the report, in the industry, the best practices are often the way things are done — but they are not necessarily documented in procedures, making them difficult to find and document. Best practices linked to the attitude in a company are typically among those which are more difficult to point to.

Some of the main findings of the report related to best practices or proposed actions to reduce the risk for an oil spill including the following issues, although mostly non Arctic spesific:

- Better and more reliable information about the actual local ice / metocean conditions
- Identifying the principal hazards and conducting a risk analysis of the actual operation
- Implementing adequate-risk mitigating options

- Implementing a good HSE system, regularly updating it, and ensuring personnel are trained in and kept abreast of updates to the system
- Requirements for training and minimum competence
- A system for continuous improvement through monitoring, updating of procedures, and training
- Building and living up to a strong safety culture at all levels in the organization - safety first
- Open and honest communication; reporting and learning from all incidents

The report pointed to the need to coordinate research and development work in order to get more value for the money invested. Sharing data and results may reduce parallel R&D work, allowing more effort to be put into projects developing real new technology and competence.

The report suggested that the Arctic Council could consider the establishment of a R&D and experience database with references to projects, reports, persons, etc. By including all Arctic Council countries in the database, new R&D projects may be based on results from existing projects; hence, it will be possible to improve both the efficiency and results of future projects. The database could also include references to best practices within different disciplines and thereby prove to be a valuable resource for both the industry and authorities.

The report found a balance between prescriptive and goal-based rules to be suitable. The development of rules and regulations often lags behind technological development. The use of more goal-based rules was thought to address some of these challenges.

Implementation and follow-up of a good HSE and management system was also highlighted as important. The value of such systems, however, is strongly dependent on regular updates according to the actual operation and that all people involved are trained and updated accordingly.

Arctic Offshore Oil and Gas Guidelines

Source: Arctic Council Arctic Offshore Oil and Gas Guidelines (Arctic Council, 2009)
http://www.pame.is/index.php/projects/offshore-oil-and-gas

The Arctic offshore oil and gas Guidelines issued by PAME are intended to be of use to the Arctic nations in offshore oil and gas activities during planning, exploration, development, production and decommissioning, with the exception of transportation of oil and gas. The goal is to assist regulators in developing standards that can be applied and enforced consistently for all offshore Arctic oil and gas operators. The intention of the Guidelines is to encourage the highest standards currently available by defining a set of recommended practices and outline strategic actions for consideration by those responsible for regulation of offshore oil and gas activities in the Arctic. The Guidelines may be of help to the industry when planning for oil and gas activities and to the public in understanding Arctic environmental concerns and practices during offshore oil and gas activities.

The PAME working group has issued the “Arctic Offshore Oil and Gas Guidelines”.

The goal is to assist regulators in developing standards that can be applied and enforced consistently for all offshore Arctic oil and gas operators.

The intention of the Guidelines is to encourage the highest standards currently available.

Guidelines for Transfer of Refined Oil and Oil products in Arctic Waters

Source: Arctic Council Guidelines for Transfer of Refined Oil and Oil products in Arctic Waters (Arctic Council, 2004) http://www.pame.is/index.php/projects/offshore-oil-and-gas

The Guidelines for transfer of refined oil and oil products in Arctic waters issued by PAME were developed for vessels operating in the Arctic. The use of the Guidelines is encouraged in all ice-infested waters. The aim is to prevent spillage during cargo / fuel oil transfer. According to the Guidelines, cargo / fuel oil fuel spillage can be prevented by: securing that reasonable precautions have been taken; that adequate resources can be deployed if unforeseen problems develop; and making sure that transfer supervisors and their crew are able to work safely and carefully.

The PAME working group has issued the guideline for “Transfer of Refined Oil and Oil products in Arctic Waters” and encourage use of the guideline in all ice infested waters.

CEN - Relevant standards and Guidelines

A couple of relevant CEN standards have been identified.

CEN/TC 12 Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries

standardization of the materials, equipment and offshore structures used in the drilling, production, transport by pipelines and processing of liquid and gaseous hydrocarbons within the petroleum, petrochemical and natural gas industries, excluding gas infrastructure from the input of gas into the on-shore transmission network up to the inlet connection of gas appliances (covered by CEN/TC 234) and those aspects of offshore structures covered by IMO requirement (ISO/TC 8). The standardization is to be achieved wherever possible by the adoption of ISO standards.

EN ISO 19906:2010 Arctic offshore structures

Source:
http://standards.cen.eu/dyn/www/f?p=204:110:0::::FSP_PROJECT,FSP_ORG_ID:23218,5996&cs=14B82C56483E16CF9304566D15FB7042F

The ISO 19906:2010 Arctic offshore structures standard was approved by CEN as a European standard on 14 December 2010. The ISO 19906 standard is currently under revision, see section 3.6.

EN 1991-1-8 Actions from waves and currents on coastal structures

CEN is developing a new standard EN 1991-1-8 Actions from waves and currents on coastal structures (CEN TC250 SC1 WG6) in order to convert the ISO 21650:2007 Actions from waves and currents on coastal structures to an ISO-EN standard (Jensen and Sandvik, 2015). The main issues to be addressed are:

- Redrafting of the ISO standard in a “Eurocode style” (essentially concerning the foreword and introductory parts)
- Considering any additional comments of the stakeholders following consultation
- Decide whether some of the informative annexes of the existing document, become normative
- Include, if relevant, up-to-date complementary information

From the available information it is expected that the ISO-EN standard would be valid for the Arctic, however, that the standard will not be Arctic specific. In particular, it is uncertain whether the standard will cover issues related to ice.

IOGP - Relevant standards, Guidelines and reports

Under IOGP, 28 Guidelines or reports were identified with the search item “standards”, 10 reports and Guidelines with “Oil Spill” and 5 with “Arctic”. Some of these reports are described below, to the extent information has been available.

IOGP report 362 (IOGP, 2012) presents a catalogue of international standards used in the petroleum and natural gas industries.

IOGP report 381 (IOGP 2010) presents IOGP’s position on the development and use of international standards.

IOGP report 4210 – “Global standards used locally” (IOGP 2011) presents a list of ISO TC67 standards and their status with API, CEN and various other standards developing organizations. An updated version of the report is expected to be published by ISO.

