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Petroleum and natural gas industries — General requirements for offshore structures

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This Australian Standard ® was prepared by ME-092, Materials, equipment, structures and related services for petroleum, petrochemical and natural gas industries. It was approved on behalf of the Council of Standards Australia on 21 April 2022.

This Standard was published on 13 May 2022.

The following are represented on Committee ME-092:

Australian Industry Group
Australian Organisation for Quality
Australian Petroleum Production and Exploration Association
Australian Pipelines and Gas Association
Department for Energy and Mining, SA
Department of Mines, Industry Regulation and Safety WA
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This Standard was issued in draft form for comment as DR AS ISO 19900:2022.

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ISBN 978 1 76113 740 2

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First published as AS ISO 19900:2022.

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Preface

This Standard was prepared by the Standards Australia Committee ME-092, Materials, equipment, structures and related services for petroleum, petrochemical and natural gas industries.

The objective of this document is to specify general requirements and recommendations for the design and assessment of bottom-founded (fixed) and buoyant (floating) offshore structures.

This document is applicable for all phases of the life of the structure, including the following:

(a) Successive stages of construction (i.e. fabrication, transportation, and installation).

(b) Service in-place, both during design life and during any life extensions.

(c) Decommissioning, and removal.

This document contains general requirements and recommendations for both the design of new build structures and for the structural integrity management and assessment of existing structures.

This document does not apply to subsea and riser systems or pipeline systems.

This document is identical with, and has been reproduced from, ISO 19900:2019, *Petroleum and natural gas industries — General requirements for offshore structures*.

As this document has been reproduced from an International document, a full point substitutes for a comma when referring to a decimal marker.

Australian or Australian/New Zealand Standards that are identical adoptions of international normative references may be used interchangeably. Refer to the online catalogue for information on specific Standards.

The terms “normative” and “informative” are used in Standards to define the application of the appendices or annexes to which they apply. A “normative” appendix or annex is an integral part of a Standard, whereas an “informative” appendix or annex is only for information and guidance.

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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).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of 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 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 7, *Offshore structures*.

This third edition cancels and replaces the second edition (ISO 19900:2013), which has been technically revised. The main changes compared to the previous edition are as follows:

— Terms and definitions have been updated;

— Design/assessment situations are described, and the process for limit state design/assessment verification has been clarified;

— Contents have been reorganized and many clarifications to provisions have been made;

— Annex A has been reorganized to mirror the numbering of the normative clauses and it has been updated with substantial guidance moved from normative clauses.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

The International Standards on offshore structures prepared by TC 67/SC 7 (i.e. ISO 19900, the ISO 19901 series, ISO 19902, ISO 19903, ISO 19904-1, the ISO 19905 series, ISO 19906) constitute a common basis addressing design requirements and assessments of all types of offshore structures used by the petroleum and natural gas industries worldwide.

NOTE These are sometimes referred to as the ISO 19900 series on offshore structures.

Through their application, the intention is to achieve adequate structural integrity and performance based on reliability levels appropriate for manned and unmanned offshore structures, whatever the nature or combination of the materials used.

Structural integrity is an overall concept comprising: models for describing actions, structural analyses, design rules, safety elements, workmanship, quality management, and national requirements, all of which are mutually dependent. The modification of any of these elements in isolation can cause an imbalance or inconsistency, with possible impact on the reliability inherent in the offshore structure. The implications involved in modifying one element, therefore, need to be considered in relation to all the elements and the overall reliability of the offshore structure.

The International Standards on offshore structures prepared by TC 67/SC 7 are intended to provide 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 documents.

Figure 1 gives a general indication of the relationships between the International Standards on offshore structures prepared by TC 67/SC 7.

This document, i.e. ISO 19900, follows the principles of ISO 2394 and is the unifying document for International Standards on offshore structures prepared by TC 67/SC 7, which encompass both specific requirements for offshore structures (the ISO 19901 series) and “structure type” documents (ISO 19902, ISO 19903, ISO 19904-1, ISO 19905-1, ISO 19905-3, and ISO 19906).

