DRAFT INTERNATIONAL STANDARD ISO/DIS 16904

ISO/TC **67** Secretariat: **NEN**

Voting begins on **2013-03-14** Voting terminates on **2013-08-14**

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Petroleum and natural gas industries — Design and testing of LNG marine transfer arms for conventional onshore terminals

Industries du pétrole et du gaz naturel — Conception et essai de bras de transfert de gaz naturel liquéfié sur des terminaux terrestres conventionnels

ICS 75.180.01

ISO/CEN PARALLEL PROCESSING

This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO-lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five-month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

To expedite distribution, this document is circulated as r eceived from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

Pour accélérer la distribution, le présent document est distribué tel qu'il est parvenu du secrétariat du comité. Le travail de rédaction et de composition de texte sera effectué au Secrétariat central de l'ISO au stade de publication.

Contents

Page

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 16904 was prepared by Technical Committee ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*.

Petroleum and natural gas industries — Design and testing of LNG marine transfer arms for conventional onshore terminals

1 Scope

This International Standard specifies the design, minimum safety requirements and inspection and testing procedures for liquefied natural gas (LNG) marine transfer arms intended for use on conventional onshore LNG terminals, handling LNG carriers engaged in international trade. It can provide guidance for offshore and coastal operations. It also covers the minimum requirements for safe LNG transfer between ship and shore.

Although the requirements for power/control systems are covered, this International Standard does not include all the details for the design and fabrication of standard parts and fittings associated with transfer arms.

This International Standard is supplementary to local or national standards and regulations and is additional to the requirements of ISO 28460.

This International Standard needs not be applied to existing facilities.

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.

IEC 60034-5, *Rotating electrical machines — Part 5: Degrees of protection provided by the integral design of rotating electrical machines (IP code) — Classification*

IEC 60079-0, *Explosive atmospheres — Part 0: General requirements*

IEC 60079-1, *Explosive atmospheres — Part 1: Equipment protection by flameproof enclosures "d"*

IEC 60079-2, *Explosive atmospheres — Part 2: Equipment protection by pressurized enclosures "p"*

IEC 60079-5, *Explosive atmospheres — Part 5: Equipment protection by powder filling "q"*

IEC 60079-6, *Explosive atmospheres — Part 6: Equipment protection by oil immersion "o"*

IEC 60079-7, *Explosive atmospheres — Part 7: Equipment protection by increased safety "e"*

IEC 60079-10-1, *Explosive atmospheres — Part 10-1: Classification of areas – Explosive gas atmospheres*

IEC 60079-11, *Explosive atmospheres — Part 11: Equipment protection by intrinsically safety "i"*

IEC 60079-18, *Electrical atmospheres — Part 18: Equipment protection by encapsulation "m"*

IEC 60079-25, *Electrical atmospheres — Part 25: Intrinsically safe electrical systems*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)* and IEC 60529/A1, *Amendment 1*

IEC 61508 (all parts), *Functional safety of electrical/electronic/programmable electronic safety-related systems*

IEC 62305-3, *Protection against lightning — Part 3: Physical damage to structures and life hazard*

ISO 3452-1, *Non-destructive testing — Penetrant testing — Part1: General principles*

ISO 4406, *Hydraulic fluid power – Fluids — Method for coding the level of contamination by solid particles*

ISO 9000, *Quality management systems — Fundamentals and vocabulary*

ISO 9001, *Quality management systems — Requirements*

ISO 9934-1, *Non-destructive testing — Magnetic particle testing – Part1: General principles*

ISO 10474, *Steel and steel products — Inspection documents*

ISO 10497, *Testing of valves — Fire type-testing requirements*

ISO 17636, *Non-destructive testing of welds — Radiographic testing of fusion-welded joints*

ISO 28460, *Installation and equipment for liquefied natural gas - Ship to shore interface and port operations*

ASME B16.5, *Pipe Flanges and Flanged Fittings*

ASME Boiler and Pressure Vessel Code IX: *Welding and Brazing Qualifications*

3 Terms and definitions and abbreviations

3.1 Terms and definitions

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

3.1
apex swivel
articulated, fluid-carrying joint located between the <inboard arm> and <outboard arm>

Note 1 to entry: See Figure B.2.

Note 2 to entry: It provides <luffing> of the <outboard arm> relative to the <inboard arm>.

