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SIST EN 1474-1:2009

Industrija nafte in zemeljskega plina - Načrtovanje in preskušanje rok za pretakanje utekočinjenega zemeljskega plina za konvencionalne terminale na kopnem (ISO 16904:2016)

Petroleum and natural gas industries - Design and testing of LNG marine transfer arms for conventional onshore terminals (ISO 16904:2016)

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Erdöl- und Erdgasindustrie - Auslegung und Prüfung von Schiffsverladearmen für Flüssigerdgas für konventionelle landseitige Terminals (ISO 16904:2016)

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Industries du pétrole et du gaz naturel - Conception et essais des bras de transfert de GNL sur des terminaux terrestres conventionnels (ISO 16904:2016)

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**Petroleum and natural gas industries - Design and testing
of LNG marine transfer arms for conventional onshore
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Industries du pétrole et du gaz naturel - Conception et
essais des bras de transfert de GNL sur des terminaux
terrestres conventionnels (ISO 16904:2016)

Erdöl- und Erdgasindustrie - Auslegung und Prüfung
von Schiffsverladearmen für Flüssigerdgas für
konventionelle landseitige Terminals (ISO
16904:2016)

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European foreword

This document (EN ISO 16904:2016) has been prepared by Technical Committee ISO/TC 67 “Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries” in collaboration with Technical Committee CEN/TC 282 “Installation and equipment for LNG” the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2016, and conflicting national standards shall be withdrawn at the latest by September 2016.

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**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 essais des
bras de transfert de GNL sur des terminaux terrestres conventionnels*

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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).

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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*.

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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 (standards.iteh.ai)

The following referenced documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

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

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

ISO 10474:2013, *Steel and steel products — Inspection documents*

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

ISO 17636-1, *Non-destructive testing of welds — Radiographic testing — Part 1: X- and gamma-ray techniques with film*

ISO 17636-2, *Non-destructive testing of welds — Radiographic testing — Part 2: X- and gamma-ray techniques with digital detectors*

ISO 28460:2010, *Petroleum and natural gas industries — Installation and equipment for liquefied natural gas — Ship-to-shore interface and port operations*

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: Equipment — 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”*

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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 intrinsic safety “i”*

IEC 60079-14, *Explosive atmospheres — Part 14: Electrical installations design, selection and erection*

IEC 60079-18, *Explosive atmospheres — Part 18: Equipment protection by encapsulation “m”*

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

IEC 60529, *Degrees of protection provided by enclosures (IP Code) and IEC 60529/A1&A2, Amendment 1&2*

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*

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

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

3 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* (3.20) and *outboard arm* (3.32)

Note 1 to entry: See [Figure B.2](#).

Note 2 to entry: It provides *luffing* (3.26) of the outboard arm relative to the inboard arm.

3.2**attitude**

various modes of use and/or location of the *transfer arm* (3.59) (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* (3.59)

Note 1 to entry: See [Figure B.2](#).

Note 2 to entry: Sometimes referred to as “standpost”.

3.4**bottom swivel**

accommodates *pitching* (3.35) motion of *LNG carrier* (3.25) and is located adjacent to *presentation flange* (3.37) in horizontal part of *TSA* (3.60)

Note 1 to entry: See [Figure B.2](#).

3.5**brinelling**

any permanent indentation in *swivel* (3.55) or *structural bearing* (3.50) raceways caused by excessive loading of balls or rollers

3.6**cargo manifold**

pipe assembly mounted onboard *LNG carrier* (3.25) to which the *presentation flange* (3.37) or *QCDC* (3.39) of the *transfer arm* (3.59) 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* (3.59) and:

- adjacent transfer arm while both arms are operating or one arm is operating and the other arm is stowed [e.g. the *counterweights* (3.11)];
- adjacent section of the same transfer arm [e.g. *triple swivel assembly* (3.60) and *outboard arm* (3.32)];
- loading platform equipment [e.g. *counterweight* (3.11) and piping or valves]

3.9**contact angle**

α

angle between the plane of the *swivel joint* (3.55) or *structural bearing* (3.50) 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* (3.25) in a harbour or other sheltered coastal location

3.11**counterweight**

system of weights used to balance the *inboard arm* (3.20) and *outboard arm* (3.32) assemblies

Note 1 to entry: Some *transfer arms* (3.59) have a single counterweight for this function and others have multiple counterweights.

3.12**design pressure**

pressure for which the *transfer arm* (3.59) is designed

Note 1 to entry: See [Table A.1](#).

3.13**design temperature**

range of temperatures for which the *transfer arm* (3.59) is designed

Note 1 to entry: See [Table A.1](#).