

**Petroleum and natural gas industries -  
Specific requirements for offshore  
structures - Part 4: Geotechnical and  
foundation design considerations**

Petroleum and natural gas industries - Specific  
requirements for offshore structures - Part 4:  
Geotechnical and foundation design considerations

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

<p>Käesolev Eesti standard EVS-EN ISO 19901-4:2003 sisaldab Euroopa standardi EN ISO 19901-4:2003 ingliskeelset teksti.</p> <p>Käesolev dokument on jõustatud 23.12.2003 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes.</p> <p>Standard on kättesaadav Eesti standardiorganisatsioonist.</p>	<p>This Estonian standard EVS-EN ISO 19901-4:2003 consists of the English text of the European standard EN ISO 19901-4:2003.</p> <p>This document is endorsed on 23.12.2003 with the notification being published in the official publication of the Estonian national standardisation organisation.</p> <p>The standard is available from Estonian standardisation organisation.</p>
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<p><b>Käsitlusala:</b> This part of ISO 19901 contains requirements and recommendations for those aspects of geoscience and foundation engineering that are applicable to a broad range of offshore structures, rather than to a particular structure type</p>	<p><b>Scope:</b> This part of ISO 19901 contains requirements and recommendations for those aspects of geoscience and foundation engineering that are applicable to a broad range of offshore structures, rather than to a particular structure type</p>
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**Võtmesõnad:** forces, geotechnics, industries, loads, natural gas, natural gas industries, offshore construction works, offshore platforms, oil industries, petroleum, platforms, seismic areas, seismic loading, shallow foundations, soil surveys, stability, testing, topography

English version

Petroleum and natural gas industries – Specific requirements for  
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Industries du pétrole et du gaz naturel – Exigences  
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Bases conceptuelles des fondations (ISO 19901-4:2003)

Erdöl- und Erdgasindustrie – Besondere Anforderungen an  
Offshore-Bauwerke – Teil 4: Geotechnische und  
Fundament-Auslegungsmerkmale (ISO 19901-4:2003)

This European Standard was approved by CEN on 10 July 2003.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom.



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## Contents

	Page
Foreword .....	4
Introduction .....	5
1 Scope .....	7
2 Normative references .....	7
3 Terms and definitions .....	7
4 Symbols .....	8
5 General requirements .....	9
5.1 General .....	9
5.2 Testing and instrumentation .....	9
5.3 Conductor installation and shallow well drilling .....	10
6 Geotechnical data acquisition and integrated geoscience studies .....	11
6.1 Geotechnical assessment .....	11
6.2 Shallow geophysical investigation .....	11
6.3 Geological modelling and identification of hazards .....	12
6.4 Geotechnical investigation .....	14
7 Stability of shallow foundations .....	15
7.1 General .....	15
7.2 Principles .....	15
7.3 Acceptance criteria .....	16
7.4 Undrained bearing capacity — constant shear strength .....	18
7.5 Undrained bearing capacity — linearly increasing shear strength .....	19
7.6 Drained bearing capacity .....	19
7.7 Shear strength used in bearing capacity calculations .....	20
7.8 Settlements and displacements .....	20
7.9 Dynamic behaviour .....	20
7.10 Hydraulic stability .....	21
7.11 Installation and removal .....	21
7.12 Shallow foundations equipped with skirts .....	21
7.13 Shallow foundations without skirts .....	21
7.14 Installation effects .....	22
Annex A (informative) Additional information and guidance .....	23
A.1 Scope .....	23
A.2 Normative references .....	23
A.3 Terms and definitions .....	23
A.4 Symbols .....	23
A.5 General requirements .....	23
A.6 Geotechnical data acquisition and integrated geoscience studies .....	24
A.6.1 Geotechnical assessment .....	24
A.6.2 Shallow geophysical investigation .....	24
A.6.3 Geological modelling and identification of hazards .....	24
A.6.4 Geotechnical investigation .....	24
A.7 Stability of shallow foundations .....	26
A.7.1 General .....	26
A.7.2 Principles .....	26
A.7.3 Acceptance criteria .....	28
A.7.4 Undrained bearing capacity — constant shear strength .....	28
A.7.5 Undrained bearing capacity — linearly increasing shear strength .....	29
A.7.6 Drained bearing capacity .....	31
A.7.7 Shear strength used in bearing capacity calculations .....	32
A.7.8 Settlements and displacements .....	32
A.7.9 Dynamic behaviour .....	32
A.7.10 Hydraulic stability .....	32

