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

### Part 5: Weight management

*Industries du pétrole et du gaz naturel — Exigences spécifiques relatives aux structures en mer —  
Partie 5: Contrôle des poids*

ICS: 75.180.10

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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](http://www.iso.org/directives)).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

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

For an explanation of 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 [www.iso.org/iso/foreword.html](http://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 third edition cancels and replaces the second edition (ISO 19901-5:2016), which has been technically revised.

The main changes compared to the previous edition are as follows:

- Title changed to Weight Management
- Document restructured and columnisation removed.
- Weight control classes removed
- Requirements for weight management for all project phases implemented
- Annexes restructured:
  - Previous [Annexes A](#) and [B](#) joined into a new [Annex A](#).
  - Previous [Annex B](#) deleted and replaced with new [Annex B](#) Accuracy of major assemblies weighing predictions added
  - Previous [Annex D](#) and [F](#) joined into new [Annex D](#) Guidelines for displacement measurement of floating facilities
  - Previous [Annex E](#) deleted and replaced by new revised [Annex E](#) Weight management during operations
  - Previous [Annex F](#) updated to [Annex D](#) Guidelines for displacement measurement of floating facilities
  - Previous [Annex G](#) updated to [Annex E](#) Weight management during operations

- Previous [Annex H](#) updated to [Annex F](#) Requirements for topside weight estimation — New builds/green field
- Previous [Annex I](#) updated to [Annex G](#) Executive summary description
- Previous [Annex J](#) expanded and updated to [Annex H](#) Weighing result uncertainty
- Previous [Annex K](#) updated to [Annex I](#) Weight management database structure
- New annexes added:
  - [Annex J](#) Weight management of concrete structures
  - [Annex K](#) Coordinate systems

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

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

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## Introduction

The International Standards ISO 19900, ISO 19901 (all parts), ISO 19902, ISO 19903, ISO 19904, ISO 19905 (all parts) and ISO 19906 relating to offshore structures 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.

ISO 19900, ISO 19901 (all parts), ISO 19902, ISO 19903, ISO 19904, ISO 19905 (all parts) and ISO 19906 relating to offshore structures 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.

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

## Part 5: Weight management

### 1 Scope

This document specifies requirements for managing and controlling the weight and centre of gravity (CoG) of offshore facilities by means of mass management during all lifecycle phases; including conceptual design, front end engineering, detail engineering, onshore/inshore construction, and offshore installation. These facilities can be completely new installations (Greenfield) or the modifications to existing installations (Brownfield). It is also necessary to continue managing and controlling weight throughout operations, decommissioning and removal to facilitate Structural Integrity Management (SIM) and to assist with removal of facilities during decommissioning. The provisions are applicable to offshore facilities of all types (fixed and floating). Only items with mass shall be addressed. Loads not related to mass shall be omitted. See ISO 19904-1, ISO 19901-6 and ISO 19901-7.

Weights from mass of snow and ice are not to be included as they are not part of a facility.

This document specifies:

- a) managing and controlling weights and CoGs for components and entire facilities;
- b) managing weight and CoG interfaces;
- c) standardised terminology for weight and CoG estimating and reporting;
- d) requirements for determining Not To Exceed (NTE) weights and budget weights;
- e) weighing and determination of weight and CoG of tagged equipment, major assemblies, modules and facilities;

This document can be used as a basis for:

- a) costing, scheduling or determining suitable construction method(s) or location(s);
- b) planning, evaluating and presenting the client's, contractor's or fabricator's weight management and reporting system;
- c) as a contract reference between client, contractor and suppliers;
- d) as a means of refining the structural analysis or model.

### 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/IEC Guide 98-3, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