The ISO 19901 series addresses particular aspects of the design, construction, and operation of offshore structures for the petroleum and natural gas industries. The provisions can be applicable to structures of different types, materials and operating environments.

In addition to the relationships between the “structure type” documents and the ISO 19901 series, there is also some interdependence among the “structure type” documents, in that one can reference another, e.g. ISO 19906 on arctic offshore structures builds upon the requirements of ISO 19902 on fixed steel offshore structures.

In ISO International Standards, the following verbal forms are used:

— “shall” and “shall not” are used to indicate requirements strictly to be followed in order to conform to the document and from which no deviation is permitted;

— “should” and “should not” are used to indicate that, among several possibilities, one is recommended as particularly suitable, without mentioning or excluding others, or that a certain course of action is preferred but not necessarily required, or that (in the negative form) a certain possibility or course of action is deprecated but not prohibited;

— “may” is used to indicate a course of action permissible within the limits of the document;

— “can” and “cannot” are used for statements of possibility and capability, whether material, physical or causal.

Additional information and guidance are given in Annex A, where the clause numbering mirrors the normative clauses to facilitate cross referencing.

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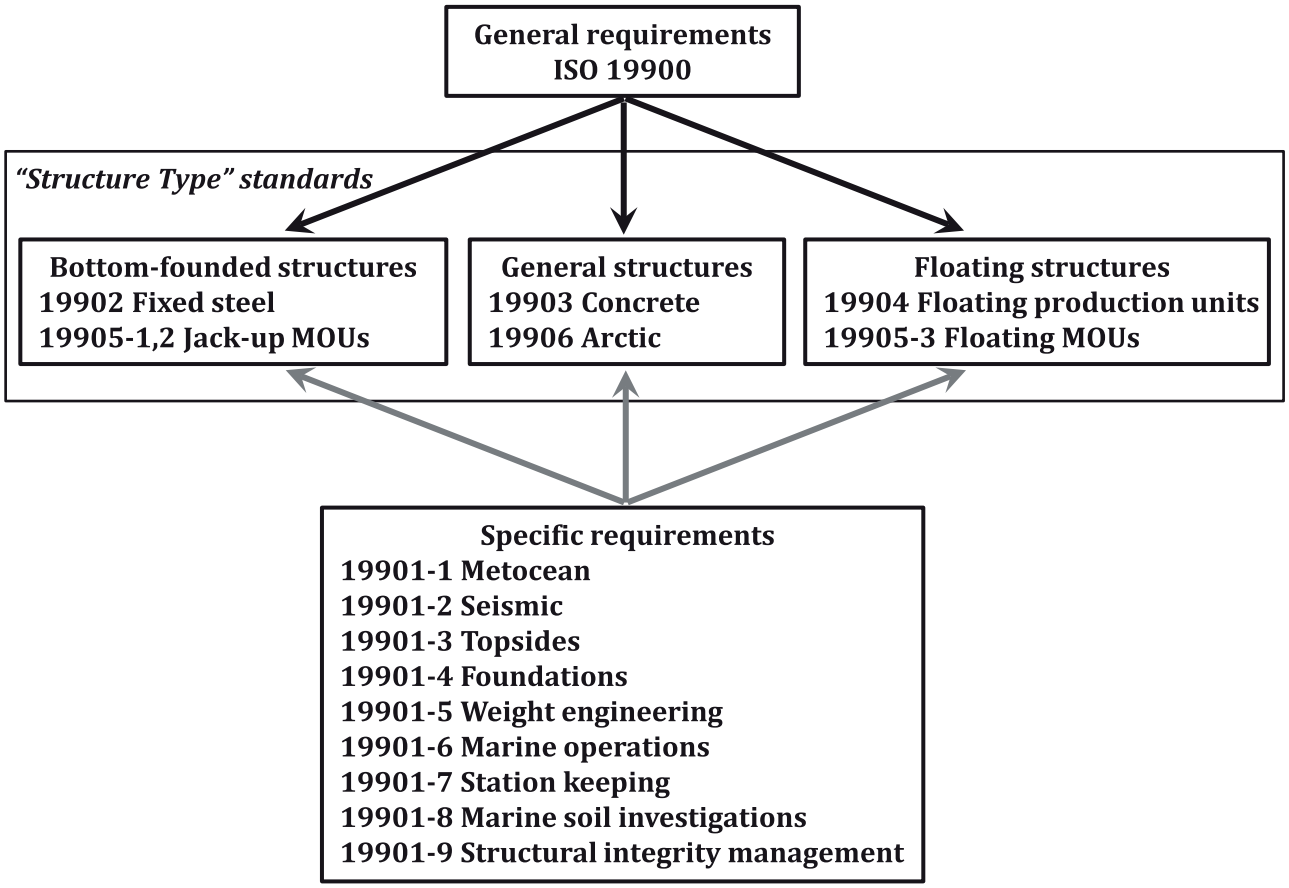

