
**Petroleum and natural gas industries —
Fixed concrete offshore structures**

*Industries du pétrole et du gaz naturel — Structures en mer fixes en
béton*



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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.

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 19903 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 19903 is one of a series of 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
- ISO 19902, *Petroleum and natural gas industries* — Fixed steel offshore structures ¹⁾
- 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 19904-2, *Petroleum and natural gas industries* — Floating offshore structures — Part 2: Tension leg platforms ²⁾
- ISO 19905-1, *Petroleum and natural gas industries* — Site-specific assessment of mobile offshore units — Part 1: Jack-ups ²⁾
- ISO/TR 19905-2, *Petroleum and natural gas industries* — Site-specific assessment of mobile offshore units — Part 2: Jack-ups commentary ²⁾
- ISO 19906, *Petroleum and natural gas industries* — Arctic offshore structures ²⁾

1) To be published.

2) Under preparation.

Introduction

The series of International Standards applicable to offshore structures, ISO 19900 to ISO 19906, constitutes a common basis covering those aspects that address design requirements and assessments of 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, whatever the type of structure and 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 International 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 judgement is therefore necessary in the use of these International Standards.

International Standard ISO 19903 was developed based on experience gained from the design, execution and use of a number of fixed concrete platforms, in particular from more than 30 years of experience with such structures in the North Sea. The background documents when developing this International Standard are from the following types of documents:

- national regulations and other requirements from the authorities;
- regional standards;
- national standards;
- operator's company specifications;
- scientific papers and reports;
- reports from inspection of structures in use.

This International Standard draws on the experience gained with fixed concrete offshore structures. This experience shows that fixed concrete offshore structures perform well and are durable in the marine environment. These structures are all unique, one-of-a-kind structures, purpose-made for a particular location and a particular set of operating requirements. This is reflected in ISO 19903 by the fact that the standard gives guidance rather than detailed prescriptive rules. This International Standard reflects in particular the experience and the conditions in the North Sea and the east coast of Canada, and the design rules and practices used there, but is intended for worldwide application.

Petroleum and natural gas industries — Fixed concrete offshore structures

1 Scope

This International Standard specifies requirements and provides recommendations applicable to fixed concrete offshore structures for the petroleum and natural gas industries, and specifically addresses

- a) the design, construction, transportation and installation of new structures, including requirements for in-service inspection and possible removal of structures,
- b) the assessment of structures in service, and
- c) the assessment of structures for reuse at other locations.

This International Standard is intended to cover the engineering processes needed for the major engineering disciplines to establish a facility for offshore operation. It can also be used for the design of floating concrete structures as specified in ISO 19904-1 ^[1] (and the future ISO 19904-2 ^[12] when published) and for arctic structures (as specified in the future ISO 19906 ^[7] when published).

In order to provide a standard that will be useful to the industry, a comprehensive treatment of some topics is provided where there is currently no relevant reference. For such well-known topics as the design formulas for concrete structural members, this International Standard is intended to be used in conjunction with a suitable reference standard for basic concrete design (see 8.2.2). The designer can use suitable national or regional design standards that provide the required level of safety. Only other ISO documents will be referenced directly in the text.

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.

ISO 1920-3, *Testing of concrete — Part 3: Making and curing test specimens*

ISO 1920-4, *Testing of concrete — Part 4: Strength of hardened concrete*

ISO 2394, *General principles on reliability for structures*

ISO 4463-1, *Measurement methods for building — Setting-out and measurement — Part 1: Planning and organization, measuring procedures, acceptance criteria*

ISO 6934 (all parts), *Steel for the prestressing of concrete*

ISO 6935 (all parts), *Steel for the reinforcement of concrete*

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 19901-5, *Petroleum and natural gas industries — Specific requirements for offshore structures — Part 5: Weight control during engineering and construction*

ISO 19901-6, *Petroleum and natural gas industries — Specific requirements for offshore structures — Part 6: Marine operations*³⁾

ISO 19902, *Petroleum and natural gas industries — Fixed steel offshore structures* ³⁾

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 19900 and the following apply.

NOTE Terms and definitions relevant for the use of this International Standard are also found in ISO 19901-1, ISO 19901-2, ISO 19901-4 and ISO 19901-6 and in ISO 19902.

3.1
abnormal design situation
design situation in which conditions exceed conventionally specified design conditions and which is used to mitigate against very remote events

NOTE Abnormal design situations are used to provide robustness against events with a probability of typically 10^{-4} per annum or lower by avoiding, for example, gross overloading.

[ISO 19901-2]

3.2
abnormal level earthquake
ALE
intense earthquake of abnormal severity under the action of which the structure should not suffer complete loss of integrity

NOTE The ALE event is comparable to the abnormal event in the design of fixed structures which are described in ISO 19902 and ISO 19903. When exposed to the ALE, a manned structure is supposed to maintain structural and/or floatation integrity for a sufficient period of time to enable evacuation to take place.

[ISO 19901-2]

3.3
accidental design situation
design situation involving exceptional conditions of the structure or its exposure

EXAMPLE Impact, fire, explosion, local failure or loss of intended differential pressure (e.g. buoyancy).

3.4
action
external load applied to the structure (direct action) or an imposed deformation or acceleration (indirect action)

NOTE 1 An imposed deformation can be caused by fabrication tolerances, settlement, temperature change or moisture variation.

3) To be published.