INTERNATIONAL STANDARD

ISO 19901-6

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Petroleum and natural gas industries — Specific requirements for offshore structures —

Part 6: Marine operations

Industries du pétrole et du gaz naturel — Exigences spécifiques relatives aux structures en mer —
Partie 6: Opérations marines

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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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 19901-6 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 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 4: Geotechnical and foundation design considerations*

— *Part 5: Weight control during engineering and construction*

— *Part 6: Marine operations*

— *Part 7: Stationkeeping systems for floating offshore structures and mobile offshore units*

The following part is under preparation:

— *Part 3: Topsides structure*

ISO 19901 is one of a series of International Standards for offshore structures. The full series consists of the following:

— 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* [1)]

— ISO/TR 19905-2, *Petroleum and natural gas industries — Site-specific assessment of mobile offshore units — Part 2: Jack-ups commentary* [1)]

— ISO 19906, *Petroleum and natural gas industries — Arctic offshore structures* [1)]

1) Under preparation.

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, petrochemical 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 materials used.

It is important to recognize that structural integrity is an overall concept comprising models for describing actions, structural analysis, 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. It is necessary, therefore, to consider the implications involved in modifications in relation to the overall reliability of 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 configuration, material and techniques without hindering innovation. Sound engineering judgment is, therefore, necessary in the use of these International Standards.

This part of ISO 19901 was developed to provide requirements and guidance for the planning, engineering and safe execution of marine operations for all types of offshore structures except for drilling rigs, pipe-laying barges and diving support vessels. Marine operations for offshore structures are parts of the construction, transportation and installation phases when the structure is at risk from the marine environment. Marine operations can extend to decommissioning, redeployment, removal, etc.

This part of ISO 19901 describes the principles of and provides requirements and guidance for marine operations associated with fixed and floating offshore structures, from the point of view of planning, engineering, implementation and documentation. Alternative requirements, methods and provisions can fulfil the intention of this part of ISO 19901 and may be applied, provided it can be demonstrated that they achieve at least the same level of confidence. The overall objective of this part of ISO 19901 is to ensure that marine operations are conducted within defined and recognized safety/confidence levels, wherever they are performed. Additional standards, codes and guidelines should also be taken into account, where applicable. Special attention should be paid to national regulations governing the area in which the marine operations are performed.

It is not the intent of this part of ISO 19901 to govern the design of structures, systems and components used in marine operations, beyond the principles given. Recognized codes and standards are normally accepted as the basis for the detailed design and the fabrication requirements of such components.

Annex A provides some background and some additional information to the main body of the document and it is intended that it be read in conjunction with the main body of the document.

Annex B provides regional information on the application of the document to certain specific offshore areas.

Petroleum and natural gas industries — Specific requirements for offshore structures —

Part 6: Marine operations

1 Scope

This part of ISO 19901 provides requirements and guidance for the planning and engineering of marine operations, encompassing the design and analysis of the components, systems, equipment and procedures required to perform marine operations, as well as the methods or procedures developed to carry them out safely.

This part of ISO 19901 is applicable to marine operations for offshore structures including

— steel and concrete gravity base structures (GBS);

— piled steel structures and compliant towers;

— tension leg platforms (TLP);

— deep draught floaters (DDF), including spars or deep draught caisson vessels (DDCV);

— floating production semi-submersibles (FPSS);

— floating production, storage and offloading vessels (FPSO);

— other types of floating production systems (FPS);

— mobile offshore units (MOU);

— topsides and components of any of the above;

— subsea templates and similar structures;

— gravity, piled, drag embedded and suction or other anchors;

— tendon foundations;

— associated mooring systems.

This document is also applicable to modifications of existing structures, e.g. installation of additional topsides modules.

This part of ISO 19901 is not applicable to the following marine operations:

a) construction activities, e.g. in a fabrication yard onshore, where there is no exposure to the marine environment;

b) drilling, processing and petrochemical activities;

c) routine marine activities during the service life of the structure;

d) drilling from mobile offshore drilling units (MODU);

e) installation of pipelines, flowlines, risers and umbilicals;

f) diving.

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 19900:2002, *Petroleum and natural gas industries — General requirements for offshore structures*

ISO 19901-1:2005, *Petroleum and natural gas industries — Specific requirements for offshore structures — Part 1: Metocean design and operating considerations*

ISO 19901-4:2003, *Petroleum and natural gas industries — Specific requirements for offshore structures — Part 4: Geotechnical and foundation design considerations*

ISO 19901-7:2005, *Petroleum and natural gas industries — Specific requirements for offshore structures — Part 7: Stationkeeping systems for floating offshore structures and mobile offshore units*

ISO 15544, *Petroleum and natural gas industries — Offshore production installations — Requirements and guidelines for emergency response*

ISO 17776, *Petroleum and natural gas industries — Offshore production installations — Guidelines on tools and techniques for hazard identification and risk assessment*

IMCA M 179, *Guidance on the Use of Cable Laid Slings and Grommets*. The International Marine Contractors Association

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 19900, ISO 19901-1, ISO 19901-4, ISO 19901-7 and ISO 19904-1 and the following apply.

NOTE Other terms and definitions relevant for the use of this part of 19901 are also found in ISO 19901-5[28], ISO 19902[29], ISO 19903[35] and ISO 19904-1[30].