Figure 1 — Relationship of International Standards on offshore structures prepared by TC67/SC7

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Petroleum and natural gas industries — General requirements for offshore structures

1 Scope

This document specifies general requirements and recommendations for the design and assessment of bottom-founded (fixed) and buoyant (floating) offshore structures.

This document is applicable for all phases of the life of the structure, including:

— successive stages of construction (i.e. fabrication, transportation, and installation),

— service in-place, both during design life and during any life extensions, and

— decommissioning, and removal.

This document contains general requirements and recommendations for both the design of new build structures and for the structural integrity management and assessment of existing structures.

This document does not apply to subsea and riser systems or pipeline systems.

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

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 19901-8, *Petroleum and natural gas industries — Specific requirements for offshore structures — Part 8: Marine soil investigations*

ISO 19901-9, *Petroleum and natural gas industries — Specific requirements for offshore structures — Part 9: Structural integrity management*

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

ISO 19903, *Petroleum and natural gas industries — Concrete offshore structures*

ISO 19904-1, *Petroleum and natural gas industries — Floating offshore structures — Part 1: Monohulls, semisubmersibles and spars*

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ISO 19905-1, *Petroleum and natural gas industries — Site-specific assessment of mobile offshore units — Part 1: Jack-ups*

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*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
abnormal environmental event
environmental *hazardous event* (3.27) having probability of occurrence not greater than 10^{-3} per annum (1 in 1 000 years)

3.2
accidental event
non-environmental *hazardous event* (3.27) having probability of occurrence not greater than 10^{-3} per annum (1 in 1 000 years)

Note 1 to entry: Accidental events, as referred to in this document, are associated with a substantial release of energy, such as vessel collisions, fires, and explosions.

Note 2 to entry: Lesser accidents that could be expected during the life of the structure, such as dropped objects and low energy vessel impact, are termed incidents and are addressed under operational design situations.

3.3
action
external load applied to the *structure* (3.53) (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. An imposed acceleration can be caused by an earthquake.

3.4
action effect
result of *actions* (3.3) on a *structural component* (3.49) (e.g. internal force, moment, stress, strain) or on the *structure* (3.53) (e.g. deflection, rotation)

3.5
air gap
distance between the highest water elevation and the lowest exposed part of the primary deck *structure* (3.53) not designed to withstand associated environmental *action effects* (3.4) for a defined *return period* (3.42)

Note 1 to entry: This definition can be refined for different platform types in their respective standards.

3.6
appurtenance
accessory or attachment to the *structure* (3.53) which typically assists installation, provides access or protection, or carries fluids or gas

Note 1 to entry: Appurtenances do not normally contribute to the stiffness of the structure but can attract significant hydrodynamic loading.

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EXAMPLE Riser, caisson, boat landing, fender, and protection frames.

3.7
basic variable
variable representing physical quantities which characterize *actions* (3.3) and environmental influences, geometric quantities, or material properties including soil properties

Note 1 to entry: Basic variables are typically uncertain random variables or random processes used in the calculation or assessment of representative values of actions or resistance.

