

This is a preview of "ISO 19901-3:2014". [Click here to purchase the full version from the ANSI store.](#)

Second edition
2014-12-15

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

Part 3: Topsides structure

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

Partie 3: Superstructures



Reference number
ISO 19901-3:2014(E)

© ISO 2014

This is a preview of "ISO 19901-3:2014". [Click here to purchase the full version from the ANSI store.](#)



COPYRIGHT PROTECTED DOCUMENT

© ISO 2014

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested 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 19901-3:2014". 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 | 6 |
| 4.1 Symbols..... | 6 |
| 4.2 Abbreviated terms..... | 8 |
| 5 Overall considerations | 9 |
| 5.1 Design situations..... | 9 |
| 5.2 Codes and standards..... | 9 |
| 5.3 Deck elevation and green water..... | 10 |
| 5.4 Exposure level..... | 10 |
| 5.5 Operational considerations..... | 10 |
| 5.6 Selecting the design environmental conditions..... | 11 |
| 5.7 Assessment of existing topsides structures..... | 11 |
| 5.8 Reuse of topsides structure..... | 11 |
| 5.9 Modifications and refurbishment..... | 11 |
| 6 Design requirements | 11 |
| 6.1 General..... | 11 |
| 6.2 Materials selection..... | 11 |
| 6.3 Design conditions..... | 11 |
| 6.4 Structural interfaces..... | 12 |
| 6.5 Design for serviceability limit states (SLS)..... | 12 |
| 6.6 Design for ultimate limit states (ULS)..... | 14 |
| 6.7 Design for fatigue limit states (FLS)..... | 15 |
| 6.8 Design for accidental limit states (ALS)..... | 15 |
| 6.9 Robustness..... | 15 |
| 6.10 Corrosion control..... | 16 |
| 6.11 Design for fabrication and inspection..... | 16 |
| 6.12 Design considerations for structural integrity management..... | 17 |
| 6.13 Design for decommissioning, removal and disposal..... | 17 |
| 7 Actions | 17 |
| 7.1 General..... | 17 |
| 7.2 In-place actions..... | 18 |
| 7.3 Action factors..... | 20 |
| 7.4 Vortex-induced vibrations..... | 21 |
| 7.5 Deformations..... | 21 |
| 7.6 Wave and current actions..... | 22 |
| 7.7 Wind actions..... | 22 |
| 7.8 Seismic actions..... | 22 |
| 7.9 Actions during fabrication and installation..... | 24 |
| 7.10 Accidental situations..... | 24 |
| 7.11 Other actions..... | 34 |
| 8 Strength and resistance of structural components | 36 |
| 8.1 Use of local building standards..... | 36 |
| 8.2 Cylindrical tubular member design..... | 36 |
| 8.3 Design of non-cylindrical sections..... | 37 |
| 8.4 Connections..... | 37 |
| 8.5 Castings..... | 38 |
| 9 Structural systems | 39 |

This is a preview of "ISO 19901-3:2014". Click here to purchase the full version from the ANSI store.

| | | |
|---|---|------------|
| 9.1 | Topsides design | 39 |
| 9.2 | Topsides structure design models | 39 |
| 9.3 | Support structure interface | 40 |
| 9.4 | Flare towers, booms, vents and similar structures..... | 40 |
| 9.5 | Helicopter landing facilities (helidecks)..... | 41 |
| 9.6 | Crane support structure..... | 44 |
| 9.7 | Derrick design | 47 |
| 9.8 | Bridges..... | 47 |
| 9.9 | Bridge bearings | 48 |
| 9.10 | Anti-vibration mountings for modules and major equipment skids..... | 48 |
| 9.11 | System interface assumptions | 48 |
| 9.12 | Fire protection systems | 49 |
| 9.13 | Penetrations | 49 |
| 9.14 | Difficult-to-inspect areas..... | 49 |
| 9.15 | Drainage..... | 49 |
| 9.16 | Actions due to drilling operations..... | 49 |
| 9.17 | Strength reduction due to heat..... | 49 |
| 9.18 | Walkways, laydown areas and equipment maintenance..... | 50 |
| 9.19 | Muster areas and lifeboat stations..... | 50 |
| 10 | Materials | 50 |
| 10.1 | General..... | 50 |
| 10.2 | Carbon steel..... | 51 |
| 10.3 | Stainless steel..... | 53 |
| 10.4 | Aluminium alloys..... | 54 |
| 10.5 | Fibre-reinforced composites..... | 55 |
| 10.6 | Timber..... | 55 |
| 11 | Fabrication, quality control, quality assurance and documentation..... | 55 |
| 11.1 | Assembly..... | 55 |
| 11.2 | Welding..... | 56 |
| 11.3 | Fabrication inspection..... | 56 |
| 11.4 | Quality control, quality assurance and documentation..... | 56 |
| 11.5 | Corrosion protection..... | 57 |
| 12 | Corrosion control..... | 57 |
| 12.1 | General..... | 57 |
| 12.2 | Forms of corrosion, associated corrosion rates and corrosion damage..... | 57 |
| 12.3 | Design of corrosion control..... | 57 |
| 12.4 | Fabrication and installation of corrosion control..... | 58 |
| 12.5 | In-service inspection, monitoring and maintenance of corrosion control..... | 59 |
| 13 | Loadout, transportation and installation..... | 59 |
| 14 | In-service inspection and structural integrity management..... | 60 |
| 14.1 | General..... | 60 |
| 14.2 | Particular considerations applying to topsides structures..... | 60 |
| 14.3 | Topsides structure default inspection scopes..... | 61 |
| 15 | Assessment of existing topsides structures..... | 62 |
| 16 | Reuse of topsides structure..... | 63 |
| Annex A (informative) Additional information and guidance | | 64 |
| Annex B (informative) Example calculation of building code correspondence factor | | 108 |
| Annex C (informative) Regional information | | 114 |
| Bibliography | | 115 |

