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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: Contrôles des poids durant la conception et la fabrication

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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.

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 19901-5 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*.

ISO 19901 consists of the following parts, under the general title *Petroleum and natural gas industries — Specific requirements for offshore structures*:

- *Part 4: Geotechnical and foundation design considerations*
- *Part 5: Weight control during engineering and construction*

The following parts of ISO 19901 are under preparation:

- *Part 1: Metocean design and operating considerations*
- *Part 2: Seismic design procedures and criteria*
- *Part 3: Topsides structure*
- *Part 6: Marine operations*
- *Part 7: Stationkeeping systems for floating offshore structures and mobile offshore units*

ISO 19901 is part of a series of standards for offshore structures. The full series consists of the following 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, *Petroleum and natural gas industries — Floating 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*

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

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.

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 and materials.

This part of ISO 19901 differentiates between projects where considerations with regard to weight and CoG have a high priority as a result of weight and/or CoG sensitivity, and projects where weight and CoG are of little consequence. This differentiation has been made by the introduction of three different classes of structure (Class A, Class B and Class C). Depending on the degree of control necessary, different clauses of this part of ISO 19901 will apply; Clause 4 provides guidelines for assigning one of these classes.

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 status reports or management reports for all classes,

— specifies requirements for weight and load budgets for offshore installations,

— specifies the methods and requirements for the weighing of major assemblies, and the determination of weight and centre of gravity,

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

and may be used

— as a basis for planning and presentation of the contractor's weight-reporting system;

— as a basis for evaluation of the contractor's weight-reporting system;

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

— as a contract reference between the ordering client and the contractor;

— as a basis for costing.

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.

Guide to the expression of uncertainty in measurement (*GUM*), BIPM, IEC, IFCC, ISO, IUPAC, IUPAP and OIML

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

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

3.1.1
assembly
designed and fabricated group of bulk and equipment items which form one unit

3.1.2
ballast
variable solid or fluid content used to trim a floating structure and/or keep a certain draft

3.1.3
base weight estimate
weight estimate used for budgeting purposes which does not include any unforeseen quantity growth, estimating errors or unnamed events

3.1.4
base weight contingency
weight addition, based on risk analysis or experience, used to transform a base weight estimate into a 50/50 weight estimate accounting for uncertainties

3.1.5
budget weight
weight reference figures as defined in the weight and load budget and related to the initial or changed design concept

3.1.6
bulk
component or arrangement of components defined as stock materials or of low complexity

NOTE Bulk items support the equipment items by providing infrastructure around and between them.

3.1.7
client weight reserve
weight addition with CoG (usually a fixed weight) controlled by the client and used to cater for any orders for variation to the contractual design concept

3.1.8
CoG envelope
defined constraint volume within which the CoG of an assembly must remain for design purposes

3.1.9
consumables
variable content, which is solid in stores and fluid in utility tanks

EXAMPLES Fuel, provisions, service/potable water, operating utilities.

3.1.10
contractor weight reserve
weight addition (usually a fixed weight) controlled by the contractor and used to cater for any design growth due to development of the initial design concept

3.1.11
deadweight
total carrying capacity of a floating structure

NOTE Includes weight of crude oil, deck cargo, temporaries, water, snow and ice accumulations, marine growth, ballast water, consumables, crew and their effects.

3.1.12
displacement
weight of the volume of water displaced by a floating structure, which is the sum of lightweight and deadweight

3.1.13
dry weight
weight of a component, weight item or an assembly in its dry installed condition including permanent utilities

NOTE 1 Examples of permanent utilities are gearbox oil, hydraulic oil, filter sand, etc.

NOTE 2 Any content of operating fluid flowing through a component, weight item or an assembly is excluded.

3.1.14
equipment
component, or arrangement of components, built for specific function(s)

NOTE The component/assembly normally has unique documentation due to its function and complexity.

3.1.15
first fill
initial filling of liquid in equipment items, piping lines or tanks

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

3.1.16
float-out
loading condition in which a major assembly is transferred from a dry construction site to become self-floating

3.1.17
fluid content
all fluids flowing through a component, weight item or an assembly

EXAMPLES Process gases, liquids, powders, etc.

3.1.18
future weight
weight of a component or an assembly to be installed after the start of production

NOTE Start of production is also known as “first oil”.

3.1.19
grillage
temporary structural foundation assemblies for modules or sections during transportation

3.1.20
gross reported weight
sum of the net weight and weight allowance

3.1.21
gross WTO
gross weight take-off
sum of the net WTO and weight allowance

3.1.22
gross weight/WTO contingency
difference between the gross reported weight and the gross WTO at any time during the project execution

3.1.23
hook-up
installation and commissioning of components or assemblies after the modules have been installed in their final position

3.1.24
hook weight
sum of lift weight and lifting gear weight

3.1.25
lifting gear
rigging
equipment needed during a lifting operation

EXAMPLES Slings, spreader bars, lifting frames, shackles, etc.