IOGP report 426 (IOGP 2010) on regulators’ use of standards presents an overview of selected national regulators’ reference and use of national, regional, international and industry standards in their regulatory documents. The report particularly focuses on standards for materials, equipment, systems and structures for the offshore petroleum industry. Furthermore, the IOGP report attempts to analyse the documents prepared by national and provincial lawmakers and the regulators themselves.

The main conclusions based on these findings are summarised as follows:

- The report shows clearly that standards play an important role in the regulators technical definition of the safety level of oil and gas installations they regulate. In fact, the oil and gas industry and regulators cannot work effectively without using these standards.
- The diversity of references provides a challenge for international operators in understanding and applying correctly all of these different references for the actual E&P activities in different countries.
- Duplication of standards should be looked into for harmonization, with the objective of reducing the number of standards covering the same subject.
- The Oil and Gas Industry is able to directly influence the content of 380 of the standards listed in the report and therefore is largely responsible for their development and maintenance.
- Whilst the references to international standards by the regulators on a global basis have increased to 21%, there is still more international standardization effort to be done.

IOGP report 440 (IOGP 2014) describes the value of standards and present an overview of ISO standards used in the Oil and Gas Industry.

IOGP report 447 - HSE Guidelines for Metocean and Arctic Survey (IOGP 2011)

This OGP report is a guideline for clients on health, safety and environmental aspects of metocean and Arctic surveys. The metocean guidance applies worldwide. The Arctic guidance applies for all cold regions where there may be sea-borne ice. It was written by a group of OGP members with input and assistance from several contractors and consultants.

IMO - Relevant conventions, codes, Guidelines

Polar Code – International Code for Ships Operating in Polar Waters

Source: http://www.imo.org/en/MediaCentre/HotTopics/polar/Pages/default.aspxHar

Background:

Ships operating in the Arctic and AntArctic environments are exposed to a number of unique risks. Poor weather conditions and the relative lack of good charts, communication systems and other navigational aids pose challenges for mariners. The remoteness of the areas makes rescue or clean up operations difficult and costly. Cold temperatures may reduce the effectiveness of numerous components of the ship, ranging from deck machinery and emergency equipment to sea suctions. When ice is present, it can impose additional loads on the hull, propulsion system and appendages.

The International code of safety for ships operating in polar waters (Polar Code) covers the full range of design, construction, equipment, operational, training, search and rescue and environmental protection matters relevant to ships operating in the inhospitable waters surrounding the two poles.

The move to develop a mandatory Code followed the adoption by the IMO Assembly, in 2009, of Guidelines for ships operating in polar waters (Resolution A.1024(26)), which are intended to address those additional provisions deemed necessary for consideration beyond existing requirements of the SOLAS and MARPOL Conventions, in order to take into account the climatic conditions of Polar waters and to meet appropriate standards of maritime safety and pollution prevention. The mandatory Polar Code standards are intended to address those additional provisions deemed necessary for consideration beyond existing requirements of the SOLAS and MARPOL Conventions, in order to take into account the climatic conditions of polar waters and to meet appropriate standards of maritime safety and pollution prevention. The Polar Code work built on previous work at IMO including recommendatory Guidelines for ships operating in polar waters (Resolution A.1024(26)), adopted in 2010.

Scope:

The Polar Code is a ship-specific Code covering the full range of design, construction, navigation and communications equipment, operational, training, emergency planning and environmental protection matters relevant to ships operating in the inhospitable waters surrounding the two poles.

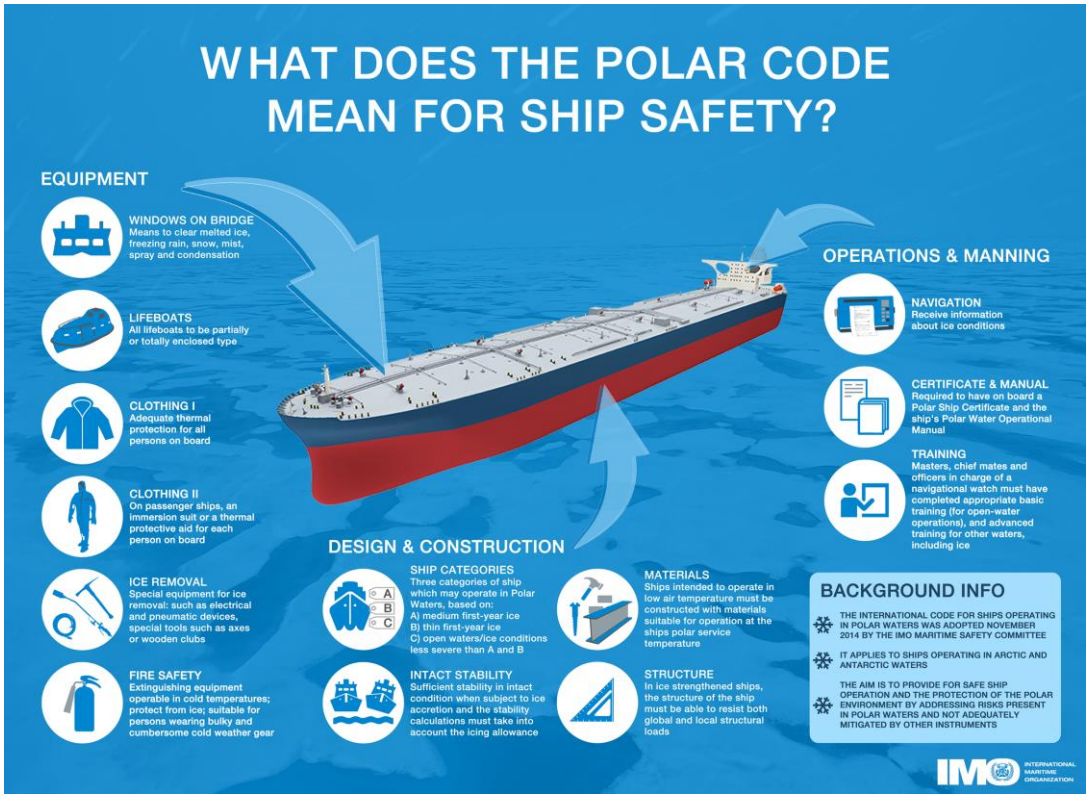


Figure 6-1. Safety aspects of the Polar Code. IMO poster.

The chapters in the Code each set out goals and functional requirements. The Polar Code includes mandatory measures covering safety part (part I-A) and pollution prevention (part II-A) and recommendatory provisions for both (parts I-B and II-B).