This is a preview of "ISO 19901-3:2014". [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 19901-3 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 19901-3:2010), which has been technically revised.

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*
- *Part 8: Marine soil investigations*

A future Part 9 dealing with structural integrity management is under preparation.

The first edition of ISO 19901-3:2010 included a number of serious typographical errors. A 'Corrected' version of the first edition was issued in December 2011. This 'Corrected' version first edition was subsequently issued by some national standards organisations. To ensure all national standards bodies issue a 'Corrected' version of the document, TC 67/SC 7 decided to produce a second edition of 19901-3 which incorporates the following changes from the original issue in 2010:

- in [4.1](#), the symbol S_d for design internal force or moment has been added;
- in [8.1](#), Formulae (7), (8) and (9) have been amended to include symbol S_d and the second paragraph has been reworded to reflect the changes in the equations;
- in [9.18](#), first paragraph, new values have been given for variable action for the grating and plating as well as for the contribution of personnel to the total variable action allowance;

This is a preview of "ISO 19901-3:2014". [Click here to purchase the full version from the ANSI store.](#)

- in [A.7.10.4.2.2](#), the text has been reworded and Formula (A.1) has been amended, in line with the modifications in [8.1](#);
- in [A.8.1](#), Formula (A.5) has been corrected by changing “max” to “min”;
- in [B.2](#), [Table B.1](#), the value of Young’s modulus has been amended so as to be in accordance with the default value recommended in ISO 19902;
- in [Tables B.3](#), [B.4](#), [B.5](#), [B.7](#), [B.8](#) and [B.9](#), some values have been updated to reflect the change in Young’s modulus;
- in [B.3.3](#), [Table B.4](#), the symbol for utilization has been corrected;
- in [B.4.5](#), [Table B.10](#), all values for compression and for compression and bending have been amended, as well as the value for the minimum ratio;
- in [B.4.5](#), first and second paragraphs, the building code correspondence factor has been amended and a sentence about its applicability has been added;
- in [Annex C](#), [Table C.1](#), the existing building code correspondence factor has been amended and a second correspondence factor, relating to CSA S16-09, has been added;
- in the Bibliography, Reference^[3] has been updated with a more recent edition; references in the text (see [A.5.2](#), [A.8.3.1](#), [A.8.3.2](#), [A.8.3.3](#) and [A.8.3.4](#)) have been updated accordingly.

In producing the second edition the following additional minor corrections have been applied to the 2011 ‘Corrected’ version of the first edition:

- in [9.5.3.4](#) the units of the area-imposed action corrected to kN/m²;
- in [9.6.2](#) the description of off-lead and side-lead in [Table 5](#) improved;
- in [A.7.10.4.2.3](#) the reference to section [A.7.10.2.4](#) changed to [A.7.10.4.2.4](#);
- in [A.11.3](#) minor text correction;
- in [Annex B Table B.1](#), symbols for bending amplification reduction factor corrected to $C_{m,y}$ and $C_{m,z}$

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 19906, *Petroleum and natural gas industries — Arctic offshore structures*

This is a preview of "ISO 19901-3:2014". [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 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 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 has been prepared for those structural components of offshore platforms which are above the wave zone and are not part of the support structure or of the hull. Previous national and international standards for offshore structures have concentrated on design aspects of support structures, and the approach to the many specialized features of topsides has been variable and inconsistent, with good practice poorly recorded.

Historically, the design of structural components in topsides has been performed to national or regional codes for onshore structures, modified in accordance with experience within the offshore industry, or to relevant parts of classification society rules. While this part of ISO 19901 permits use of national or regional codes, and indeed remains dependent on them for the formulation of component resistance equations, it provides modifications that result in a more consistent level of component safety between support structures and topsides structures.

In some aspects, the requirements for topsides structures are the same as, or similar to, those for fixed steel structures; in such cases, reference is made to ISO 19902, with modifications where necessary. [Annex A](#) provides background to, and guidance on, the use of this part of ISO 19901, and is intended to be read in conjunction with the main body of this part of ISO 19901. The clause numbering in [Annex A](#) follows the same structure as that in the body of the normative text in order to facilitate cross-referencing.

[Annex B](#) provides an example of the use of national standards for onshore structures in conjunction with this part of ISO 19901.

Regional information on the application of this part of ISO 19901 to certain specific offshore areas is provided in [Annex C](#).

In 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.