### 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

- 3.1 approved variations**  
approved scope changes affecting the predicted weight and changing the weight budget figures.
- 3.2 assembly**  
designed and fabricated group of bulk and equipment items which form one unit
- 3.3 brownfield**  
modifications/upgrade to an existing installation, including removing of redundant systems and equipment and adding new structures and systems
- 3.4 budget weight**  
localised budgets weights and CoG (3.9) parameters set by project for discipline(s) and/or sub-contractor(s) and identified in the weight budget document (3.57)
- 3.5 bulk**  
loose construction materials e.g. piping, valves, cable and trays, etc.  
EXAMPLE Structural steel also fits the definition of 'bulks'  
Note 1 to entry: Bulk items support the equipment items by providing infrastructure around and between them.
- 3.6 centre of gravity CoG**  
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the point in a body or system of bodies at which the entire weight may be considered to act  
Note 1 to entry: For assemblies, modules or facilities, the aggregate CoG is the mathematical weighted average of the CoGs of the individual items (comprising the completed assembly, module or facilities) measured from a common reference point.
- 3.7 client**  
organisation for which a weight report is prepared  
Note 1 to entry: This is the project owner (oil company/operator, fabricator, engineering sub-contractor, lift/transport contractor, etc.).
- 3.8 contractor**  
organisation tasked with the design of a facility or part of a facility.
- 3.9 CoG envelope**  
defined constraint volume within which the CoG of an assembly shall remain for a specified loading condition
- 3.10 conceptual design**  
the first phase of design, during which several concepts are evaluated until it is clear which concept should be carried forward.

**3.11****conceptual design weight allowance**

and allowance added to the conceptual predicted weight to reach the design weight

**3.12****consumables**

materials consumed and replenished during normal operating of an offshore installation.

EXAMPLE Potable/service water, diesel fuel, crew provisions, drilling powders for creation of mud and/or cement.

**3.13****contents**

fluids or powders held within piping, equipment or structural tanks at their normal operating levels

Note 1 to entry: Typical contents are hydrocarbons, cooling and heating mediums, chemicals, fuels, condensates, seawater, fresh water, powders (drilling cement and mud additives), etc. Fluids continuously installed in an item of equipment (e.g. coolants and lubricating oils) are not to be considered as contents. See dry weight (3.18) for additional explanation.

**3.14****deadweight**

total carrying capacity of a floating facility

Note 1 to entry: Includes weight of crude oil, deck cargo, temporary items, water, marine growth, ballast water, consumables, crew and their effects.

Note 2 to entry: See [Annex D](#).

**3.15****design weight**

the weight unlikely to be exceeded in conceptual design. This weight is used for engineering purposes

**3.16****discipline**

branch of engineering reflecting a single aspect in the project

EXAMPLE Architectural, drilling, electrical, HVAC, instrumentation, loss control (safety), piping, structural and telecommunications.

**3.17****displacement**

weight of the volume of water displaced by a floating structure

Note 1 to entry: The sum of lightweight and deadweight including mooring system load, appendences and/or appurtenances e.g. structures outside the moulded hull.

Note 2 to entry: See [Annex D](#).

**3.18****dry weight**

weight of a component, weight item or an assembly in its dry installed condition including permanent utilities in closed equipment systems

Note 1 to entry: Examples of permanent utilities are gearbox oil, hydraulic oil, filter sand, coolant, etc.

Note 2 to entry: Any content of operating fluid flowing through a component, weight item or an assembly is excluded.

**3.19  
equipment**

component or arrangement of components, built for specific function(s)

Note 1 to entry: The component/assembly normally has unique documentation due to its function and complexity.

Note 2 to entry: Refer to tagged equipment ([3.50](#)) for further explanation.

**3.20  
estimate to complete  
ETC**

the estimated weight of items not included in the gross WTO in order to bring it up to the predicted weight.

**3.21  
estimated weight**

weight based on initial calculation or previous experience

**3.22  
fabricator**

organisation contractually tasked with construction of a portion (such as assemblies, modules, topsides, hull etc.) of a facility

**3.23  
facility**

a construction (such as a topside, hull etc.) that is built, installed, or established to serve a particular purpose

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**3.24  
float-out**

loading condition for transfer of assembly, module or topsides from a construction site to become self-floating

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**3.25  
future weight**

weight of a component or an assembly to be installed after a specified time after the start of production

**3.26  
front end engineering design  
FEED**

the phase following conceptual design phase, during which the selected concept is matured, and design parameters normally are fixed

**3.27  
greenfield**

new facilities which are fabricated onshore and installed offshore

**3.28  
grillage**

structure, secured to the deck of a transport barge or vessel, designed to support the cargo (e.g. module or topsides) and distribute the loads between the cargo and the internal structure of the transport barge or vessel

**3.29  
gross weight take off  
gross WTO**

the net weight take off including weight allowance ([3.56](#))

**3.30  
hook-up**

installation of components or assemblies after the modules have been installed to complete it into a functioning installation

**3.31****lifting gear**

items needed during a lifting operation to connect the lifting hook to the item being lifted

EXAMPLE Slings, spreader bars, lifting frames, shackles.