3.2
attitude
various modes of use and/or location of the <transfer arm> (i.e. manoeuvring, stowed, connected, hydrostatic test, and maintenance)

Note 1 to entry: The <transfer arm> can take several positions for each <attitude>.

3.3
base riser
riser
vertical assembly which bolts to the loading platform and supports the articulated assembly of the <transfer arm>

Note 1 to entry: See Figure B.2.

Note 2 to entry: Sometimes referred to as ‘standpost’.

3.4
bottom swivel
accommodates pitching motion of <LNG carrier> and is located adjacent to <presentation flange> in horizontal part of <TSA>

Note 1 to entry: See Figure B.2.

3.5
brinelling
any permanent indentation in <swivel> or <structural bearing> raceways caused by excessive loading of balls or rollers

3.6
cargo manifold
pipe assembly mounted onboard <LNG carrier> to which the <presentation flange> or <QCDC> of the <transfer arm> is connected

Note 1 to entry: See Figure B.2.

3.7
cavitation
formation and collapse of bubbles in a liquid when the pressure falls to or below the liquid vapour pressure; the collapse releases energy, sometimes with an audible sound and vibration

Note 1 to entry: Such low pressures occur in high velocity zones such as the inner radius of elbows, or at places with variations of diameters.

3.8
clash
any contact during design operational conditions, or as a result of an emergency separation, between any part of a <transfer arm> and:

- adjacent <transfer arm> while both <arm>s are operating or one <arm> is operating and the other <arm> is stowed (e.g. the counterweights);
- adjacent section of the same <transfer arm> (e.g. <triple swivel assembly> and <outboard arm>);
- loading platform equipment (e.g. <counterweight> and piping or valves)

3.9
contact angle α
angle between the plane of the <swivel joint> or <structural bearing> balls or rollers and the centre of contact at the ball or roller raceway interface

3.10
conventional onshore LNG terminal
LNG exporting or receiving terminal that is located on-shore and that has a marine transfer arms for the loading or unloading of LNG carriers in a harbour or other sheltered coastal location

3.11
counterweight
system of weights used to balance the <inboard arm> and <outboard arm> assemblies

Note 1 to entry: Some <transfer arm>s have a single <counterweight> for this function and others have multiple <counterweight>s.

3.12
design pressure
pressure for which the <transfer arm> is designed

Note 1 to entry: See Table A.1.

3.13
design temperature
range of temperatures for which the <transfer arm> is designed

Note 1 to entry: See Table A.1.

3.14
drift
longitudinal and/or lateral displacement of the <LNG carrier> under the influence of environmental forces

Note 1 to entry: See also “surge fore or aft” in 3.51 and “sway” in 3.53.

3.15
emergency release system
ERS
system that provides a positive means of quick release of <transfer arm>s and safe isolation of <LNG carrier> and shore

Note 1 to entry: See Figure B.2.

3.16
emergency shut down
ESD
method that safely and effectively stops the transfer of <LNG> and vapour between the <LNG carrier> and shore

3.17
freeboard
vertical distance between the ship's deck and the water level at the manifold location

Note 1 to entry: See Table A.3 and Figure A.1.

3.18
freewheel
ability of a hydraulically operated <transfer arm> when connected to a <LNG carrier> to follow freely without hydraulic restraint the vertical and horizontal motions of the <LNG carrier>’s manifold (draft changes and <sway> and <surge> motions)

3.19
heave
vertical motion of the <LNG carrier> due to wave action

Note 1 to entry: See Table A.4 and Figure A.2.

3.20
inboard arm
product-carrying pipe and any structural members contained between the <apex swivel> and the <trunnion swivel>

Note 1 to entry: See Figure B.2.

3.21
included angle
angle formed between <inboard arm> and <outboard arm>

Note 1 to entry: See Figure B.2.

Note 2 to entry: The maximum and minimum <included angle>s are left to the transfer arm manufacturer.

Note 3 to entry: The <included angle> in the stowed position of the <transfer arm>s is such, that the <arm>s are parked with the <triple swivel assembly> behind the berthing line.

3.22
insulating flange
electrical insulating system, usually dedicated, which is installed in the lower end of the <outboard arm>

Note 1 to entry: Its purpose is to prevent stray currents from causing an arc at the <LNG carrier>'s flange as the <transfer arm> is connected or disconnected.