3.8
calibration
process used to determine and optimize partial factors using *structural reliability analysis* (3.52) and target reliabilities

3.9
characteristic value
value assigned to a *basic variable* (3.7) with a prescribed probability

Note 1 to entry: In some design/assessment situations, a variable can have two characteristic values, an upper value and a lower value.

3.10
conductor
tubular pipe set into the ground to provide the initial stable structural foundation for setting the surface casing and protecting the internal well string from metocean actions

Note 1 to entry: The conductor provides lateral and, in some cases, axial support, enables circulation of drilling fluid, and guides the drill string to facilitate setting of the surface casing.

3.11
decommissioning
process of shutting down a *platform* (3.37) enabling preparations for cleaning, dismantling and/or removal from location at the end of *total service life* (3.18)

3.12
design resistance
resistance limit calculated using factored *representative values* (3.40) of *basic variables* (3.7) or from factored expressions based on unfactored *representative values* (3.40) of *basic variables* (3.7)

EXAMPLE Examples of basic variables relevant to resistance are material properties.

3.13
design service life
planned period for which a *structure* (3.53) is used for its intended purpose with anticipated maintenance, but without substantial repair being necessary

3.14
design value
value derived from the *representative value* (3.40) for use in *limit state verification* (3.32)

Note 1 to entry: Design values can be different in different design/assessment situations due to different partial factors.

3.15
design/assessment criteria
quantitative formulations describing the conditions to be fulfilled for each *design/assessment situation* (3.16)

3.16
design/assessment situation
set of physical conditions for which the *structure* (3.53) or its components are verified

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3.17
deterioration
process that adversely affects *structural integrity* (3.50) over time

Note 1 to entry: Deterioration can be caused by naturally occurring chemical, physical, or biological actions including corrosion, by severe environmental actions, by incidents and accidental actions, by repeated actions such as those causing fatigue, by wear due to use, and by improper operation and maintenance of the structure.

3.18
total service life
design service life (3.13) plus any subsequent operational life extension period(s)

3.19
durability
ability of a *structure* (3.53) or *structural component* (3.49) to maintain its function throughout its *total service life* (3.18)

3.20
exposure level
classification system used to establish relevant criteria for a *structure* (3.53) based on consequences of failure

3.21
extreme environmental event
environmental *hazardous event* (3.27) typically having probability of occurrence of 10^{-2} per annum (1 in 100 years)

3.22
fit-for-service
fulfilling defined *structural integrity* (3.50) and *performance* (3.36) requirements

Note 1 to entry: A structure not meeting all the specific provisions can be fit-for-service, provided it does not cause unacceptable risk to life-safety or the environment.

3.23
fitness-for-service assessment
engineering evaluations to demonstrate that a *structure* (3.53) or a *structural component* (3.49) which deviates from its design basis, is *fit-for-service* (3.22)

Note 1 to entry: Deviations can include deterioration or damage, life extension, and other changes and modifications to the structure or to the design basis.

3.24
fixed structure
structure (3.53) that is bottom founded and transfers most of the *actions* (3.3) on it to the *seabed* (3.47)

3.25
floating structure
structure (3.53) where the full weight is supported by buoyancy

3.26
hazard
potential source of harm

Note 1 to entry: Harm is typically differentiated between harm to people, harm to the environment, or harm in terms of costs to organization(s) or society in general.

3.27
hazardous event
event which occurs when a *hazard* (3.26) interacts with a *structure* (3.53)

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EXAMPLE Wave impacting the structure, iceberg impacting the structure, excessive topside weight added to the structure, vessel collision, fire, explosion, and landslip in the vicinity of structural anchors (piles).

3.28
ice gouge
ice scour
incision in the *seabed* (3.47) or removal of seabed material by an ice feature

3.29
incident
non-environmental *hazardous event* (3.27) considered in an operational *design/assessment situation* (3.16)

Note 1 to entry: Incident, as referred to in this document, is a lesser accidental event, associated with possible local damage or damage to structural components, occurring with low probability, most typically associated with probabilities not less than 10^{-2} per annum (1 in 100 years).

