SLOVENSKI STANDARD
SIST EN ISO 19901-2:2018

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Industrija za predelavo nafte in zemeljskega plina - Posebne zahteve za naftne ploščadi - 2. del: Postopki potresno varnega projektiranja in potresna merila (ISO 19901-2:2017)

Petroleum and natural gas industries - Specific requirements for offshore structures - Part 2: Seismic design procedures and criteria (ISO 19901-2:2017)

Erdöl- und Erdgasindustrie - Spezielle Anforderungen für Offshore-Anlagen - Teil 2: Seismische Auslegungsverfahren und –kriterien (ISO 19901-2:2017)

Industries du pétrole et du gaz naturel - Exigences spécifiques relatives aux structures en mer - Partie 2: Procédures de conception et critères sismiques (ISO 19901-2:2017)

Ta slovenski standard je istoveten z: **EN ISO 19901-2:2017**

ICS:

75.180.10	Oprema za raziskovanje, vrtanje in odkopavanje	Exploratory, drilling and extraction equipment
91.120.25	Zaščita pred potresi in vibracijami	Seismic and vibration protection

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English Version

Petroleum and natural gas industries - Specific requirements for offshore structures - Part 2: Seismic design procedures and criteria (ISO 19901-2:2017)

Industries du pétrole et du gaz naturel - Exigences spécifiques relatives aux structures en mer - Partie 2: Procédures de conception et critères sismiques (ISO 19901-2:2017)

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This European Standard was approved by CEN on 18 November 2017.

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN ISO 19901-2:2017) has been prepared by Technical Committee ISO/TC 67 "Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries" in collaboration with Technical Committee CEN/TC 12 “Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries” the secretariat of which is held by CYS.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2018, and conflicting national standards shall be withdrawn at the latest by June 2018.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

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Endorsement notice

The text of ISO 19901-2:2017 has been approved by CEN as EN ISO 19901-2:2017 without any modification.

INTERNATIONAL STANDARD

ISO 19901-2

Second edition
2017-11

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

Part 2: Seismic design procedures and criteria

Industries du pétrole et du gaz naturel — Exigences spécifiques relatives aux structures en mer —

Partie 2: Procédures de conception et critères sismiques

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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).

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

For an explanation on 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 the following URL: 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 second edition cancels and replaces the first edition (ISO 19901-2:2004), which has been technically revised.

A list of all parts in the ISO 19901 series can be found on the ISO website.

Introduction

The series of International Standards applicable to types of offshore structure, ISO 19900 to ISO 19906, addresses 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 or assessment rules, safety elements, workmanship, quality control procedures and national requirements, all of which are mutually dependent. The modification of one aspect of design or assessment 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 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 seismic design. These include the magnitude and probability of seismic events, the use and importance of the offshore structure, the robustness of the structure under consideration and the allowable damage due to seismic actions with different probabilities. All of these, and any other relevant information, need to be considered in relation to the overall reliability of the structure.

Seismic conditions vary widely around the world, and the design criteria depend primarily on observations of historical seismic events together with consideration of seismotectonics. In many cases, site-specific seismic hazard assessments will be required to complete the design or assessment of a structure.

This document is intended to provide general seismic design procedures for different types of offshore structures, and a framework for the derivation of seismic design criteria. Further requirements are contained within the general requirements standard, ISO 19900, and within the structure-specific standards, ISO 19902, ISO 19903, ISO 19904 and ISO 19906. The consideration of seismic events in connection with mobile offshore units is addressed in ISO 19905.

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

Regional information on expected seismic accelerations for offshore areas is provided in Annex B.

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

Part 2: Seismic design procedures and criteria

1 Scope

This document contains requirements for defining the seismic design procedures and criteria for offshore structures; guidance on the requirements is included in Annex A. The requirements focus on fixed steel offshore structures and fixed concrete offshore structures. The effects of seismic events on floating structures and partially buoyant structures are briefly discussed. The site-specific assessment of jack-ups in elevated condition is only covered in this document to the extent that the requirements are applicable.

Only earthquake-induced ground motions are addressed in detail. Other geologically induced hazards such as liquefaction, slope instability, faults, tsunamis, mud volcanoes and shock waves are mentioned and briefly discussed.