3.23
jack
permanent, adjustable load-carrying mechanism potentially installed in the <triple swivel assembly> to transfer a portion of the <arm> fluid weight to the deck instead of the <LNG carrier's> manifold

Note 1 to entry: See Figure B.2.

3.24
jetty control centre
control centre situated on or adjacent to the jetty primarily to control and/or monitor the <transfer arm>s

Note 1 to entry: Sometimes referred to as 'jetty control room' or 'local control room'.

3.25
LNG carrier
LNGC
tank ship designed for the carriage of <LNG>

3.26
luffing
rotary motions of the <inboard arm> and <outboard arm> in the vertical plane

Note 1 to entry: See Figure B.2.

3.27
main hydraulic unit
MHU
hydraulic unit that generates hydraulic power to ensure the normal operation and emergency release sequence of the arms

3.28
manifold setback
horizontal distance between the board side of <LNG carrier> and the face of <cargo manifold>

Note 1 to entry: See Table A.3 and Figure A.1.

3.29
manifold spacing
horizontal distance between the centerlines of the pipe assembly of the <cargo manifold>

Note 1 to entry: See Table A.3 and Figure A.1.

3.30
middle swivel
accommodates yawing and surge of <LNG carrier> and is located between <top swivel> and <bottom swivel> in vertical part of <TSA>

Note 1 to entry: See Figure B.2.

3.31
operating envelope
volume in which <presentation flange>(s) of a (group of) <transfer arm>(s) is (are) required to operate

3.32
outboard arm
product-carrying pipe and any structural members contained between the <apex swivel> and the <triple swivel assembly>

Note 1 to entry: See Figure B.2.

3.33
owner (or designated agent)
company or group of companies for whose use the <transfer arm>s are installed, responsible for the safe design and construction of the installation

3.34
pantograph system
system for transmitting balancing loads from the <outboard arm> to the <counterweight>(s)

Note 1 to entry: The system comprises an assembly of linkages and pinned connections, or a cable and sheaves system (respectively “rigid link pantograph” and “cables and sheaves pantograph”).

3.35
pitch(ing)
rotation of the <LNG carrier> around transversal horizontal axis

Note 1 to entry: See Table A.4 and Figure A.2.

3.36
powered emergency release coupling
PERC
powered device to provide a means of quick release of the <transfer arms> when such action is required only as an emergency measure

3.37
presentation flange
<transfer arm> flange for connection to either the <cargo manifold> or <spool piece>

Note 1 to entry: See Figure B.2.

3.38
product
fluid transferred using <transfer arm>s

Note 1 to entry: Fluids are <LNG>, <NG> or <LN_2>.

3.39
quick connect disconnect coupler
QCDC
coupler
manual or hydraulic mechanical device used to connect the <transfer arm> to the <cargo manifold> without employing bolts

Note 1 to entry: See Figure B.2.

3.40
remote pendant control
remote control
device to facilitate the fine manoeuvring operation of the <transfer arm>s from a remote location (e.g. <LNG carrier>'s <cargo manifold> area)

Note 1 to entry: The system can use a trailling wire or radio-controlled system.

3.41
riser and trunnion swivel assembly
fluid carrying system consists of <riser swivel>, <trunnion swivel> and elbows and mounted on top of the <riser>

Note 1 to entry: See Figure B.2.

3.42
riser flange
<transfer arm> flange for connection to LNG piping

Note 1 to entry: See Figure B.2.

3.43
riser swivel
swing joint in the <riser and trunnion swivel assembly> which permits <slewing> of the <transfer arm>

Note 1 to entry: See Figure B.2.

3.44
roll(ing)
rotation of <LNG carrier> around longitudinal horizontal axis

Note 1 to entry: See Table A.4 and Figure A.2.

3.45
safety integrity level
SIL
statistical representations of the integrity of the safety instrumented system when a process demand occurs

Note 1 to entry: See Clause 5.

3.46
slew(ing)
horizontal, rotary motion of the <transfer arm> around the <riser>

Note 1 to entry: See Figure B.2.

3.47
spool (piece)
short length of pipe for the purpose of matching the <cargo manifold> to the <presentation flange> or <QCDC>

Note 1 to entry: Sometimes referred to as "adaptor" or "short distance piece".

3.48
spotting line
line used by the <LNG carrier> when berthing to align the centrelines of the <transfer arm> and <cargo manifold>

Note 1 to entry: See Figure A.4.