3.30
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.

3.31
limit state
state beyond which the *structure* (3.53) or *structural component* (3.49) no longer satisfies the *design/assessment criteria* (3.15)

3.32
limit state verification
demonstration that the total design *action effect* (3.4) in each *design/assessment situation* (3.16) does not exceed the *limit state* (3.31) *design resistance* (3.12)

3.33
nominal value
value assigned to a variable specified or determined on a non-statistical basis, typically from acquired experience or physical conditions, or as published in a recognized code or standard

Note 1 to entry: In some design/assessment situations, a variable can have two nominal values, an upper value and a lower value.

3.34
offshore
situated in water some distance from the shore

Note 1 to entry: Alternatively, near shore can be used to specify locations next to the coast or in mouths of rivers.

3.35
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.

Note 2 to entry: The operator can be termed the owner or the duty holder.

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3.36
performance
ability of a *structure* (3.53) or a *structural component* (3.49) to fulfil specified requirements

Note 1 to entry: Specified requirements include requirements for structural integrity and functionality.

3.37
platform
complete assembly of structural and non-structural systems for the purpose of development and production of petroleum and natural gas fields

Note 1 to entry: The platform includes the structure and non-structural systems such as topsides equipment, piping and accommodation.

Note 2 to entry: The platform includes the structural conductors and risers but does not include the non-structural components of the hydrocarbon wells.

Note 3 to entry: The platform does not include the geological strata supporting the foundation. However, site-specific geotechnical parameters provide the boundary conditions necessary to model the platform's foundation or anchoring.

3.38
reference period
period of time used as a basis for determining the *representative value* (3.40) of operational, environmental, accidental and/or repetitive actions

3.39
reliability
performance (3.36) over a specified period of time

Note 1 to entry: When reliability is used in the context of limit states, it can be expressed as the probability that the limit is not exceeded.

Note 2 to entry: The specified period of time is typically one year.

3.40
representative value
value assigned to a *basic variable* (3.7) for verification of a *limit state* (3.31) in a *design/assessment situation* (3.16)

Note 1 to entry: Two types of representative value used in design verification are characteristic value and nominal value.

3.41
resistance
ability of a *structure* (3.53), or a *structural component* (3.49), to withstand *action effects* (3.4)

3.42
return period
average time between occurrences of an event

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 occurrence of the event.

Note 2 to entry: For the purpose of this definition, events include both discrete hazardous events as well as exceedances of a threshold value of a relevant variable.

3.43
riser
part of an offshore pipeline, including any subsea spool pieces, which extends from the *sea floor* (3.46) to the pipeline termination point on a *platform* (3.37)

Note 1 to entry: For fixed structures, the termination point is usually the topsides.

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Note 2 to entry: For floating structures, the riser can terminate at other locations on the platform.

3.44
robustness
ability of a *structure* (3.53) to withstand *hazardous events* (3.27) without being damaged to an extent disproportionate to the cause

3.45
scour
removal of *seabed* (3.47) material caused by currents and/or waves

3.46
sea floor
interface between sea and *seabed* (3.47)

3.47
seabed
materials below the *sea floor* (3.46)

3.48
splash zone
part of a *structure* (3.53) that is intermittently exposed to air and immersed in the sea

3.49
structural component
discrete part of a *structure* (3.53)

Note 1 to entry: For this document, a component can include an assembly of components, e.g. a subsystem.

EXAMPLE Examples of components include columns, beams, stiffened plates, tubular members and joints, mooring lines and tendons, gravel fill, foundation anchors and piles, but not the geological strata.

3.50
structural integrity
ability of a *structure* (3.53) or a *structural component* (3.49) to maintain *performance* (3.36) throughout the *total service life* (3.18), with respect to structural safety, *robustness* (3.44), serviceability, and *durability* (3.19)

3.51
structural integrity management
SIM
systematic multi-step cyclic process intended to assure *structural integrity* (3.50) and functionality of a *structure* (3.53) throughout its *total service life* (3.18)

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.

