INTERNATIONAL STANDARD

ISO 19900

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Petroleum and natural gas industries — General requirements for offshore structures

Industries du pétrole et du gaz naturel — Exigences générales pour les structures en mer

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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 19900 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*.

This second edition cancels and replaces the first edition (ISO 19900:2002), which has been technically revised.

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ISO 19900 is one of a series of standards for offshore structures. The full series consists of the following International Standards:

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— 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 (all parts), *Petroleum and natural gas industries — Floating offshore structures*

— ISO 19905 (all parts), *Petroleum and natural gas industries — Site-specific assessment of mobile offshore units*

— 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 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 offshore structures International Standards are intended to provide wide latitude in the choice of structural configurations, materials and techniques and to allow for innovative solutions. Sound engineering judgement is, therefore, necessary in the use of these International Standards.

ISO 19900 applies to offshore structures and is in accordance with the principles of ISO 2394. ISO 19900 includes, where appropriate, additional provisions that are specific to offshore structures.

Figure 1 gives a general indication of the relationship among the various International Standards applicable to types of offshore structure. ISO 19900 is the core of this set.

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The ISO 19901 series of parts provides provisions on particular aspects of the design, construction, and operation of offshore platforms for the petroleum and natural gas industries, whose provisions can be applicable to platforms of different types, materials and operating environments. ISO 19901-7 has specific relevance to floating structures.

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In addition to the relationship among the specific provisions of the parts of ISO 19901 and the International Standards for bottom-founded, floating, or Arctic structures, there is also some interdependence among these latter International Standards, in that one International Standard can reference the design provisions of one of the other International Standards in this set. Users need to be aware of these cross-references when using any member of this set of International Standards.

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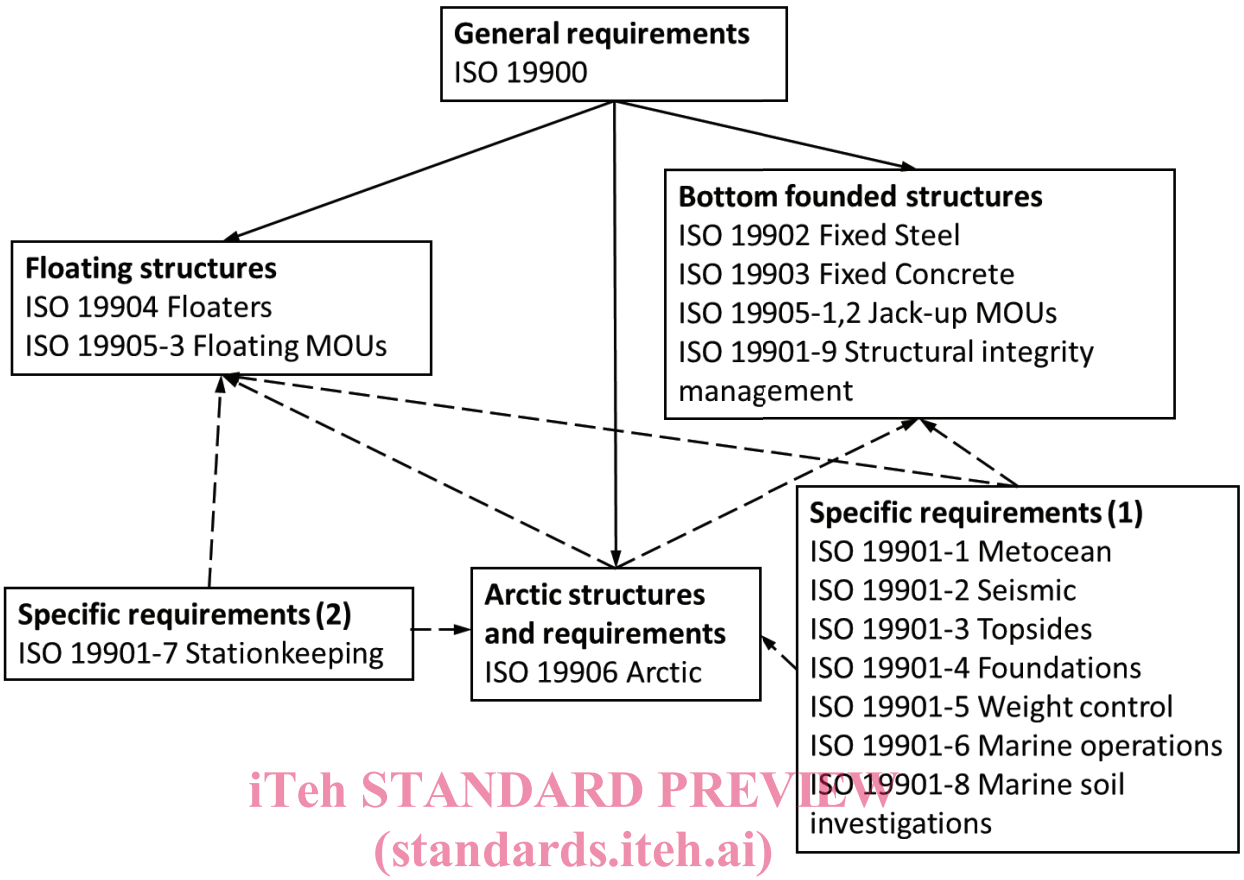

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Figure 1 — Relationship among standards

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Petroleum and natural gas industries — General requirements for offshore structures

1 Scope

This International Standard specifies general principles for the design and assessment of offshore structures subjected to known or foreseeable types of actions. These general principles are applicable worldwide to all types of offshore structures, including, bottom-founded structures as well as floating structures, and to all types of materials used including steel, concrete and aluminium.

