



BSI Standards Publication

**Petroleum and natural gas industries
- Arctic operations - Material
requirements for arctic operations**

National foreword

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**Petroleum and natural gas
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— Material requirements for
arctic operations**

*Industries du pétrole et du gaz naturel — Opérations en Arctique —
Exigences relatives au matériel requis pour les opérations en Arctique*



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Foreword

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

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

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

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

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

Introduction

Operations in an Arctic environment are characterized by low ambient temperatures, the presence of sea ice and ice bergs and icing of structures and components. In many cases they are also associated with remote locations relative to infrastructure and logistics. Maintenance operations are therefore expensive and accidents leading to emissions can have severe environmental consequences.

Structural failure is in most cases failure of materials and caused by well-known degradation mechanisms such as fatigue and corrosion. Under Arctic conditions, failure due to possible brittle materials behaviour needs to be given special consideration.

This document was developed to bridge the gap between the functional requirements to offshore structures in Arctic environments given in design standards and the material requirements given in material and fabrication specifications where Arctic operating conditions have not been considered in sufficient detail.

Petroleum and natural gas industries - Arctic operations - Material requirements for arctic operations

1 Scope

This document 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.

This document 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.

This document 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.

This document also gives recommendations:

- to mitigate the operational and integrity aspects related to snow and ice accretion on topside structures;
- to take into account the particular Arctic operating conditions in corrosion assessments and requirements for corrosion protection systems;
- for particular operational requirements to ensure safe operation in Arctic regions.

The requirements in this document are applicable to any operating temperatures, but particular requirements related to de-rating (loss of strength) at high temperatures are not addressed. Limitations to the applicable minimum design temperature caused by the capability of the materials' low temperature performance can exist but are not a limitation for the scope of this document.

As a practical guideline for the use of this document, low temperature is defined as lowest anticipated service temperature (LAST) below $-10\text{ }^{\circ}\text{C}$.

NOTE For determination of LAST, see [6.3.2](#).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 19900, *Petroleum and natural gas industries — General requirements for offshore structures*

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

ISO 19901-2, *Petroleum and natural gas industries — Specific requirements for offshore structures — Part 2: Seismic design procedures and criteria*

ISO 19901-4, *Petroleum and natural gas industries — Specific requirements for offshore structures — Part 4: Geotechnical and foundation design considerations*

ISO 19902:2007, *Petroleum and natural gas industries — Fixed steel offshore structures*