3.52
structural reliability analysis
probabilistic methodology for determining *limit state* (3.31) failure probabilities

3.53
structure
combination of physically connected *structural components* (3.49)

3.54
topsides
structure (3.53) and equipment placed on a supporting structure [fixed or floating] to provide some or all of a *platform's* (3.37) functions

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

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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.

3.55
ductility
<material> ability of a material to deform and absorb energy beyond its elastic limit

3.56
ductility
<structural component> ability of a *structural component* (3.49) to sustain *action effects* (3.4) beyond yield

3.57
ductility
<structural system> ability of a structural system to deform and dissipate energy, and to redistribute *action effects* (3.4)

4 Symbols and abbreviated terms

4.1 Symbols

A	accidental action
a_d	design value of geometric variable
a_k	characteristic value of geometric variable
a_r	representative value of geometric variable
E	environmental action
F_d	design action
F_r	representative value of an action
f_d	design value of material property (for example strength)
f_r	representative value of material property (for example yield strength)
G	permanent action
L1, L2, L3	exposure levels of structures
P	annual probability of occurrence or probability of exceedance
p_f	probability of failure
Q	operational action
Q_1	operational action of long duration
Q_2	operational action of short duration
R	reliability of a structural system
R_d	design value of resistance
R_k	characteristic value of resistance, or value based on characteristic values of material properties

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R_r representative value of resistance

S_d total design action effect

T annual return period of an event or an action

γ_f partial action factor the value of which reflects the uncertainty or randomness of the action

γ_m partial material factor the value of which reflects the uncertainty or variability of the material property

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

Δa additive partial geometric quantity the value of which reflects the uncertainties of the geometric variable

4.2 Abbreviated terms

ALS abnormal/accidental limit state

FLS fatigue limit state

IMO International Maritime Organization

QA quality assurance

QC quality control

SLS serviceability limit state

ULS ultimate limit state

5 Fundamental requirements

5.1 General

Offshore structures shall be planned, designed, constructed, operated, and assessed in such a way that they perform with adequate structural integrity (see 5.2), and meet all functional requirements (see 5.3), for all phases of their life (see 5.4).

Requirements set by regional, national, and local regulations and standards can be different from those given in this document. While such requirements take precedence, conformance to this document can be claimed only if the requirements of this document are also met.

NOTE Requirements for personnel safety set by flag states and coastal state authorities can have a substantial effect on the design of a floating structure.

5.2 Structural integrity requirements

Structural integrity is achieved by the following:

— conformance to this document;

— verification of structural reliability using the limit state approach, see 8.1;

— quality management during constructional phases of an offshore project;

— structural integrity management in service;

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— operational procedures aligned with the design and assessment assumptions.

To protect safety of life, prevent damage to the environment, and protect against financial or societal loss, a structure and its structural components shall have adequate structural integrity to

a) withstand actions arising from hazardous events and other sources of actions during their construction and service in-place,

b) perform adequately under all design/assessment situations, including serviceability, expected during the total service life,

c) not fail under repeated actions (fatigue) or deterioration mechanisms (e.g. corrosion, wear), and

d) provide an appropriate level of robustness (see 5.5.2) against damage and failure, taking due account of

   — the cause and mode of damage or failure, and

   — the possible consequences of damage or failure in terms of risk to life, environment and property.

The integrity of a structure and its components is described in terms of adequate reliability associated with a specified set of limit states. Adequate reliability is realized by conforming to the limit state verification requirements in Clause 8, and to the appropriate structure type standard (ISO 19902, ISO 19903, ISO 19904-1, ISO 19905-1, ISO 19905-3, and ISO 19906).

5.3 Functional requirements

The functions of an offshore platform can include drilling, producing, processing, storage, offloading, personnel accommodation, or another function or combination of functions in support of the petroleum and natural gas industries.

