

Planning, Designing, and Constructing Structures and Pipelines for Arctic Conditions

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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 nongovernmental, 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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 19906 was prepared by Technical Committee ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, Subcommittee SC 7, *Offshore structures*.

ISO 19906 is one of a series of International Standards for offshore structures. The full series consists of the following International Standards.

- ISO 19900, *Petroleum and natural gas industries—General requirements for offshore structures*
- ISO 19901 (all parts), *Petroleum and natural gas industries—Specific requirements for offshore structures*¹
- ISO 19902, *Petroleum and natural gas industries—Fixed steel offshore structures*
- ISO 19903, *Petroleum and natural gas industries—Fixed concrete offshore structures*
- ISO 19904-1, *Petroleum and natural gas industries—Floating offshore structures—Part 1: Monohulls, semi-submersibles and spars*
- ISO 19905 (all parts), *Petroleum and natural gas industries—Site-specific assessment of mobile offshore units*²
- ISO 19906, *Petroleum and natural gas industries—Arctic offshore structures*

¹ ISO 19901-3, *Topsides structure*, to be published.

² All parts are under preparation.

Introduction

A series of API standards address design requirements and assessments for all offshore structures used by the petroleum and natural gas industries worldwide. Through their application, the intention is to achieve reliability levels appropriate for manned and unmanned offshore structures, regardless of the type of structure and the nature or combination of the materials used.

It is important to recognize that structural integrity is an overall concept comprising models for describing actions, structural analyses, design rules, safety elements, workmanship, quality control procedures, and national requirements, all of which are mutually dependent. The modification of one aspect of design in isolation can disturb the balance of reliability inherent in the overall concept or structural system. The implications involved in modifications, therefore, need to be considered in relation to the overall reliability of all offshore structural systems.

The series of standards applicable to the various types of offshore structure is intended to provide wide latitude in the choice of structural configurations, materials, and techniques without hindering innovation. Sound engineering judgment is, therefore, necessary in the use of these standards.

This standard was developed in response to the offshore industry's demand for a coherent and consistent definition of methodologies to design, analyze, and assess arctic and cold region offshore structures of the class described in Section 1.

Structures capable of resisting ice have been in use in temperate regions for well over a century. These include bridge piers and navigation aids in ice-covered rivers and estuaries. In fact, bridge codes in cold countries have included methods for ice loads dating back many decades. In more severe arctic and cold regions, ice resistant structures are more recent. But much experience has been gained commencing in the 1960s, and this knowledge is incorporated into this standard. Where uncertainties still exist, conservative approaches and methods have been recommended.

This standard also addresses issues such as topsides winterization, and escape, evacuation, and rescue that go beyond what is strictly necessary for the design, construction, transportation, installation, and decommissioning of the structure. These issues are essential for offshore operations in arctic and cold region conditions and they are not covered in other standards. When future editions of this and other standards are prepared, efforts will be made to avoid duplication of scope.

Annex A provides background to and guidance on the use of this standard and it is intended that it be read in conjunction with the main body of this standard. The section numbering in Annex A is the same as in the normative text to facilitate cross-referencing.

Annex B provides regional information on the physical environment of specific offshore areas in arctic and cold regions.

To meet certain needs of industry for linking software to specific elements in this standard, a special numbering system has been permitted for figures, tables, equations and bibliographic references.

Planning, Designing, and Constructing Structures and Pipelines for Arctic Conditions

1 Scope

This 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. Reference to arctic and cold regions in this standard is deemed to include both the arctic and other cold regions that are subject to similar sea ice, iceberg, and icing conditions. The objective of this standard is to ensure that offshore 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, to the industry, and to society in general.

This standard does not contain requirements for the operation, maintenance, service-life inspection, or repair of arctic and cold region offshore structures, except where the design strategy imposes specific requirements (e.g. 17.2.2).

While this standard does not apply specifically to mobile offshore drilling units (see ISO 19905-1), the procedures relating to ice actions and ice management contained herein are applicable to the assessment of such units.

This standard does not apply to mechanical, process, and electrical equipment or any specialized process equipment associated with arctic and cold region offshore operations except in so far as it is necessary for the structure to sustain safely the actions imposed by the installation, housing, and operation of such equipment.

2 Normative References

The following referenced documents are indispensable for the application 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.

API Recommended Practice 2EQ, *Seismic Design Procedures and Criteria for Offshore Structures*

API Recommended Practice 2FPS, *Planning, Designing, and Constructing Floating Production Systems*

API Recommended Practice 2GEO, *Geotechnical and Foundation Design Considerations*

API Recommended Practice 2MOP, *Marine Operations*

API Recommended Practice 2SK, *Design and Analysis of Stationkeeping Systems for Floating Structures*

ISO 19900¹, *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 19901-3, *Petroleum and natural gas industries—Specific requirements for offshore structures—Part 3: Topsides structure*

¹ International Organization for Standardization, 1, ch. de la Voie-Creuse, Case postale 56, CH-1211, Geneva 20, Switzerland, www.iso.org.