This International Standard specifies design principles that are applicable to:

— the successive stages in the construction of the structure (i.e. fabrication, transportation and installation);

— use during its intended life; and

— its decommissioning.

The principles are also generally applicable to the assessment or modification of existing structures. Aspects related to quality control are also addressed.

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This International Standard is applicable to the design of complete structures, including substructures, topsides structures, vessel hulls, foundations and mooring systems.

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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 2394:1998, *General principles on reliability for 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*

ISO 19901-7, *Petroleum and natural gas industries — Specific requirements for offshore structures — Part 7: Stationkeeping systems for floating offshore structures and mobile offshore units*

ISO 19906, *Petroleum and natural gas industries — Arctic offshore structures*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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3.1
abnormal value
design value of a parameter of abnormal severity used in accidental limit state checks in which a structure is intended not to suffer complete loss of integrity

Note 1 to entry: Abnormal events are typically accidental and environmental (including seismic) events having probabilities of exceedance of the order of 10^{-3} to 10^{-4} per annum.

3.2
accidental situation
design situation involving exceptional conditions of the structure or its exposure

EXAMPLE Impact, fire, explosion, loss of intended differential pressure.

3.3
action
external load applied to the structure (direct action) or an imposed deformation or acceleration (indirect action)

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

Note 1 to entry: An earthquake typically generates imposed accelerations.

3.4
action effect
effect of actions on structural components

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EXAMPLE Internal force, moment, stress or strain.

3.5
air gap

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clearance between the highest water or ice surface that occurs during the extreme environmental conditions and the lowest exposed part not designed to withstand wave or ice impingement

3.6
appurtenance
part of the structure that is installed to assist installation, to provide access or protection

3.7
basic variable
one of a specified set of variables representing physical quantities which characterize actions, environmental influences, geometric quantities, or material properties, including soil properties

3.8
calibration
process used to determine partial factors using structural reliability analysis and target reliabilities

3.9
catenary mooring
mooring system where the restoring action is provided by the distributed weight of mooring lines

3.10
characteristic value
value assigned to a basic variable associated with a prescribed probability of not being violated by unfavourable values during some reference period

Note 1 to entry: The characteristic value is the main representative value. In some design situations, a variable can have two characteristic values, an upper and a lower value.

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3.11
compliant structure
structure that is sufficiently flexible that applied lateral dynamic actions are substantially balanced by inertial reactions

3.12
conductor
tubular pipe extending upward from or beneath the sea floor containing pipes that extend into the petroleum reservoir

3.13
consequence category
classification system for identifying the environmental, economic, and indirect personnel safety consequences of failure of a platform

3.14
decommissioning
process of shutting down a platform and removing it from its current location at the end of its service life

3.15
design criteria
quantitative formulations that describe the conditions to be fulfilled for each limit state

3.16
design service life
assumed period for which a structure is used for its intended purpose with anticipated maintenance, but without substantial repair being necessary

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3.17
design situation
set of physical conditions representing real conditions during a certain time interval, for which the design demonstrates that relevant limit states are not exceeded

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3.18
design value
value derived from the representative value for use in the design verification procedure

3.19
durability
ability of a structure or structural component to maintain its function throughout its design service life

3.20
exposure level
classification system used to define the requirements for a structure based on consideration of life-safety and consequences of failure

3.21
fit-for-purpose
meeting the intent of an International Standard although not meeting all provisions of that International Standard, such that not meeting the specific provisions does not cause unacceptable risk to life-safety or the environment

3.22
fixed structure
structure that is bottom founded and transfers most of the actions on it to the seabed

3.23
floating structure
structure where the full weight is supported by buoyancy

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3.24
hazard
situation or event with the potential to cause any, or all, of human injury, damage to the environment, and damage to property

3.25
jack-up
mobile offshore unit with a buoyant hull and one or more legs that can be moved up and down relative to the hull

Note 1 to entry: A jack-up reaches its operational mode by lowering the leg(s) to the seabed and then raising the hull to the required elevation. The majority of jack-ups have three or more legs, each of which can be moved independently and which are supported in the seabed by spudcans.

3.26
life-safety category
classification system for identifying the applicable level of life-safety for a platform

3.27
mobile offshore unit
offshore structure designed such that it can be routinely relocated

Note 1 to entry: Mobile offshore unit is also known as MOU.