- Part I-A Mandatory Safety Measures; General, Polar Water Operational Manual, Ship Structure, Subdivision and Stability, Watertight and Weather Tight Integrity, Machinery Installations, Fire Safety/Protection, Life-saving Appliances and Arrangements, Safety of Navigation, Communication, Voyage Planning, Manning and Training
- Part I-B; Additional Guidance Regarding the Provisions of the Instruction and Part I-A
- Part II-A Pollution Prevention measures; Prevention of Pollution by Oil, Control of Pollution by Noxious Liquid Substances in Bulk, Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form, Prevention of Pollution by Sewage from Ships, Prevention of Pollution by Garbage from Ships
- Part II-B; Additional Guidance to Part II-A

The Code will require ships intending to operating in the defined waters of the AntArctic and Arctic to apply for a Polar Ship Certificate, which would classify the vessel as:

- Category A ship - ships designed for operation in polar waters at least in medium first-year ice, which may include old ice inclusions
- Category B ship - a ship not included in category A, designed for operation in polar waters in at least thin first-year ice, which may include old ice inclusions
- Category C ship - a ship designed to operate in open water or in ice conditions less severe than those included in Categories A and B.

The issuance of a certificate would require an assessment, taking into account the anticipated range of operating conditions and hazards the ship may encounter in the polar waters. The assessment would

include information on identified operational limitations, and plans or procedures or additional safety equipment necessary to mitigate incidents with potential safety or environmental consequences.

Ships will need to carry a Polar Water Operational Manual, to provide the Owner, Operator, Master and crew with sufficient information regarding the ship's operational capabilities and limitations in order to support their decision-making process.

Status:

IMO has now adopted the International Code for Ships Operating in Polar Waters (Polar Code) (IMO, 2015) and related amendments to make it mandatory under both the International Convention for the Safety of Life at Sea (SOLAS) and the International Convention for the Prevention of Pollution from Ships (MARPOL).

The Polar Code is expected to enter into force on 1 January 2017.

The Polar Code and SOLAS amendments were adopted during the 94th session of IMO's Maritime Safety Committee (MSC), in November 2014. The environmental provisions and MARPOL amendments were adopted during the 68th session of the Marine Environment Protection Committee (MEPC) in May 2015.

The expected date of entry into force of the SOLAS amendments is 1 January 2017, under the tacit acceptance procedure. It will apply to new ships constructed after that date. Ships constructed before 1 January 2017 will be required to meet the relevant requirements of the Polar Code by the first intermediate or renewal survey, whichever occurs first, after 1 January 2018

Because it contains both safety and environment related provisions, the Polar Code will be mandatory under both SOLAS and the International Convention for the Prevention of Pollution from Ships (MARPOL).

LSA – Life Saving Appliances

Source: International Life-Saving Appliances Code (LSA Code) 2010 Edition (IMO, 2010b)
http://seatorrent.com/viewtopic.php?t=7291

Background:

The Code was mandatory by resolution MSC.47(66) under SOLAS regulation III/3.10, whereby regulation III/34 determines that all life-saving appliances and arrangements shall comply with its requirements.

Scope:

It provides international requirements for the life-saving appliances that are required in chapter III of the 1974 SOLAS Convention, including personal life-saving appliances (for example, lifebuoys, lifejackets, immersion suits, anti-exposure suits and thermal protective aids), visual aids (parachute flares, hand flares and buoyant smoke signals), survival craft (liferafts and lifeboats), rescue boats, launching and embarkation appliances and marine evacuation systems, line-throwing appliances; and general alarm and public address systems

Status:

The Code entered into force on 1 July 1998 and since then has been amended in accordance with SOLAS Article VIII as follows:

- by the May 2006 amendments, which were adopted by resolution MSC.207(81) and will enter into force on 1 July 2010;

- by the December 2006 amendments, which were adopted by resolution MSC.218(82) and entered into force on 1 July 2008; and
- by the 2008 amendments, which were adopted by resolution MSC.272(85) and will enter into force on 1 July 2010.

The consolidated text of the LSA Code incorporates the above three sets of amendments, including the two sets entering into force on 1 July 2010, since they were deemed to be accepted, in accordance with the SOLAS amendment procedures, on 1 January 2010.

MODU Code– Code for Construction and Equipment of Mobile Offshore Drilling Units

Source: Code for the Construction and Equipment of Mobile Offshore Drilling Units, 2009 (2009 MODU Code) (IMO, 2009) http://www.safety4sea.com/images/media/pdf/A.1023(26)%20MODU%20Code.pdf

Background:

The MODU Code (code for the construction and equipment of mobile offshore drilling units) was adopted by IMO in 2009 and provides an international standard for MODUs of new construction which will facilitate their international movement and operation and contribute to ensure a level of safety for such units and for personnel on board, equivalent to that required by the 1974 SOLAS Convention and Protocol of 1988 relating to the International Convention on Load Lines, 1966, for conventional ships engaged on international voyages.

Scope:

The purpose of the MODU Code is to recommend design criteria, construction standards and other safety measures for mobile offshore units so as to minimize the risk to such units, to the personnel on board and to the environment. The MODU Code is not Arctic specific, but it does recommend design criteria, construction standards and other safety measures for mobile offshore drilling units so as to minimize the risk to such units, to the personnel on board and to the environment.

MODUs have international certificates issued by the flag authority. The certificate can be based on the flag states National regulations or based on international regulations, i.e. the IMO MODU Code. It will be up to the flag states to decide whether or not the IMO Polar Code also shall apply for MODUs in their ship register. According to the NMA the MODU code is voluntary.

Status:

For mobile offshore units constructed before 1 January 2012, the provisions of the 1989 MODU Code, as amended, should apply.

International Offshore Support Vessel Chemical Code (IOSVCC)

Source: http://www.imo.org/en/MediaCentre/MeetingSummaries/PPR/Pages/PPR-1st-Session.aspx

Background:

The aim is to develop a consistent regulatory framework for the transport and handling of limited amounts of hazardous and noxious liquid substances in bulk on offshore support vessels with a single certification scheme, taking into account the complex and continued evolution of the offshore industry as well as the unique design features and service characteristics of these vessels

Status:

The Sub-Committee on Pollution Prevention and Response, continues its work on developing a draft Code for the Transport and Handling of Limited Amounts of Hazardous and Noxious Liquid Substances in Bulk in Offshore Support Vessels (OSV Chemical Code).