The requirements are intended to reduce risks to persons, the environment, and assets to the lowest levels that are reasonably practicable. This intent is achieved by using:

a) seismic design procedures which are dependent on the exposure level of the offshore structure and the expected intensity of seismic events;

b) a two-level seismic design check in which the structure is designed to the ultimate limit state (ULS) for strength and stiffness and then checked to abnormal environmental events or the abnormal limit state (ALS) to ensure that it meets reserve strength and energy dissipation requirements.

Procedures and requirements for a site-specific probabilistic seismic hazard analysis (PSHA) are addressed for offshore structures in high seismic areas and/or with high exposure levels. However, a thorough explanation of PSHA procedures is not included.

Where a simplified design approach is allowed, worldwide offshore maps, which are included in Annex B, show the intensity of ground shaking corresponding to a return period of 1 000 years. In such cases, these maps may be used with corresponding scale factors to determine appropriate seismic actions for the design of a structure.

For design of fixed steel offshore structures, further specific requirements and recommended values of design parameters (e.g. partial action and resistance factors) are included in ISO 19902, while those for fixed concrete offshore structures are contained in ISO 19903. Seismic requirements for floating structures are contained in ISO 19904, for site-specific assessment of jack-ups and other MOUs in ISO 19905 (all parts), for arctic structures in ISO 19906 and for topsides structures in ISO 19901-3.

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

ISO 19901-8, *Petroleum and natural gas industries — Specific requirements for offshore structures – Part 8: Marine soils Investigation*

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

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

3 Terms and definitions

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

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

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

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

3.1
abnormal level earthquake
ALE
intense earthquake of abnormal severity with a very low probability of occurring during the life of the structure

Note 1 to entry: The ALE event is comparable to the abnormal event in the design of fixed structures which are described in ISO 19902 and ISO 19903.

3.2
attenuation
decay of seismic waves as they travel from the earthquake source to the site under consideration

3.3
directional combination
combination of response values due to each of the three orthogonal components of earthquake-induced ground motions

3.4
escape and evacuation system
system provided on the offshore structure to facilitate escape and evacuation in an emergency

EXAMPLE Passageways, chutes, ladders, life rafts and helidecks.

3.5
extreme level earthquake
ELE
strong earthquake with a reasonable probability of occurring during the life of the structure

Note 1 to entry: The ELE event is comparable to the extreme environmental event in the design of fixed structures which are described in ISO 19902 and ISO 19903.

3.6
fault movement
movement occurring on a fault during an earthquake

3.7
ground motion
accelerations, velocities or displacements of the ground produced by seismic waves radiating away from earthquake sources

Note 1 to entry: A fixed offshore structure is founded in or on the *seabed* (3.17) and consequently only seabed motions are of significance. The term ground motions is used rather than seabed motions for consistency of terminology with seismic design for onshore structures.

Note 2 to entry: Ground motions can be at a specific depth or over a specific region within the seabed.

3.8
liquefaction
fluidity of soil due to the increase in pore pressures caused by earthquake action under undrained conditions

3.9
modal combination
combination of response values associated with each dynamic mode of a structure

3.10
mud volcano
diapiric intrusion of plastic clay causing high pressure gas-water seepages which carry mud, fragments of rock (and occasionally oil) to the surface

Note 1 to entry: The surface expression of a mud volcano is a cone of mud with continuous or intermittent gas escaping through the mud.

3.11
probabilistic seismic hazard analysis
PSHA
framework permitting the identification, quantification and rational combination of uncertainties in earthquakes' intensity, location, rate of recurrence and variations in *ground motion* (3.7) characteristics

3.12
probability of exceedance
probability that a variable (or that an event) exceeds a specified reference level given exposure time

EXAMPLE Example of probability of exceedance during a given exposure time is the annual probability of exceedance of a specified magnitude of ground acceleration, ground velocity or ground displacement.

3.13
response spectrum
function representing the peak elastic response for single degree of freedom oscillators with a specific damping ratios in terms of absolute acceleration, pseudo velocity, or relative displacement values against natural frequency or period of the oscillators

3.14
safety system
systems provided on the offshore structure to detect, control and mitigate hazardous situations

EXAMPLE Gas detection, emergency shutdown, fire protection, and their control systems.

3.15
sea floor
interface between the sea and the *seabed* (3.17)

3.16
seabed slide
failure of *seabed* (3.17) slopes

3.17
seabed
material below the *sea floor* (3.15) in which a structure is founded

3.18
seismic risk category
SRC
category defined from the exposure level and the expected intensity of seismic motions