	Page
<b>A.7.11 Installation and removal</b> .....	<b>32</b>
<b>A.7.12 Shallow foundations equipped with skirts</b> .....	<b>32</b>
<b>A.7.13 Shallow foundations without skirts</b> .....	<b>33</b>
<b>A.7.14 Installation effects</b> .....	<b>33</b>
<b>Annex B (informative) Carbonate soils</b> .....	<b>34</b>
<b>B.1 General</b> .....	<b>34</b>
<b>B.2 Characteristic features</b> .....	<b>34</b>
<b>B.3 Properties</b> .....	<b>35</b>
<b>B.4 Foundations</b> .....	<b>35</b>
<b>B.4.1 Driven piles</b> .....	<b>35</b>
<b>B.4.2 Other deep foundation alternatives</b> .....	<b>35</b>
<b>B.4.3 Shallow foundations</b> .....	<b>35</b>
<b>B.5 Assessment</b> .....	<b>36</b>
<b>Bibliography</b> .....	<b>37</b>

## Foreword

This document (EN ISO 19901-4:2003) has been prepared by Technical Committee ISO/TC 67 "Materials, equipment and offshore structures for petroleum and natural gas industries" in collaboration with Technical Committee CEN/TC 12 "Materials, equipment and offshore structures for petroleum and natural gas industries", the secretariat of which is held by AFNOR.

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 February 2004, and conflicting national standards shall be withdrawn at the latest by February 2004.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

### Endorsement notice

The text of ISO 19901-4:2003 has been approved by CEN as EN ISO 19901-4:2003 without any Introduction.

## Introduction

The offshore structures International Standards ISO 19900 to ISO 19906 constitute a common basis covering those aspects that address design requirements and assessments of all offshore structures used by the petroleum and natural gas industries worldwide. Through their application the intention is to achieve reliability levels appropriate for manned and unmanned offshore structures, whatever the type of structure and the nature 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 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. For foundations, some additional considerations apply. These include the time, frequency and rate at which actions are applied, the method of foundation installation, the properties of the surrounding soil, the overall behaviour of the seabed, effects from adjacent structures and the results of drilling into the seabed. All of these, and any other relevant information, need to be considered in relation to the overall reliability of the foundation.

The design practice for the foundations of offshore structures has proved to be an innovative and evolving process over the years since the 1950s. This evolution is expected to continue and is encouraged. Therefore, circumstances can arise when the procedures described herein or in the other International Standards ISO 19902 to ISO 19906 (or elsewhere) are insufficient on their own to ensure that a safe and economical foundation design is achieved.

Seabed soils vary. Experience gained at one location is not necessarily applicable at another. The scope of the site investigation for one structure is not necessarily adequate for another. Extra caution is necessary when dealing with unfamiliar soils or foundation concepts. This part of ISO 19901 is intended to provide wide latitude in the choice of site investigation techniques and foundation solutions, without hindering innovation. Sound engineering judgement is therefore necessary in the use of this part of ISO 19901.

For an offshore structure and its foundations, the action effects at the interface between the structure's subsystem and the foundation's subsystem(s) are internal forces, moments and deformations. When addressing the foundation's subsystem(s) in isolation, these internal forces, moments and deformations may be considered as actions on the foundation's subsystem(s) and this approach is followed in this part of ISO 19901.

To meet certain needs of industry for linking software to specific elements in this part of ISO 19901, a special numbering system has been permitted for figures, tables and equations.

Some background to and guidance on the use of this part of ISO 19901 is provided for information in Annex A. Guidance on foundations in carbonate soils is provided for information in Annex B. There is, as yet, insufficient knowledge and understanding of such soils to produce normative requirements.

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## 1 Scope

This part of ISO 19901 contains requirements and recommendations for those aspects of geoscience and foundation engineering that are applicable to a broad range of offshore structures, rather than to a particular structure type. Such aspects are

- site characterization,
- soil and rock characterization,
- design and installation of foundations supported by the seabed (shallow foundations), and
- identification of hazards.

Aspects of soil mechanics and foundation engineering that apply equally to offshore and onshore structures are not addressed. The user of this part of ISO 19901 is expected to be familiar with such aspects.

NOTE 1 Particular requirements for the design of piled foundations, which have a traditional association with fixed steel structures, are given in ISO 19902.

NOTE 2 Particular requirements for the design of shallow gravity foundations, which have a traditional association with fixed concrete structures, are detailed in ISO 19903.

NOTE 3 Particular requirements for the anchor points of mooring systems of floating structures are detailed in ISO 19901-7 [65].

NOTE 4 Particular requirements for the design of spud can foundations, which have a traditional association with jack-up mobile offshore units (MOUs), are detailed in ISO 19905 (all parts).

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

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

## 3 Terms and definitions

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

### 3.1

#### **design actions**

combination of representative actions and partial safety factors representing a design situation for use in checking the acceptability of a design

### 3.2

#### **drained condition**

condition whereby the applied stresses and stress changes are supported by the soil skeleton and do not cause a change in pore pressure