

Derivation of Metocean Design and Operating Conditions

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ISO 19901-1:2015 (Modified), Petroleum and natural gas industries—
Specific requirements for offshore structures—Part 1: Metocean
design and operating considerations



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The committee responsible for this document is ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, subcommittee SC 7, *Offshore structures*.

This second edition cancels and replaces the first edition (ISO 19901-1:2005), which has been technically revised.

ISO 19901 consists of the following parts under the general title *Petroleum and natural gas industries—Specific requirements for offshore structures*.

- *Part 1: Metocean design and operating considerations*
- *Part 2: Seismic design procedures and criteria*
- *Part 3: Topsides structure*
- *Part 4: Geotechnical and foundation design considerations*
- *Part 5: Weight control during engineering and construction*
- *Part 7: Stationkeeping systems for floating offshore structures and mobile offshore units*
- *Part 8: Marine soil investigations*

The following parts are under preparation:

- *Part 6: Marine operations*
- *Part 9: Structural integrity management*

ISO 19901 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*
- 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 19905-1, *Petroleum and natural gas industries—Site-specific assessment of mobile offshore units—Part 1: Jack-ups*
- ISO/TR 19905-2, *Petroleum and natural gas industries—Site-specific assessment of mobile offshore units—Part 2: Jack-ups commentary*
- ISO 19905-3, *Petroleum and natural gas industries—Site-specific assessment of mobile offshore units—Part 3: Floating unit*
- ISO 19906, *Petroleum and natural gas industries—Arctic offshore structures*

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Introduction

The series of International Standards applicable to types of offshore structure, 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 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 International Standards applicable to types of offshore structure is intended to provide a 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.

The overall concept of structural integrity is described above. Some additional considerations apply for metocean design and operating conditions. The term “metocean” is short for “meteorological and oceanographic” and refers to the discipline concerned with the establishment of relevant environmental conditions for the design and operation of offshore structures. A major consideration in the design and operation of such a structure is the determination of actions on, and the behavior of, the structure as a result of winds, waves, and currents.

Environmental conditions vary widely around the world. For the majority of offshore locations, there are few measured data from historic conditions; comprehensive data often only start being collected when there is a specific need, for example, when exploration for hydrocarbons is being considered. Despite the usually short duration for which data are available, designers of offshore structures need estimates of extreme and abnormal environmental conditions (with an individual or joint probability of the order of 1×10^{-2} /year and 1×10^{-3} to 1×10^{-4} /year, respectively).

Even for areas such as the Gulf of Mexico, offshore Indonesia, and the North Sea, where there are up to 30 years of fairly reliable measurements available, the data are insufficient for rigorous statistical determination of appropriate extreme and abnormal environmental conditions. The determination of relevant design parameters has therefore to rely on the interpretation of the available data by experts, together with an assessment of any other information, such as prevailing weather systems, ocean wave creation, and regional and local bathymetry, coupled with consideration of data from comparable locations. In particular, due account needs to be taken of the uncertainties that arise from the analyses of limited data sets. It is hence important to employ experts from both the metocean and the structural communities in the determination of design parameters for offshore structures, particularly since setting of appropriate environmental conditions depends on the chosen option for the offshore structure.

This part of ISO 19901 provides procedures and guidance for the determination of environmental conditions and their relevant parameters. Requirements for the determination of the actions on, and the behavior of, a structure in these environmental conditions are given in ISO 19901-3, ISO 19901-6, ISO 19901-7, ISO 19902, ISO 19903, ISO 19904-1, ISO 19905-1, and ISO 19906.

Some background to, and guidance on, the use of this standard is provided in informative Annex A. The clause numbering in Annex A is the same as in the main text to facilitate cross-referencing.

Regional information, where available, is provided in the Regional Annexes B to J. This information has been developed by experts from the region or country concerned to supplement the guidance provided in this standard. Each Regional Annex provides regional or national data on environmental conditions for the area concerned.

Annex K highlights the areas where this adoption of ISO 19901-1 as the second edition of API RP 2MET differs from ISO 19901-1:2015.

Derivation of Metocean Design and Operating Conditions

1 Scope

This standard gives general requirements for the determination and use of meteorological and oceanographic (metocean) conditions for the design, construction, and operation of offshore structures of all types used in the petroleum and natural gas industries.

The requirements are divided into two broad types:

- those that relate to the determination of environmental conditions in general, together with the metocean parameters that are required to adequately describe them;
- those that relate to the characterization and use of metocean parameters for the design, the construction activities, or the operation of offshore structures.

The environmental conditions and metocean parameters discussed are as follows:

- extreme and abnormal values of metocean parameters that recur with given return periods that are considerably longer than the design service life of the structure;
- long-term distributions of metocean parameters, in the form of cumulative, conditional, marginal, or joint statistics of metocean parameters; and
- normal environmental conditions that are expected to occur frequently during the design service life of the structure.

Metocean parameters are applicable to:

- the determination of actions for the design of new structures;
- the determination of actions for the assessment of existing structures;
- the site-specific assessment of mobile offshore units;
- the determination of limiting environmental conditions, weather windows, actions and action effects for pre-service and post-service situations (i.e. fabrication, transportation and installation, or decommissioning and removal of a structure); and
- facility operations, where appropriate.

NOTE Specific metocean requirements for site-specific assessment of jack-ups are contained in ISO 19905-1, for arctic offshore structures in ISO 19906, and for topside structures in ISO 19901-3.

2 Normative References

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.