Guidelines for ships operating in polar waters

Source: Guidelines for Ships Operating in Polar Waters, 2010 edition (IMO, 2010a)
http://www.imo.org/en/Publications/Documents/Attachments/Pages%20from%20E190E.pdf

Background:

The polar environment imposes additional demands on ship systems, including navigation, communications, life-saving appliances, main and auxiliary machinery, environmental protection and damage control, and emphasizes the need to ensure that all ship systems both are capable of functioning effectively under anticipated operating conditions and provide adequate levels of safety in accident and emergency situations.

Scope:

The Guidelines for ships operating in polar waters aim at mitigating the additional risk imposed on shipping due to the harsh environmental and climatic conditions existing in polar waters (IMO, 2010a). In addition, the guideline recognizes that safe operation in such conditions requires specific attention to human factors, including training and operational procedures.

Status:

IMO has adopted the International Code for Ships Operating in Polar Waters (Polar Code) (IMO, 2015) and related amendments.

International Code of Safety for Ships using Gases or other Low-flashpoint Fuels (IGF code)

Source: http://www.imo.org/en/MediaCentre/PressBriefings/Pages/28-CCC1IGF.aspx#.VjAVXsbKyM8

Background:

The basic philosophy of this Code is to provide mandatory provisions for the arrangement, installation, control and monitoring of machinery, equipment and systems using low-flashpoint fuel to minimize the risk to the ship, its crew and the environment, having regard to the nature of the fuels involved.

Throughout the development of this Code it was recognized that it must be based upon sound naval architectural and engineering principles and the best understanding available of current operational experience, field data and research and development.

Scope:

The Code addresses all areas that need special consideration for the usage of low flashpoint fuels, based on a goal-based approach, with goals and functional requirements specified for each section forming the basis for the design, construction and operation of ships using this type of fuel.

It has been agreed that the new IGF Code should apply to new ships and to existing ships converting from the use of conventional oil fuel to the use of gases or other low-flashpoint fuels, on or after the date of entry into force of the Code. The IGF Code would not apply to cargo ships of less than 500 gross tonnage, but the provisions of the IGF Code could be applied to such ships on a voluntary basis, based on national legislation.

Status:

Due to the rapidly evolving new fuels technology, IMO will periodically review this Code, taking into account both experience and technical developments. The current version of this Code includes regulations to meet the functional requirements for natural gas fuel. Regulations for other low-flashpoint fuels will be added to this Code as, and when, they are developed by IMO.

In the meantime, for other low-flashpoint fuels, compliance with the functional requirements of this Code must be demonstrated through alternative design.

The draft International Code of Safety for Ships using Gases or other Low flashpoint Fuels (IGF Code), along with proposed amendments to make the Code mandatory under SOLAS, were agreed by the inaugural session of the Sub-Committee on Carriage of Cargoes and Containers (CCC 1)adopted by the Maritime Safety Committee (MSC 95) in June 2015, under IMO Resolution MSC.391(95), and will enter into force on 1 January 2017.

ISO – Arctic specific standards

ISO 19901-6:2009, Specific requirements for offshore structures

Part 6: Marine operations is currently under revision and will also consider aspects relevant for the Arctic

ISO 19906:2010 Arctic offshore structures

ISO has developed the standard ISO 19906 - Petroleum and natural gas industries -- Arctic offshore structures. This standard, now under revision was first published in 2010 as:

The ISO 19906: 2010 Arctic offshore structures standard, 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. The objective is to ensure that offshores structures in Arctic and cold regions provide an appropriate level of reliability with respect to personnel safety, environmental protection and asset value to the owner, the industry and to society in general.

This International standard contains requirements for the design strategy, operation, maintenance, and service-life inspection or repair of Arctic and cold region offshore structures.

ISO 19906:2010 has been adopted as a national standard by Canada, Russia and the European Union (Frederking, 2012). Furthermore, API has adopted a modified edition of the ISO 19906:2010 standard, published as API RP 2N:2015. The main differences are that API uses the wording "load" rather than ISO's "actions". Furthermore, API does not refer to the probability of occurrence at 10^{-5}.

Blanchet et al. (2011) provides a brief history of the document preparation as it relates to country and industry involvement, development of technical input, editing and review processes undertaken and acceptance of the document by ISO and its participating members.

Through the ICESTRUCT JIP (2009-2012) a document identifying gaps in the ISO 19906:2010 standard, in addition to commenting on possible solutions aimed at filling these gaps, was published. Following on from this there was identified a need for revising the ISO 19906 standard, in particular regarding calculating ice loads.

Status (May 2016)

The committee ISO TC 67/SC 7 is currently working on the revision of ISO 19906:2010 which is to be published as:

ISO/AWI 19906 - Petroleum and natural gas industries -- Arctic offshore structures

Draft International standard (DIS) version is planned for mid-2016.

The following countries participate in the revision: Canada, Norway, United Kingdom, Germany, Finland and France.

Scope

Frederking (2012) compares standards for predicting ice forces on Arctic offshore structures, amongst others the ISO 19906:2010 standard and the previous Canadian standard CAN/CSA S471-04 General requirements, design criteria, the environment, and loads, published in 2004, in addition to the Russian Federation's federal code SNiP 2.06.04-82* Loads and forces on hydro technical structures (influence of ice, sea waves and ships), published in 1995 (Note, the * indicates this is the later 1995 edition). ISO 19906:2010 incorporates guidance on ice thickness and geometry effects from the Canadian standard, while the standard incorporates guidance on ice strength from the Russian standard. Furthermore, API RP 2N served as the basis for ISO 19906:2010 Arctic offshore structures standard.

ISO/TC 67/SC 8 Arctic Operations

Based on recommendations from the Barents 2020 project (see section 5.1), the international standardization Arctic operations subcommittee ISO/TC 67/SC 8 Arctic operations was established in 2012, where the Barents 2020 Phase 4 report formed a background for the work..

Text below describing the new standards are from the CD version of the standards, made available to the project. Thus the description may be altered in the final version of the standards.

