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

Part 5: Weight control during engineering and construction

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

Partie 5: Contrôle des poids durant la conception et la fabrication

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Foreword

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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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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is 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 19901-5:2003), 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*

The following parts are under preparation:

— *Part 9: Structural integrity management*

0 Introduction

0.1 General

The International Standards ISO 19900 to 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 to 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.

0.2 Preface

It is proposed to canvass the TC 67/SC 7 member countries to widen the scope of this part of ISO 19901 for the third edition. As a consequence, the title might change.

— It is proposed to expand and re-structure this part of ISO 19901 to more comprehensively address topsides weight engineering principles, roles, responsibilities and objectives for a complete platform life cycle.

— It is proposed to re-format into a more traditional ISO document layout.

— The use of weight class A, B and C tables will be reviewed.

— There will be an outline of how to control topside weight, and of the aims and expectations of a Weight Review Panel (or similar).

— A common topside operating philosophy will be included with a matrix of coincident drilling loads, operating loads, and laydown / storage loads to be included in topside weight databases.

— It is proposed to give guidance on applied design contractor allowances during detailed design, plus the use of client operational and management reserves.

— The weight and CoG accuracy expected from weighings will be addressed.

— Separate clauses will be added to give clarity to specific requirements of floating structures and jackets

— The contents and terminology will be coordinated to interface with ISO 19902, *Design of offshore structures*, and the forthcoming ISO19901-9, *Structural integrity management* (due to be published in 2017).

It is proposed to give more guidance on a range of topics encountered during the phases of a platform life cycle, typically:

a) Weight control principles

Overview of principles, aims and objectives

Roles and responsibilities

Competency

Interfaces with ISO 19901-9 and ISO 19902

i) Decommissioning phase

Preparations for decommissioning

Some of the above proposed changes are outlined in Annex G of this document (informative).

It is proposed that preparation of the third edition of this part of ISO 19901 will begin immediately after the issue of this edition with a target publication date of 2017.

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

Part 5: Weight control during engineering and construction

1 Scope

This part of ISO 19901 specifies requirements for controlling the weight and centre of gravity (CoG) by means of mass management during the engineering and construction of structures for the offshore environment. The provisions are applicable to offshore projects that include structures of all types (fixed and floating) and materials. These structures can be complete new installations or the modifications to existing installations. Maintaining the weight control of existing installations is not part of the main body of this part of ISO 19901, but some guidance on this is included in the Annex G.

This part of ISO 19901:

— specifies quality requirements for reporting of weights and centres of gravity;

— specifies requirements for weight reporting;

— provides a basis for overall project weight reports or management reports for all weight control classes;

— specifies requirements for weight and load budgets;

— specifies the methods and requirements for the weighing and the determination of weight and CoG of major assemblies;

— specifies requirements for weight information from suppliers, including weighing of equipment and bulk materials for offshore installations.

It can be used:

— as a basis for planning, evaluating and presenting the client's, contractor's or fabricator's weight management and reporting system;

— as a means of refining the structural analysis or model;

— as a contract reference between client, contractor and suppliers;

— as a basis for costing, scheduling or determining suitable fabrication method(s) or location(s).

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/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
assembly
designed and fabricated group of bulk and equipment items which form one unit

3.2
budget weight
weight reference figures as defined in the weight and load budget and related to the initial or changed design concept

3.3
bulk
component or arrangement of components defined as stock materials or of low complexity

Note 1 to entry: Bulk items support the equipment items by providing infrastructure around and between them.

3.4
centre of gravity
CoG
average location of the weight of an item

Note 1 to entry: For assemblies, modules or topsides, the aggregate CoG is the mathematical weighted average of the CoGs of the individual items (comprising the completed assembly, module or topsides) measured from a common reference point.

3.5
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/transportation contractor, etc.).

3.6
client weight reserve
weight addition (usually a lump sum weight) controlled by the client and used to account for any orders for variation to the contractual design concept

3.7
CoG envelope
defined constraint volume within which the centre of gravity (CoG) of an assembly shall remain

3.8
consumables
variable content that does not remain at a constant level due to consumption during the operation of an offshore installation

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

3.9
contents
fluids or bulk powders held within bulks (piping or structural tanks) or equipment at their normal operating levels

Note 1 to entry: Typical contents are hydrocarbons, cooling and heating mediums, chemicals, fuels, condensates, seawater, fresh water, dry powders (drilling cement and mud additives), dry stores for workshops, sack stores, etc. Fluids that are expected to be continuously installed in an item of equipment (e.g. coolants and lubricating oils) are not to be considered as contents. See *dry weight* (3.16) for further explanation.

3.10
contractor
organization tasked with constructing a portion of, or an overall project facility

3.11
contractor weight reserve
additional weight (either a lump sum weight or percentage of a total weight) at a specified CoG, controlled by the contactor and used to account for any design growth within their control

3.12
deadweight
total carrying capacity of a floating structure

Note 1 to entry: Includes weight of crude oil, deck cargo, temporaries, water, snow and ice accumulations, marine growth, ballast water, consumables, crew and their effects.

Note 2 to entry: See Annex D.

3.13
discipline
discrete branch of engineering reflecting a single aspect in the project

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

3.14
discipline check list
document detailing the weight items that are within the discipline's control

3.15
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.

3.16
dry weight
weight of a component, weight item or an assembly in its dry installed condition including permanent utilities

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

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

3.17
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* (3.41) for further explanation.