3.1
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, settlement, temperature change or moisture variation.

NOTE An earthquake typically generates imposed accelerations.

[ISO 19900:2002, 2.1]

3.2
action effect
effect of actions on structural components

EXAMPLE Internal forces, moments, stresses, strains, rigid body motions or elastic deformations.

[ISO 19904-1:2006, 3.5]

3.3
air cushion
air pumped into underbase compartments of the structure

NOTE Normally applied in order to reduce the draught and increase the freeboard and/or to alter the structural loading.

[ISO 19903:2006, 3.10]

3.4
assembly
designed and fabricated group of bulk and equipment items that form one unit

[ISO 19901-5:2003, 3.1.1]

3.5
ballast
variable solid or fluid content in order to change the draught, stability, trim and/or heel of a structure afloat

NOTE Adapted from ISO 19901-5:2003, 3.1.2.

3.6
ballast system
system used to change the draught, stability, trim and/or heel of a structure afloat

3.7
barge
simple floating vessel, normally non-propelled, on which a structure is transported

3.8
basic variable
one of a specified set of variables representing physical quantities that characterize actions, environmental influences, geometrical quantities or material properties, including soil properties

[ISO 19900:2002, 2.5]

3.9
bending efficiency factor
factor by which the calculated breaking strength of a rope is reduced to take account of the reduction in strength caused by bending around a shackle, trunnion, padear or crane hook

3.10
bollard pull
towing or manoeuvring action that can be generated by a tug for an indefinite period of time with its propulsion system running at operational, as opposed to maximum revolutions per minute

NOTE Bollard pull is expressed in kilonewtons.

3.11
bridging document
document that aligns and co-ordinates the requirements and responses of various parties in relation to a specific aspect of a project

NOTE Commonly used to align and co-ordinate the emergency response procedures for owner and contractors.

3.12
bumper
temporary structure designed to protect structures or modules during the initial fitting stage of an installation operation

3.13
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 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.

[ISO 19900:2002, 2.7]

3.14
CoG envelope
defined constraint volume within which the centre of gravity (CoG) of an assembly or a module shall remain

NOTE Adapted from ISO 19901-5:2003, 3.1.8.

3.15
consequence factor
factor applied to critical structural components in the design of lifting operations to ensure that these components have an increased factor of safety in relation to the consequence of their failure

NOTE Consequence factors are additional safety factors, applied to critical structural components of the lifted object over and above the normal safety factors used in a WSD analysis of the lifted object. They are, accordingly, applied to lift points, their attachments to the object and components in the object supporting lift points. They are not intended for application to slings, grommets and shackles.

3.16
construction afloat
addition of material or outfitting to the structure while afloat

NOTE Adapted from ISO 19903:2006, 3.17.

3.17
crane vessel
vessel, ship or barge on which lifting equipment is mounted

NOTE For the purpose of this document, this term includes crane barges, crane ships, derrick barges, shear-leg barges and semi-submersible crane vessels.

3.18
cribbing
arrangement of timber baulks, secured to the deck of the barge or vessel, designed to support the cargo

NOTE Cribbing is generally arranged at strong points of the deck and/or cargo.

3.19
deadweight
total carrying capacity of a floating structure

NOTE 1 This includes cargo weight, deck cargo, snow and ice, marine growth, ballast water, consumables and crew onboard a floating unit.

NOTE 2 Adapted from ISO 19901-5:2003, 3.1.11.

3.20
deck mating
marine operation in which the platform topsides is floated into position and connected to the support structure

NOTE This operation is normally conducted by ballasting and deballasting of the support structure.

[ISO 19903:2006, 3.18]

3.21
decommissioning
process of shutting down a platform and removing hazardous materials at the end of its production life

[ISO 19900:2002, 2.10]

3.22
design criterion
quantitative formulation that describes the conditions that shall be fulfilled for each limit state

NOTE Adapted from ISO 19900:2002, 2.11.

3.23
design situation
set of physical conditions representing potential conditions during a certain time interval for which the design is expected to demonstrate that relevant limit states are not exceeded

NOTE Adapted from ISO 19900:2002, 2.13.

3.24
design value
value derived from the representative value for use in the design verification procedure

[ISO 19900:2002, 2.14]

3.25
determinate lift
lift where the slinging arrangement is such that the sling forces are statically determinate and not significantly affected by minor differences in sling length or elasticity

3.26
displacement
weight of the volume of water displaced by a floating structure

NOTE 1 The weight of the water displaced is the sum of the lightship weight, deadweight and mooring system load including vertical component of the mooring pre-tension and/or riser action.

NOTE 2 Adapted from ISO 19901-5:2003, 3.1.12.

3.27
dunnage
arrangement of timber on deck of a barge or vessel laid out to support the cargo

3.28
dynamic action
action that induces acceleration of a structure or a structural component of a magnitude sufficient to require specific consideration

[ISO 19901-7:2005, 3.8]

3.29
dynamic amplification factor
DAF
ratio of a dynamic action effect to the corresponding static action effect

NOTE An appropriately selected dynamic amplification factor can be applied to static actions to simulate the effects of dynamic actions.

[ISO 19902:2007, 3.16]