ISO 35101 Working environment (TC67 SC8 WG 1)

This International standard describes the working environment and human factor challenges that can be expected when operating oil and gas installations in Arctic environments/climate. This International standard provides principles and generic Guidelines for the design and operation of oil and gas installations both onshore and offshore. The aim is to ensure optimal health, safety, human performance and decision-making conditions for people working on oil and gas installations in Arctic conditions.

This International standard applies to the design and operation of new installations, and to modification of existing installations for operation in the Arctic environment. This also includes offshore and onshore exploration and accommodation units for such activities.

This International standard is divided into three main parts. The first part (Clause 5) describes the general principles and Guidelines for risk management. The second part (Clause 6) describes the general working environment (WE) hazards found in many workplaces, and provides threshold limit values (TLVs) and design references for those that can be especially challenging in Arctic conditions. The third part (Clauses 7 and 8) addresses the climatic conditions expected in the Arctic. Clause 7 describes WE design and technical solutions (e.g. metocean data, winterization, de-icing, falling ice, accommodation, etc.), while Clause 8 describes WE operational requirements for prevention and management of cold-related problems.

ISO 35102 Escape, evacuation and rescue from offshore installations (ISO/TC 67/SC 8 WG2)

This International standard specifies requirements and provides recommendations and guidance for the development and implementation of an escape, evacuation and rescue (EER) systems to incorporate into the offshore structure design, construction, transportation, installation, operation and removal, related to activities of petroleum and natural gas industries in Arctic and cold regions. Reference to Arctic and cold regions in this International standard is deemed to include both the Arctic and other cold regions that are subject to similar metocean conditions. The objective of this International standard is to ensure that offshore EER in Arctic and cold regions provide an appropriate level of reliability with respect to personnel safety, environmental protection and asset value to the owner, to the industry and to society in general.

The escape, evacuation and rescue (EER) provisions of this International standard are intended to promote the successful escape from the incident, subsequent evacuation from the installation (emergency or precautionary evacuation), and the ultimate rescue of installation personnel.

ISO 35103 Environmental monitoring (ISO/TC 67/SC 8 WG3)

This International standard specifies requirements, specifications and Guidelines to ensure that environmental monitoring in the offshore Arctic region is fit for purpose. The Arctic region includes the territory lying to the North of the Arctic Circle (Latitude 66°33′45.8″). This International standard can be applied to those sub-Arctic locations where conditions are similar to the Arctic.

This International standard is applicable to all Arctic oil and gas operations from license block acquisition, through exploration, engineering design, construction, commissioning, operation, decommissioning and restoration. It covers the offshore or maritime environment, including for the purposes of this International standard the fully marine and estuarine waters of the Arctic, whether frozen or ice-free. The environment includes all relevant physical, chemical and biological components. Onshore (terrestrial) environments are not covered in this International standard.

This International standards covers both monitoring of environmental aspects for normal, abnormal and emergency conditions, and monitoring of environmental impacts. It includes monitoring in near-field, farfield, transboundary and regional scales, but does not include global environmental monitoring.

ISO 35104 Ice management (TC67 SC8 WG4)

The overall objective of the standard is to ensure that ice management is planned, engineered and implemented within defined and recognized safety / confidence levels, wherever they are performed. The following in-ice activities and infrastructures which require ice management are covered by this standard; floating moored and/or dynamically positioned drilling vessels, coring vessels, production facilities and work-over vessels, construction and installation (including trenching, dredging, pipe laying), tanker loading and other offloading operations, protecting subsea installations, seismic operations, oil spill response, bottom founded structures (fixed installations).

ISO TS 35105 Materials for Arctic operations (ISO/TC 67/SC 8 WG5)

This technical specification (TS) provides recommendations for material selection, manufacturing and fabrication requirements, testing and qualification of steel structures and components for offshore and onshore petroleum and natural gas facilities operating in Arctic and cold environments.

It is intended to be used as a supplement to existing standards for steel structures where the particular operating conditions in Arctic regions are not sufficiently addressed.

The specification gives particular requirements to ensure safe operation with respect to the risk of brittle fracture at low temperatures. These requirements will affect the selection of material grade and design

class as well as the technical delivery conditions for steel. They will also affect the fabrication requirements as well as testing and qualification requirements.

Recommendations are given to mitigate the operational and integrity aspects related to snow and ice accretion on topside structures

Recommendations are also given to take into account the particular Arctic operating conditions in the corrosion assessment and requirements to corrosion protection systems.

Finally this specification provides recommendations for particular operational requirements to ensure safe operation in Arctic regions.

As a practical guideline for the use of this document, low temperature is defined as minimum operating temperatures lower than -10°C. (Load ≤ −10℃)

ISO 35106 Arctic metocean, ice and seabed data (TC67 SC8 WG6)

This International standard specifies requirements and provides recommendations and guidance for the collection, analysis and presentation of relevant physical environmental data for Arctic activities of the petroleum and natural gas industries in the Arctic and cold regions.

Arctic and cold climate regions are different from other regions addressed in ISO 19901-1 as a result of low temperatures, localized and rapidly changing weather systems, snow and ice accumulation, frozen soils, sea ice, icebergs, shelf ice, glaciers and the frozen surfaces of lakes and rivers.

Activities include design and operations. Operations include planning and actual execution.

Reference to Arctic and cold regions in this international standard is deemed to include both the Arctic and other cold regions that are subject to similar environmental conditions.

Some other relevant standards are:

ISO 18215:2015 Ships and marine technology - Vessel machinery operations in polar waters – Guidelines

Background

The intent of ISO 18215:2015 is to provide guidance to ship design and operational personnel (crew) on the critical issues to consider regarding machinery, prior to and during vessel operations in the extreme conditions of the Earth's polar regions.

Scope

This International standard is intended to supplement the IMO Code for Ships Operating in Polar Waters and the IACS UR "I", Requirements Concerning Polar Class. Although the application of this International standard is primarily concerned only for ships operating in polar regions, some of the design considerations and planning might need to be implemented during construction or in a shipyard environment.

Status

ISO 18215:2015 revises the ISO/PAS 18215:2012.

ISO 21650:2007 Actions from waves and currents on coastal structures

Scope

ISO 21650:2007 describes the principles of determining the wave and current actions on structures of following types in the coastal zone and estuaries:

- Breakwaters
  - Rubble mound breakwaters
  - Vertical and composite breakwaters
  - Wave screens
  - Floating breakwaters
- Coastal dykes
- Seawalls
- Cylindrical structures (jetties, dolphins, lighthouses, pipelines etc.)