The platform's (including the structure's) functional requirements and design service life shall be specified by the operator.

Functional requirements for control and mitigation of fires and explosions should be specified according to ISO 13702[3]. The selection of a suitable approach and mitigating measures including safety systems can depend upon the function of the platform.

All functional and operational requirements including site-specific marine biological, physical environmental, and geotechnical conditions affecting the layout and design of the structure shall be established and documented.

All functional and operational requirements in temporary and in-service phases, as well as robustness against accidental events that can influence the layout and the structural design, shall be established and documented.

NOTE Functional requirements for floating structures also include maritime functions.

5.4 Requirements for specific phases of the life of the structure

5.4.1 Planning

For new build structures, planning shall be completed before design is started to obtain a safe, workable, and economical offshore structure. Planning can be associated with conceptual field development, or in a broad concept development phase.

For existing structures, planning shall be completed to obtain data and models which represent the structure's current conditions before the structure is assessed to be fit-for-service for its remaining service life including any life extension.

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Relevant and related sustainability aspects impacting the environment, the economy and society, along with their interdependence and interrelationships, should be considered.

Structure related requirements should be established in association with functional requirements associated with non-structure related disciplines. In some cases, significant modifications are required to the planned structural configuration to meet functional requirements and to mitigate risks in non-structural disciplines.

5.4.2 Construction and deployment

Consideration shall be given to all activities and operations required for construction including, where appropriate, fabrication, load-out, transportation, installation and securing in place of the structure, and hook-up of subsea equipment and facilities.

Design requirements shall be established accounting for the following:

a) the type of structure and its location;

b) the environmental conditions including seasonality;

c) the construction equipment;

d) the nature and duration of the construction operations.

Planning, engineering and safe execution of marine operations for all types of offshore structures within the scope of this document shall be in accordance with ISO 19901-6.

NOTE Marine operations for marine site investigations, mobile jack-ups, pipe-laying barges, and diving support vessels are outside the scope of ISO 19901-6.

5.4.3 Structural integrity management

A system for structural integrity management shall be developed during the design phase and maintained throughout the total service life of the structure in accordance with Clause 13 and with the appropriate document for the actual structure type (i.e. ISO 19901-9, ISO 19902, ISO 19903, ISO 19904-1 or ISO 19905-1).

5.4.4 Decommissioning and removal

Consideration shall be given at the design stage to decommissioning and possible removal of the structure or parts of the structure at the end of its design service life.

Decommissioning shall be conducted in accordance with the operator's specifications and can be subject to local and international legislation and IMO rules.

5.5 Requirements for durability and robustness

5.5.1 Durability, maintenance and inspection

The durability of the structure shall be achieved by adequate design and assessment, inspection, monitoring, maintenance and repair. Effects of corrosion, loss of material by abrasion, and other forms of deterioration that can affect the resistance of the structure or structural components shall be taken into account.

NOTE 1 Deterioration can also be caused by operational incidents such as dropped objects and spillage of corrosive or refrigerated fluids.

Durability of the structure and structural components shall be achieved by

a) an inspection and maintenance programme,

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b) designing the structure so as to allow for deterioration in those areas that cannot be, or are not expected to be, maintained during the design service life of the structure, or

c) a combination of a) and b).

NOTE 2 Structural integrity, serviceability, and durability throughout the design service life are not simply the outcome of the design calculations, but are also dependent on the quality of materials, the quality management exercised in construction, the supervision on site and the manner in which the structure is installed, used and maintained.

NOTE 3 The rate of deterioration can be estimated on the basis of calculations, experimental investigations, experience from other structures, or a combination of these. Deterioration can be reduced or prevented by providing suitable protection systems.

An inspection and maintenance programme shall be consistent with the design and use of the structure, the environmental conditions to which it is exposed, and the consequent rate of deterioration.

The structure or structural components shall be designed and constructed so that deterioration remains below defined thresholds within the time intervals between inspections. The design shall allow easy access to relevant parts of the structure for inspection without unnecessary or unreasonably complicated dismantling.