3.18
estimated weight
weight determined based on previous experience

3.19
first fill
initial filling of specific contents in items of equipment or piping prior to start of operation of an offshore facility

Note 1 to entry: First fill typically takes place towards the end of site construction, prior to tow-out and prior to filling for normal operations.

3.20
float-out
loading condition in which a major assembly is transferred from a dry construction site to become self-floating

3.21
future weight
weight of a component or an assembly to be installed after the start of production

3.22
grillage
steel structure, secured to the deck of a barge or vessel, designed to support the cargo and distribute the loads between the cargo and the barge or vessel

3.23
gross weight
sum of the net weight and weight allowances

3.24
hook-up
installation of components or assemblies after the modules have been installed in their final position, to connect to the existing installation

3.25
hook weight
sum of component, assembly or module lift weight and lifting gear

3.26
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.

3.27
lifting gear
equipment needed during a lifting operation

EXAMPLE Slings, spreader bars, lifting frames, shackles.

3.28
lift weight
weight of a component, assembly or a module, including temporaries and residual fluid content but excluding lifting gear

3.29
lightship weight
dry and invariable weight of a floating unit, including minimum utility content to secure a safe condition

Note 1 to entry: See Annex D.

3.30
loading condition
defined event for which a weight and CoG need to be controlled

Note 1 to entry: For each loading condition, all weight items and variable loads that are known or predicted to occur are identified, quantified and located.

Note 2 to entry: Typical loading conditions are dry installed offshore, float-out at assembly site, future operating installed offshore, operating installed offshore, load-out to offshore transport vessel, transport to offshore field, etc.

3.31
load-out
transfer by way of horizontal movement of an assembly, module or topsides from its land-based fabrication site onto a floating or grounded transport barge or vessel

Note 1 to entry: The following are typical load-out operations:

— skidded: load-out using a combination of skid-ways, skid-shoes or runners, propelled by towing engines, jacks or winches;

— trailer: load-out using multi-axle trailers [self-propelled modular transporter (SPMT)].

3.32
master equipment list
MEL
project -specific database for control and management of technical data for tagged equipment

3.33
mating
transfer of a major assembly supported on barge(s) or vessel(s) to a temporary or permanent support structure

3.34
module
major assembly of items forming a major building block which needs to be controlled with respect to weight and CoG

3.35
net weight
calculated or estimated weight of an item excluding allowances

3.36
not-to-exceed weight
NTE weight
maximum acceptable weight for any given loading condition, with an associated limiting CoG envelope

3.37
operating weight
sum of the dry weight and the content weight

3.38
project management
<weight management> management personnel tasked with implementing weight policy, objectives and procedures

3.39
residual content
content in bulks and equipment remaining after testing or commissioning, and being present during the subsequent loading conditions up to the start of production

3.40
sea fastening
items used for temporary fastening to keep all items in position during transportation at sea

3.41
tagged equipment
equipment identified and labelled in accordance with the project coding manual and tracked in MEL

3.42
temporary items
temporaries
items temporarily installed during a loading condition and removed afterwards

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

3.43
test weight
sum of the dry weight plus the content required to test the equipment or assembly

3.44
tow-out
towing of a complete floating structure to the offshore installation site

3.45
transport
<loading condition> transfer of an assembly or module from one inshore or at shore location to another location, or to the offshore installation site

3.47
weight allowance
weight additions to account for expected general growth due to immaturity of the current project stage and/or components which are not estimated in detail at the current project stage

3.48
weight and load budget
WLB
document defining the weight and CoG limits for each loading condition, major assembly (and disciplines for the dry installed offshore load condition)

Note 1 to entry: The WLB are to act as a comparison reference for:

a) weight, load and CoG control and reporting for the duration of the project through the engineering, construction, installation and operation phases;

b) structural capacity requirements for individual sections or modules and for the total topsides or supporting structure;

c) temporary and permanent bearing capacity and stability of the total facility;

d) overall cost and schedule control.

3.49
weight item
item or collection of bulk and/or equipment, content or assembly identified for weight reporting purposes

3.50
weight management
all planned and controlled activities which deal with:

— definition and publication of the project weight procedures, objectives and policies;

— identification of information about and evaluation of alternative design solutions;

— selection and implementation of an optimal design with respect to weight, CoG, volume, functionality, cost and progress;

— monitoring and reporting weight data throughout the complete life cycle of an installation to assess present and potential weight status

Note 1 to entry: Project management, engineering disciplines and weight control discipline shall cooperate and participate to influence the weight management process by means of adequate working methods and tools.

3.51
weight objective
defined set of engineering goals necessary to fulfil the project contractual weight/CoG requirements and intentions in order to contribute to the correct design quality as defined by the management

3.52
weight phase code
code used to identify the loading conditions in which a weight item is present

3.53
weight policy
statement from the project management, based on the weight objective, 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 matters

3.54
weight report
regularly issued project document that details the weight and CoG for required assemblies and load conditions based on best available information

Note 1 to entry: This document provides the basic load case for the project Structural Integrity models.

3.55
weight status code
code, based on the maturity of the design, used to identify the level of accuracy of the weight of a weight item

Note 1 to entry: The weight status code is often used to assess the value of the weight allowance applied. As a design matures, the weight status code will change so that an item's weight allowance is reduced.