ISO 21650:2007 does not include breakwater layout for harbours, layout of structures to manage sediment transport, scour and beach stability or the response of flexible dynamic structures, except vortex induced vibrations.

Design will be performed at different levels of detail:

- Concepts
- Feasibility
- Detailed design

ISO 21650:2007 is aimed at serving detailed design. It is valid also for the Arctic, however, it is not Arctic specific. In particular, it does not cover issues related to ice.

Status

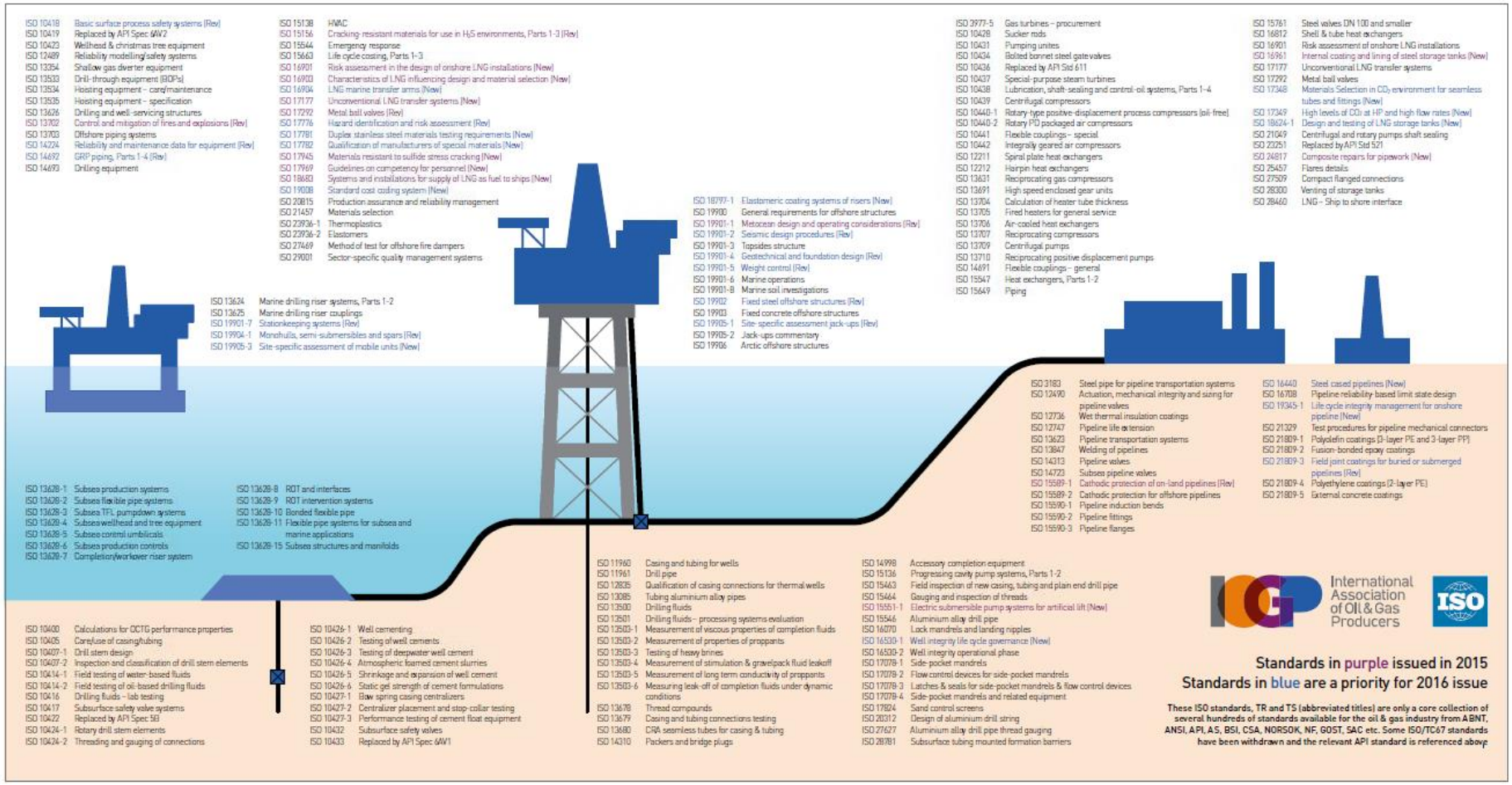
The ISO 21650:2007 standard was last reviewed in 2011.

ISO standards used in the Oil and Gas Industry

ISO standards that are used in the oil and gas industry are shown at the next page.

Source: http://www.iogp.org/PapersPDF/ISO%20standards%20Issued%202016.pdf

ISO Standards for use in the oil & gas industry



Appendix III. Classification Societies – relevant classification rules and Guidelines

Some examples of relevant classification rules and Guidelines for the Maritime industry is included in this appendix.

IACS - Requirements

Polar class (IACS, 2011):

Source:
http://www.iacs.org.uk/document/public/Publications/Unified_requirements/PDF/UR_I_pdf410.pdf

The International Association of Classification Societies (IACS) has published unified requirements for polar ships that apply to ships constructed of steel and are intended for navigation in ice-infested polar waters, except ice breakers. These were adopted by IACS Council in 2006 and are part of all member society Rules since 2008. Under continuing development to extend scope and address issues of interpretation and application.

IACS unified requirements for Polar Class ships covers the following tasks:

- Structural tasks: Terminology, ship-ice interactive scenarios, polar classes, hull areas, materials and grades of steel, abrasion / corrosion allowances, longitudinal strength, plating and framing, powering, appendages
- Machinery tasks:, Propeller ice interaction forces, propeller strength procedures, shafting, gear, steering systems, sea water cooling, powering, machinery accelerations

Polaris - Polar Operational Limitations Assessment Risk Indexing System (IMO, 2014)

The proposed Polar Operational Limit Assessment Risk Indexing System (POLARIS) builds on the existing operational limitations in part I-B of the IMO Polar Code by recognizing that limitations need to be related to the ice class assigned to the ship and the ice conditions in which the ship is intending to operate.

The basis of POLARIS is an evaluation of the risks posed to the ship by ice conditions using ice descriptions consistent with WMO nomenclature and the ship's assigned ice class consistent with the ice classes referenced in the Polar Code.