The planning and the execution of inspection should include scheduled baseline inspection, periodic inspections, special inspections, and unscheduled inspections (e.g. after a hazardous event such as an earthquake or other severe environmental or accidental event).

In the event of deterioration or damage to protection systems or to structural components, maintenance shall include upgrading of the affected protection systems or repair of the affected structural components.

5.5.2 Robustness

A structure shall incorporate robustness so that damage arising from a hazardous event is not disproportionate to the cause.

Robustness shall be realized by

a) ensuring (by design or by protective measures) that no critical part of the structure exposed to a hazardous event can suffer complete loss of integrity,

b) providing alternate load-carrying paths (structural redundancy) in such a way that any single structural component exposed to a hazardous event can fail without complete loss of integrity of the structure or a critical part of the structure,

c) providing sufficient residual resistance after relevant damage conditions associated with certain abnormal and accidental design/assessment situations, see 7.4.4 and 7.4.5, or

d) a combination of a), b) and c).

Structures in a floating state shall be designed/assessed to have adequate stability in all associated design/assessment situations in both the intact and damaged conditions, during construction, transportation, installation, service in place, decommissioning and removal phases.

Structures in a floating state for which buoyancy is important should be subdivided into compartments to limit the consequences of unintended flooding. The configuration of compartments should be determined after considering protection measures (including operation of those measures) that can be used to prevent flooding.

Stationary floating structures (temporarily located mobile offshore units or permanently located floating structures) shall incorporate sufficient damaged stability and reserve of buoyancy so that design/assessment situations involving unintended flooding do not result in complete loss of the structure.

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Robustness requirements for permanently located floating structures shall be in accordance with those of ISO 19904-1. Site-specific robustness requirements for temporarily moored mobile offshore units shall be in accordance with those of 19905-3.

NOTE General robustness requirements for temporarily moored mobile offshore units are based on IMO rules.

The stationkeeping systems of floating structures shall incorporate sufficient robustness so that the structure can withstand the loss of at least one stationkeeping component (such as a mooring line, a thruster, or a fairlead) in accordance with the provisions of ISO 19901-7.

6 Basis for design/assessment

6.1 General

The basis for design/assessment for the structure shall include all relevant hazardous events (see 7.2) and functional requirements (see 5.3), described in terms of their associated design/assessment situations (see 7.4) for all the phases of the life of the structure (see 5.4), including design/assessment situations arising during construction, fabrication, transportation, installation, and decommissioning of the structure.

Equipment and material layouts shall be specified and associated weights and centres of gravity shall be determined. Exposure of such equipment and material to hazardous events, such as those due to the environment or accidents, shall be taken into account.

The conditions and requirements identified in 6.2 to 6.5 shall also be included in the basis for design/assessment.

Structures and structural components shall be configured and designed/assessed so that accelerations, velocities and displacements do not impair the safety and health of personnel, and the serviceability of processes and equipment.

6.2 Platform location and orientation

The site location, structure position and orientation with respect to true north, and the tolerances on position and orientation shall be specified.

The position and orientation of the structure and its ancillary systems (such as piles, mooring lines, anchors, conductor pipes, risers, offloading systems, tendons, berms, movable protection barriers, temporary refuges, and evacuation systems) should take account of the following:

— the reservoir geometry;

— construction requirements (including access for drilling and/or construction vessels, their stationkeeping systems and their support spread);

— the physical environment (including prevailing wind, wave and ice drift directions);

— other platforms and infrastructure in the vicinity (such as subsea wells, manifolds, flowlines, and pipelines);

— accessibility by ships and helicopters.

6.3 Physical environmental conditions

The physical environmental conditions applicable at the region or location shall be specified.

Metocean conditions shall be established in accordance with ISO 19901-1. Tidal, wind driven, pressure driven, global circulation, loop and eddy currents, and the occurrence of fluid motion caused by internal waves should be considered, if relevant. Waves and currents of seismic origin (tsunamis) shall also be

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