**3.32****lift weight**

weight of a component, assembly, or a module at its lift points, including permanent and temporary items, but excluding the lifting gear

**3.33****loading condition**

design condition(s) for which the weight and CoG of an assembly, module or topside is required to be controlled

EXAMPLE Dry, operating, lift, load-out, shackles.

**3.34****load-out**

loading condition for transfer by way of horizontal movement of an assembly, module or topsides from its land-based construction site onto a transport barge or vessel

Note 1 to entry: See [5.4](#)

**3.35****management reserves**

reserves to take account for any scope changes during the detail engineering phase

**3.36****master equipment list****MEL**

project specific list for compiling and management of technical data for tagged equipment

**3.37****mating**

loading condition for transfer of an assembly, module or topsides supported on barge(s) or vessel(s) to a temporary or permanent support structure

**3.38****module**

assembly of items forming a major building block that forms a component part of a facility, which needs to be controlled with respect to weight and CoG

**3.39****net weight take off****net WTO**

the weight take off based on the actual designed data from 3-dimensional model, engineering drawings or supplier data

**3.40****not-to-exceed weight****NTE weight**

maximum acceptable weight and CoG envelope for any given loading condition

**3.41****operating**

loading condition for an operating offshore facility at the start of steady-state production

Note 1 to entry: All bulk and equipment items are present with contents at nominal operating levels.

**3.42**

**operating reserves**

weight difference between the predicted weight and the NTE weight during the operating phase

**3.43**

**operational reserves**

reserves to account for unplanned future modifications

**3.44**

**operating weight**

sum of the dry weight and the contents weight

**3.45**

**planned futures**

weight budget reserve to account for planned future installations on the facility.

**3.46**

**predicted weight**

the actual expected weight. sum of gross WTO and ETC, the actual estimated/calculated weight through all project phases

**3.47**

**reconciled weighed weight**

the actual weight at the time of the weighing including any weighing correction(s)

**3.48**

**sea fastening**

items used for temporary retention of permanent or temporary items in position during transport at sea

Note 1 to entry: sea fastening may be internal to or external of the item (module or topsides) being transported.

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**3.49**

**supplier**

a party that supplies goods or services

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**3.50**

**tagged equipment**

equipment identified and labelled in accordance with the project coding manual and tracked in MEL

**3.51**

**temporary items**

items temporarily installed during a loading condition and removed afterwards

Note 1 to entry: Temporary items do not form part of a structure's permanent dry or operating weight.

**3.52**

**topsidess**

structure and equipment placed on a supporting structure [fixed or floating] to provide some or all of a platform's functions.

Note 1 to entry: For a ship-shaped floating structure, the deck is not part of the topsides.

Note 2 to entry: For a jack-up, the hull is not part of the topsides.

Note 3 to entry: A separate fabricated deck or module support frame is part of the topsides.

[SOURCE: ISO 19900]

**3.53**

**tow-out**

loading condition for towing of a complete floating structure to the offshore installation site

**3.54****transport**

loading condition for transfer of an assembly or module from one inshore or at shore location to another location, or to the offshore installation site

**3.55****upper bound weight constraint**

the absolute maximum weight. go/no go weight during conceptual design phase

Note 1 to entry: See 8.1.1

**3.56****weight allowance**

additions to account for expected general growth due to immaturity of the current project

Note 1 to entry: the weight allowance will typically cover for data accuracy, design change and fabrication allowances

**3.57****weight budget document****WBD**

document defining the budget weights and CoG limits for each loading condition of the facility

**3.58****weight database**

live database containing the present predicted weights and CoGs for all loading conditions (3.33), including net and gross WTO (3.39, 3.29) and estimate to complete (ETC) (3.20) for a facility, broken down by modules and by engineering disciplines

**3.59****weight database custodian**

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**WDC**

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the organization tasked with the responsibility for maintaining the weight database

**3.60****weight item**

item or collection of bulk and/or equipment, contents or assembly identified for weight reporting purposes

**3.61****weight objective**

defined set of engineering goals necessary to fulfil the project contractual weight and CoG requirements and intentions in order to contribute to the correct design quality as defined by the management

**3.62****weight phase code**

code used in the weight database to identify the loading conditions in which a weight item is present

**3.63****weight policy**

a statement from project management defining how the weight objective is to be achieved

Note 1 to entry: As a minimum, the policy should include:

- the importance of the weight objective to the project aims and results;
- the priority, profile and control of weights at different levels in the project;
- a philosophy for responsibility and authority within and between project groups engaged in weight management activities