

This is a preview of "ISO 19901-7:2013". [Click here to purchase the full version from the ANSI store.](#)

Second edition
2013-05-01

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

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

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

*Partie 7: Systèmes de maintien en position des structures en mer
flottantes et des unités mobiles en mer*



Reference number
ISO 19901-7:2013(E)

© ISO 2013

This is a preview of "ISO 19901-7:2013". [Click here to purchase the full version from the ANSI store.](#)



COPYRIGHT PROTECTED DOCUMENT

© ISO 2013

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

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

Published in Switzerland

This is a preview of "ISO 19901-7:2013". Click here to purchase the full version from the ANSI store.

Contents

Page

Foreword	v
Introduction.....	vii
1 Scope	1
2 Normative references	2
3 Terms and definitions	2
4 Symbols and abbreviated terms	7
4.1 Symbols.....	7
4.2 Abbreviated terms	8
5 Overall considerations.....	9
5.1 Functional requirements.....	9
5.2 Safety requirements	9
5.3 Planning requirements.....	10
5.4 Inspection and maintenance requirements	10
5.5 Analytical tools	10
6 Design requirements.....	10
6.1 Exposure levels	10
6.2 Limit states.....	11
6.3 Defining design situations	11
6.4 Design situations.....	12
7 Actions.....	14
7.1 General	14
7.2 Site-specific data requirements	14
7.3 Environmental actions on mooring lines.....	15
7.4 Indirect actions	16
8 Mooring analysis	18
8.1 Basic considerations	18
8.2 Floating structure offset	19
8.3 Floating structure response	20
8.4 Mooring line response	25
8.5 Line tension	26
8.6 Line length and geometry constraints	26
8.7 Anchor forces	27
8.8 Typical mooring configuration analysis and assessment	27
8.9 Thruster-assisted moorings	28
8.10 Transient analysis of floating structure motions.....	29
9 Fatigue analysis.....	30
9.1 Basic considerations	30
9.2 Fatigue resistance	30
9.3 Fatigue analysis procedure	32
10 Design criteria.....	37
10.1 Floating structure offset	37
10.2 Line tension limit	38
10.3 Grounded line length	38
10.4 Anchoring systems	38
10.5 Fatigue safety factor	41
10.6 Corrosion and wear.....	41
10.7 Clearances	42

This is a preview of "ISO 19901-7:2013". Click here to purchase the full version from the ANSI store.

10.8	Supporting structures	42
11	Mooring hardware.....	42
11.1	Mooring line components	42
11.2	Winching equipment	43
11.3	Monitoring equipment.....	43
12	In-service inspection, monitoring and maintenance.....	44
12.1	General.....	44
12.2	Mobile moorings	44
12.3	Permanent moorings	44
13	Dynamic positioning system	46
13.1	Basic considerations.....	46
13.2	Design and analysis	47
13.3	Design, test and maintenance.....	48
13.4	Operating personnel.....	48
13.5	Determination of stationkeeping capability	48
14	Synthetic fibre rope mooring.....	48
14.1	Basic considerations.....	48
14.2	Fibre rope mooring analysis.....	49
14.3	Fatigue analysis	50
14.4	Creep analysis.....	50
14.5	Design criteria.....	50
14.6	Model testing.....	51
Annex A	(informative) Additional information and guidance	52
Annex B	(informative) Regional information	169
Bibliography	176

This is a preview of "ISO 19901-7:2013". [Click here to purchase the full version from the ANSI store.](#)

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 19901-7 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 19901-7:2005), which has been technically revised.

This second edition of ISO 19901-7 includes several major additions and changes, primarily to Annex A (informative). The largest change is the addition of detailed informative text incorporated directly from API RP 2SK on all types of anchor design. In the first edition of this International Standard, this material was previously addressed only by reference to API RP 2SK. Informative material has also been added from API RP 2SK regarding the analysis and mitigation of vortex-induced motions of large cylindrical hulls. Consequently, the normative text has been modified to remove reference to API RP 2SK and to cross-reference portions of the expanded informative annex.

The other significant change is the updating of guidance on polyester rope mooring design to conform to the provisions of the recent amendment to API RP 2SM. The changes include new definitions of stiffness, recognition of effective filter barriers, removal of the prohibition against the rope touching the sea floor, and more detail on minimum tension requirements, among others. Additionally, minor corrections were made to the text in 7.4.4 (Wind actions) and 8.3.4 (Riser considerations), and the terminology "most probable maximum" has been standardized throughout. Finally, the Norwegian clause of Annex B has been updated at the request of Norway, and a new Canadian clause has been added.

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 3: Topsides structure*
- *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*

This is a preview of "ISO 19901-7:2013". [Click here to purchase the full version from the ANSI store.](#)

The following parts are under preparation:

— *Part 8: Marine soil investigations*

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

- 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*
- ISO/TR 19905-2, *Petroleum and natural gas industries — Site-specific assessment of mobile offshore units — Part 2: Jack-ups commentary and detailed sample calculation*
- ISO 19905-3, *Petroleum and natural gas industries — Site-specific assessment of mobile offshore units — Part 3: Floating units¹⁾*
- ISO 19906, *Petroleum and natural gas industries — Arctic offshore structures*

1) Under preparation.

This is a preview of "ISO 19901-7:2013". [Click here to purchase the full version from the ANSI store.](#)

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 type of structure and nature or combination of 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 series of International Standards applicable to types of offshore structure is intended to provide 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.

This part of ISO 19901 was developed in response to the worldwide offshore industry's demand for a coherent and consistent definition of methodologies to analyse, design and evaluate stationkeeping systems used for floating production and/or storage platforms of various types (e.g. semi-submersibles, spar platforms, ship-shaped structures) and to assess site-specific applications of mobile offshore units (such as mobile offshore drilling units, pipelay units, construction units).

Stationkeeping is a generic term covering systems for keeping a floating structure, which is under the constant influence of external actions, on a pre-defined location and/or heading with limited excursions. Stationkeeping systems resist external actions by means of any combination of the following:

- mooring systems (e.g. spread moorings or single point moorings);
- dynamic positioning systems (generally consisting of thrusters).

The external actions generally consist of wind, wave, current and ice actions on the floating structure, mooring and/or risers.

Some background to, and guidance on, the use of this part of ISO 19901 is provided in informative Annex A. The clause numbering in Annex A is the same as in the normative text to facilitate cross-referencing.

Regional information, where available, is provided in informative Annex B.