3.1.26
lift weight
weight of a component, an assembly or a module at padeyes, including temporaries and residual fluid content but excluding lifting gear

3.1.27
lightweight
lightship
dry weight and utility systems required for a minimum operation of a floating structure

3.1.28
live load
load on a deck area according to its defined function

3.1.29
loading condition
defined event or operation during which loads occur

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

3.1.30
load-out
loading condition in which a major assembly or a module is transferred from land onto a floating structure by horizontal movement

3.1.31
mating
loading condition in which a major assembly supported on vessel(s) is joined onto its temporary or permanent substructure

3.1.32
net weight
weight (excluding any allowances or contingencies) obtained either by estimation as estimated from early design documents or present sketches, calculated take-off from drawings or 3D model, or as given in vendor data-sheets or obtained by physical weighing

3.1.33
net WTO
net weight take-off
weight derived from calculated take-off or from 3D model, given in vendor data-sheets or weighed, excluding any allowances or contingencies

3.1.34
not-to-exceed weight
NTE weight
maximum acceptable weight

3.1.35
operating weight
sum of the dry weight and the fluid content weight

3.1.36
project management
dedicated management personnel with the task of implementing weight policy, objectives and procedures

3.1.37
residual fluid content
fluid content remaining after testing or commissioning and present during the subsequent loading condition until the start of production

3.1.38
sea fastening
items used for temporary fastening to keep movable items in position during transportation at sea

3.1.39
tagged equipment
equipment tagged in accordance with the project coding manual

3.1.40
temporaries, noun pl
components, assemblies or utility items which are temporarily installed during a specific loading condition and removed afterwards, either prior to or after installation

3.1.41
test weight
sum of the dry weight plus the fluid content required to test the equipment and assembly

3.1.42
tow-out
final towing of a complete floating structure to the offshore production field

3.1.43
transport
loading condition in which a major assembly or a module is transferred from one inshore/at shore location to another location or to the offshore production field

3.1.44
weight allowance
quantified weight addition accounting for definable components which could not be specified at the actual project stage

NOTE Weight allowance is expressed either as a percentage or as a lump sum.

3.1.45
weight contingency
weight addition, based on risk analysis or experience, used to transform a base weight estimate to a 50/50 weight estimate accounting for uncertainties and/or definable components which could not be specified at the actual project stage

NOTE Weight contingency is expressed either as a percentage or as a lump sum.

3.1.46
weight item
defined collection of bulk and/or equipment, design volume or assembly suitable for weight reporting purposes

3.1.47
weight installation code
computer code which verifies whether a component or a weight item is physically installed or not in an assembly or module

3.1.48
weight management

all planned and controlled activities which deal with the

— definition and publication of the project weight objective and policy,

— 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.

NOTE The project management, the engineering disciplines and the weight control discipline are actively cooperating and taking part in and influencing the weight management process by means of adequate working methods and tools, to include weight optimization, weight consciousness and weight reductions.

3.1.49
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

3.1.50
weight phase code
computer code defining in which loading conditions a component or a weight item is present

3.1.51
weight policy
statement by the project management based on the weight objective and how it will be achieved

NOTE The statement should as a minimum describe

— the weight objective's importance to the project aims and results,

— the priority, profile and control at different levels in the project,

— a philosophy for responsibility and authority within and between project groups engaged in weight/CoG matters.

3.1.52
weight reporting
adequate and timely weight/CoG information reported with respect to content and presentation in order to fulfil expectations and requirements from/needs of organizations involved in the project

3.1.53
weight status code
computer code related to the weight item level of accuracy

3.1.54
50/50 weight estimate
value representing the median value in the probability distribution of weight estimates

NOTE The actual weight value is equally likely to be smaller or larger than the 50/50 weight estimate.

NOTE The 50/50 weight estimate is used as the basis for weight budgeting.

3.2 Abbreviated terms

CoG centre of gravity

LCG longitudinal centre of gravity

MEL master equipment list

NTE not to exceed

TCG transverse centre of gravity

TLP tension leg platform

WLB weight and load budget

WTO weight take-off

4 Weight control classes

4.1 General

In order to select the most appropriate level for weight control and weight reporting according to the degree of weight and/or CoG sensitivity of the project, three classes of weight control have been defined.

The tender documents and final contract shall specify the applicable weight control class, so that the contractor can allocate the required resources.

4.2 Class A: High definition of weight and CoG requirements

Class A shall apply if the project is weight- or CoG-sensitive for lifting and marine operations or during operation (with the addition of temporaries), or has many contractors with which to interface. Projects may also require this high definition if risk gives cause for concern.

Full traceability of weights shall be given for this class, commencing with all documented weight data from suppliers.

Recording of weight data for Class A requires the use of a relational-type database from the commencement of detail engineering, with suppliers' data, fabricators' data and data from physical weighings integrated into the system.