POLARIS uses a Risk Index of Risk Values which are assigned to a ship based on the ice class. The Risk Values may be used to evaluate the limitations of the ship operating in an ice regime using input either from historic or current ice charts or in real time from the bridge of the ship.

The principle features of POLARIS are:

- the use of IACS Polar Class ice classes and ice classes assigned equivalence to Finnish Swedish Ice Class Rules under HELCOM, which are consistent with ice class references used elsewhere in the draft Code;
- the use of ice type definitions generally consistent with World Meteorological Organization (WMO) nomenclature and which can be found on international ice charts;
- consideration of partial ice concentrations, that is an ice field (ice regime) consisting of various percentages of different ice types and open water;
- consideration of ice decay – the outcome of which is a reduced risk due to a reduction in ice strength for some ice types when operating in summer; and

- an acknowledgement that ships operating under icebreaker escort have a different risk profile to ships operating independently.

ABS - American Bureau of Shipping - Guidelines

Winterization Guidelines for LNG/CNG carriers in Arctic environments (ABS, 2006):

Source: https://www.eagle.org/eagleExternalPortalWEB/ShowProperty/BEA%20Repository/References/Technical%20Papers/2006/WinterizationGuidelinesLNGCNG

ABS has prepared a paper discussing ship designs for transportation of oil and gas in the Arctic region and Baltic Sea and operation challenges for this trade from an ABS class perspective. Year round carriage by sea in Arctic environments will place extreme challenges on the ships and their crew. The paper focuses on two related perspectives:

- Winterization of vessels operating in the Arctic environment
- Implications for design, winterization and operations due to the needs of humans operating under Arctic conditions

Guidance notes on ice class (ABS, 2014a):

Source: http://ww2.eagle.org/content/dam/eagle/rules-and-guides/current/special_service/136_iceclass/ice_class_gn_e-feb14.pdf

The purpose of the guidance notes is to provide ship designers with a clear guidance on alternative design procedures for hull side structures, on alternative methods for determination of power requirements and on procedures for propeller strength assessment based on the finite element method for Baltic ice class vessels.

Guide for vessels operating in low temperature environments – LTE guide (ABS, 2014b):

Source: http://ww2.eagle.org/content/dam/eagle/rules-and-guides/current/conventional_ocean_service/178_iceloadsmon/ice_load_monitoring_guide_e.pdf

ABS issued this guide to assist the marine industry in the operation of merchant vessels in low temperature environments. The operation presents challenges for designers, builders, owners and operators that are related directly to construction, outfitting and operation of vessels and issues pertaining to the ability of the crew to function in a difficult environment. Included in the guide are the ABS criteria that are intended to assist in the design, operation and maintenance of vessels continuously operating in ice, occasionally operating in ice and which are operating in low temperatures in the absence of ice.

Guide for ice load monitoring systems (ABS, 2011):

Source: http://ww2.eagle.org/content/dam/eagle/rules-and-guides/current/conventional_ocean_service/178_iceloadsmon/ice_load_monitoring_guide_e.pdf

The guide provides requirements for the installation of, and the information to be provided by, ice load monitoring systems fitted on ice classed ABS vessels. The systems are intended as an aid when a vessel is operating in ice-infested waters so that appropriate action can be taken to minimize the likelihood of the vessel sustaining structural damage from interaction with the ice.

Bureau Veritas – Relevant Rules and Guidelines

Rule note NR 527 Rules for the classification of Polar Class and Icebreaker ships (Bureau Veritas, 2013b):

Source:
http://www.veristar.com/portal/rest/jcr/repository/collaboration/sites%20content/live/veristarinfo/web%20contents/bv-content/generalinfo/giRulesRegulations/bvRules/rulenotes/documents/527-NR_2013-04.pdf

The rule note applies to ships constructed of steel and intended for navigation in ice-infested polar waters, including icebreakers. The requirements apply in addition to the applicable requirements of NR 467 Rules for the classification of steel ships.

The rule note includes rules regarding material and welding, design ice loads, requirements to machinery and propulsions, auxiliary systems, cooling water, ballast and ventilation system.

Rule note NR 584 Propulsors in ice (Bureau Veritas, 2012):

Source:
http://www.veristar.com/portal/rest/jcr/repository/collaboration/sites%20content/live/veristarinfo/web%20contents/bv-content/generalinfo/giRulesRegulations/bvRules/rulenotes/documents/4980.36.584NR_2012-07.pdf

The rule note applies in addition to NR 467 Rules for the classification of steel ships and NR 527 Rules for the classification of Polar Class and Icebreaker ships to the following types of propulsors intended for navigation in ice-infested waters;

- Podded propulsor, with or without nozzle
- Geared propulsor, with or without nozzle

The rule includes sections for materials, ice interaction, machinery design and electrical installation.

Rule note NR 616 Ice load monitoring system (Bureau Veritas, 2015):

Source:
http://www.veristar.com/portal/rest/jcr/repository/collaboration/sites%20content/live/veristarinfo/web%20contents/bv-content/generalinfo/giRulesRegulations/bvRules/rulenotes/documents/616-NR_2015-01.pdf

The rule note applies to ships which are fitted with equipment continuously monitoring iceloads exerted on ship's hull by ice formations. The rule includes separate sections for design, installation, testing and surveys.

Guidance note NI 543 Ice reinforcement selection in different world navigation areas (Bureau Veritas, 2013a):

Source:
http://www.veristar.com/portal/rest/jcr/repository/collaboration/sites%20content/live/veristarinfo/web%20contents/bv-content/generalinfo/giRulesRegulations/bvRules/rulenotes/documents/5494.34.543NI_2013-09.pdf

This guidance note aims to provide advice on the Ice Class or Polar Class notation to be adopted for the navigation in areas such as the Canadian Arctic, the Greenland waters, the Russian Arctic, the Baltic Sea, the AntArctic and some other locations in Central and Eastern Europe. Based on the climatic conditions in

a given area at a specific time of the year and the local legislation applicable, this note allows for identification of the most appropriate additional class notation for navigation in ice.