3.28
limit state
state beyond which the structure no longer satisfies the relevant design criteria

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3.29
nominal value
value assigned to a basic variable determined on a non-statistical basis, typically from acquired experience or physical conditions

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3.30
normal conditions
permanent, variable and environmental actions associated with operating conditions of the platform

Note 1 to entry: Normal conditions are sometimes referred to as persistent conditions.

3.31
offshore structure
structure used for the development and production of offshore petroleum and natural gas fields in offshore areas

3.32
operator
representative of the company or companies leasing the site

Note 1 to entry: The operator is normally the oil company acting on behalf of co-licensees.

3.33
operations manual
manual that defines the operational characteristics, procedures and capabilities of an offshore platform and associated essential systems

3.34
owner
representative of the company or companies owning or leasing a development

3.35
platform
complete assembly, including structure, topsides, foundations and stationkeeping systems

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3.36
reference period
period of time used as the basis for determining values of basic variables

3.37
reliability
ability of a structure or a structural component to fulfill the specified requirements

3.38
representative value
value assigned to a basic variable for verification of a limit state

3.39
resistance
capacity of a component, or a cross-section of a component, to withstand action effects without failure

3.40
return period
average period between occurrences of an event or of a particular value being exceeded

Note 1 to entry: The offshore industry commonly uses a return period measured in years for environmental events. The return period in years is equal to the reciprocal of the annual probability of exceedance of the event.

3.41
riser
tubular used for the transport of fluids between the sea floor and a termination point on the platform

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Note 1 to entry: For a fixed structure, the termination point is usually the topsides. For floating structures, the riser can terminate at other locations of the platform.

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3.42
robustness
ability of a structure to withstand accidental and abnormal events without being damaged to an extent disproportionate to the cause

3.43
scour
removal of seabed soils caused by currents, waves and ice

3.44
splash zone
part of a structure that is intermittently exposed to air and immersed in the sea

3.45
structural system
load-bearing components of a structure and the way in which these components function together

3.46
structural component
physically distinguishable part of a structure

EXAMPLE Column, beam, stiffened plate, tubular joint, or foundation pile.

3.47
structural integrity management system
structured methodology, consisting of a multi-step cyclic activity, including feedback, intended to assure the life and functionality of a structure

Note 1 to entry: Typical steps include data collection, data evaluation, development of an inspection strategy, development and execution of an inspection programme, and consequent remedial works.

Note 2 to entry: Structural integrity management is also known as SIM.

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3.48
structural reliability analysis
procedure for the determination of the level of safety against failure of a structure or structural component

3.49
structure
organized combination of connected components designed to withstand actions and provide adequate rigidity

3.50
structure orientation
position of a structure in plan referenced to a fixed direction, such as true north

3.51
taut-line mooring
mooring system where the restoring action is predominately provided by elastic deformation of mooring lines

3.52
topsides
structures and equipment placed on a supporting structure (fixed or floating) to provide some or all of a platform's functions

Note 1 to entry: For a ship-shaped floating structure, the deck is not part of the topsides.

Note 2 to entry: For a jack-up, the hull is not part of the topsides.

Note 3 to entry: A separate fabricated deck or module support frame is part of the topsides.

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4 Symbols and abbreviated terms

4.1 Symbols

A	accidental action
a_d	design value of geometric parameter
a_k	characteristic value of geometric parameter
a_r	representative value of geometric parameter
E	environmental action
F_d	design value of action
F_r	representative value of action
f_d	design value of material property, for example strength
f_k	characteristic value of material property, for example yield strength
G	permanent action
G_k	characteristic value of permanent action
G_r	representative value of permanent action
L_1,L_2,L_3	exposure levels of structures
p	annual probability of occurrence

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p_f probability of failure

Q variable action

Q_1 variable action of long duration

Q_2 variable action of short duration

Q_k characteristic value of variable action

R reliability of a structural system

R_d design value of component resistance

R_k characteristic value of component resistance, based on characteristic values of material properties

R_r representative value of component resistance

S_d action effect

T annual return period of an action

γ_d factor related to model uncertainty or other circumstances that are not taken into account by the other γ values

γ_f partial action factor the value of which reflects the uncertainty or randomness of the action (see 9.2.3)

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γ_m partial material factor the value of which reflects the uncertainty or variability of the material property (see 9.3.2)

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γ_R partial resistance factor the value of which reflects the uncertainty or variability of the component resistance including those of material properties (see 9.3.2)

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Δ_a additive partial geometric quantity the value of which reflects the uncertainties of the geometric parameter (see 9.4.2)

4.2 Abbreviated terms

ALS accidental limit state

ALE abnormal level earthquake

EER escape, evacuation and rescue

ELE extreme level earthquake

FLS fatigue limit state

PFD partial factor design

QA quality assurance

QC quality control

QMS quality management system

SLS serviceability limit state

ULS ultimate limit state

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