Guidance note NI 565 Ice characteristics and ice / structure interactions (Bureau Veritas, 2010):

Source:
http://www.veristar.com/portal/rest/jcr/repository/collaboration/sites%20content/live/veristarinfo/web%20contents/bv-content/generalinfo/giRulesRegulations/bvRules/rulenotes/documents/4706.24.565NI_2010_09.pdf

The purpose of the guidance note is to collect and provide data on ice (physical and mechanical characteristics) as well as giving some guidance on the calculations of the forces generated by ice on ships and offshore structures. The note includes information on different types of ice and on the mechanical properties of these different types of ice and it includes analytical formulae and methods to estimate forces applied on the structures due to ice, with respect to the different modes of failure of ice. These pressures and loads may be used to assess the strength of the structure.

COLD notation:

The objective of the COLD notation is to deal with low ambient temperatures, frozen spray (icing of ships) and reduced effectiveness of components:

- Material class and grade selection for low air temperatures
- Decks and superstructures
- Stability
- Propulsion and other essential services (e.g. firefighting, lifesaving, mooring equipment)
- Electricity production
- Navigation
- Crew protection and elimination of ice where necessary for safe access
- Lifting appliances

DNV – GL – Relevant Rules and Recommended practices

Rules for classification of ships for navigation in ice (DNV, 2013a)

Source: https://exchange.dnv.com/publishing/RulesShip/2013-09/ts501.pdf

The rules for classification of ships for navigation in ice cover the following technical aspects related to ship design:

- Sec. 2 Basic Ice Strengthening; General, Structural Requirements for the Class Notation ICE-C, Machinery, Requirements for the Class Notation ICE-E
- Sec. 4 Vessels for Arctic and Ice Breaking Services; General, Materials and Corrosion Protection, Ship Design and Arrangement, Design Loads, Global Strength, Local Strength, Hull Appendages and Steering Gears, Welding, Machinery System, Propulsion Machinery and Propellers, Thrusters, Stability and Watertight Integrity
- Sec. 5 Sealers; General, Strength of Hull and Superstructures, Sternframe rudder and Steering Gear, Anchoring and Mooring Equipment, Machinery
- Sec. 6 Tentative Rules for Winterization; General requirements (anti-icing, anti-freezing, and de-icing measures), Requirements to winterization
- Sec 7 DAT (-X^{o}C); General, Material selection

- Sec 8 Polar Class; General, Design Ice Loads – Hull, Local Strength Requirements, Longitudinal Strength, Appendages, Direct Calculations, Welding, Materials and Corrosion Protection, Ice Interaction Loads – Machinery, Design – Machinery, Stability and Watertight Integrity

DNVGL-OS-A201 Winterization for cold climate operations (DNV GL, 2015b):

Source: https://rules.dnvgl.com/servicedocuments/dnvgl

The standard provides general principles for preparation of mobile units and offshore installations for intended operations in cold-climate conditions.

The standard has been developed for general world-wide application. Governmental legislation in excess of the provisions of this standard may apply depending on type, location and intended service of the unit or installation.

The objective of winterization is ensuring that a vessel is capable of and suitably prepared for operations in cold climates. This is provided for by setting functional requirements to systems and equipment which are intended to be in operation in cold-climate conditions.

DNV-OS-C101 Design of offshore steel structures, general – LFRD method (DNV GL, 2015a):

Source: https://rules.dnvgl.com/docs/pdf/dnvgl/OS/2015-07/DNVGL-OS-C101.pdf

The standard provides principles, technical requirements and guidance for the structural design of offshore structures.

The standard is applicable to all types of offshore structures of steel. Furthermore, the standard is applicable to the design of complete structures including substructures, topside structures, vessel hulls and foundations. The standard gives requirements for the following:

- Design principles
- Structural categorization
- Material selection and inspection principles
- Design loads
- Load effect analyses
- Design of steel structures and connections
- Corrosion protection
- Foundation design

Environmental loads such as snow and ice accumulation, in addition to direct ice loads in terms of impact with sea ice or icebergs, are described in the standard.

DNV-OS-F101 Submarine pipeline systems (DNV, 2013b):

Source: https://www.dnvgl.com/rules-standards/index.html

The standard gives criteria and recommendations on concept development, design, construction, operation and abandonment of submarine pipeline systems. The objectives of the standard are to ensure that the concept development, design, construction, operation and abandonment of pipeline systems are safe and conducted with due regard to public safety and the protection of the environment, provide an internationally acceptable standard of safety for submarine pipeline systems by defining minimum requirements for concept development, design, construction, operation and abandonment, serve as a technical reference document in contractual matters between purchaser and contractor and serve as a

guideline for designers, purchaser and contractors. The standard includes a section on the design of pipelines subjected to potential ice interaction.

DNV-RP-C209 Arctic environmental conditions, ice loads and load effects:

This recommended practice is under development and expected for hearing in 2015. The development of the recommended practice is based on experiences from the joint industry project IceStruct. The recommended practice will provide practical and consistent design recommendations for fixed and floating structures in ice. It will provide guidance where existing codes are incomplete, silent or merely provide functional requirements.

DNV-RP-F107 Risk assessment of pipeline protection (DNV, 2010a)

Source: https://www.dnvgl.com/rules-standards/index.html

The recommended practice presents a risk-based approach for assessing pipeline protection against accidental external loads.

DNV-RP-F302 Selection and use of subsea leak detection systems (DNV, 2010b)

Source: https://www.dnvgl.com/rules-standards/index.html

The objective of this best practice is to summarize industry experiences and knowledge with relevance to selection and use of detectors for a subsea leak detection system. The document is a result of a JIP on leak detection ongoing from 2005 to 2010.

Lloyd's Register - Rules

Rules for winterization of ships (provisional):

Source: http://www.lr.org/en/RulesandRegulations/Provisional-Rules-for-the-Winterisation-of-Ships.aspx

Lloyd's Register has developed winterization rules which account for the specific nature of operating in low temperature environment. In the development of these rules, they focused on the need to undertake systematic review of the ship and its systems, using a risk assessment approach for material selection of deck equipment and systems as an illustrative example. The winterization rules will provide a level of protection for ships that is commensurate with the envisaged operations and arrangements.

Rules for ice and cold operations (Lloyd's Register, 2015):

Source: http://www.lr.org/en/RulesandRegulations/ships.aspx

The rules state the requirements for ships intended for operations in ice and cold conditions. It is included in Lloyd's Register rules and regulations for the classification of ships part 8.

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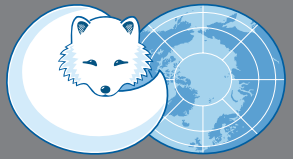

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