SLOVENSKI STANDARD
SIST EN 1474-2:2009

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Napeljave in oprema za utekoļ injeni zemeljski plin - Naļ rtovanje in preskuġanje obalnih pretakaliġļ - 2. del: Naļ rtovanje in preskuġanje cevi za pretakanje

Installation and equipment for liquefied natural gas - Design and testing of marine transfer systems - Part 2: Design and testing of transfer hoses

Anlagen und Ausrüstung für Flüssigerdgas - Auslegung und Prüfung von Schiffsübergabesystemen - Teil 2: Auslegung und Prüfung von Übergabeschläuchen

Installations et équipements de gaz naturel liquéfié - Conception et essais des systemes de transfert marins - Partie 2: Conception et essais des tuyaux de transfert

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ICS:

75.200	Oprema za skladiġļ enje nafte, naftnih proizvodov in zemeljskega plina	Petroleum products and natural gas handling equipment

SIST EN 1474-2:2009 **en,fr,de**

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Installation and equipment for liquefied natural gas - Design and testing of marine transfer systems - Part 2: Design and testing of transfer hoses

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN 1474-2:2008) has been prepared by 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of an identical text or by endorsement, at the latest by June 2009, and conflicting national standards shall be withdrawn at the latest by June 2009.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This European Standard consists of 3 parts:

— EN 1474-1: *Installation and equipment for liquefied natural gas — Design and testing of marine transfer systems — Part 1: Design and testing of transfer arms*

— EN 1474-2: *Installation and equipment for liquefied natural gas — Design and testing of marine transfer systems — Part 2: Design and testing of transfer hoses*

— EN 1474-3, *Installation and equipment for liquefied natural gas — Design and testing of marine transfer systems — Part 3: Offshore transfer systems*

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

1 Scope

This European Standard gives general guidelines for the design, material selection, qualification, certification, and testing details for Liquefied Natural Gas (LNG) transfer hoses for offshore transfer or on coastal weather-exposed facilities for aerial, floating and submerged configurations or a combination of these. Whilst this European Standard is applicable to all LNG hoses, it is acknowledged that there may be further specific requirements for floating and submerged hoses.

The transfer hoses will be designed to be part of transfer systems (it means that they will be fitted with ERS, QCDC, handling systems, hydraulic and electric components etc.) To avoid unnecessary repetition, cross-references to EN 1474-1 and EN 1474-3, are made for all compatible items, and for references, definitions and abbreviations. Where additional references, definitions and abbreviations are required specifically for LNG hoses, they are listed in this European Standard.

Transfer hoses need to be durable when operating in the marine environment and to be flexible with a minimum bending radius compatible with handling and the operating requirements of the transfer system.

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.

EN 1474-1:2008, *Installation and equipment for liquefied natural gas — Design and testing of marine transfer systems — Part 1: Design and testing of transfer arms*

EN 1474-3:2008, *Installation and equipment for liquefied natural gas — Design and testing of marine transfer systems — Part 3: Offshore transfer systems*

EN ISO 1746, *Rubber or plastic hoses and tubings — Bending tests (ISO 1746:1998, including technical corrigendum 1:1999)*

EN ISO 7369, *Pipework — Metal hoses and hoses assemblies — Vocabulary (ISO 7369:2004)*

EN ISO 8330, *Rubber and plastic hoses and hoses assemblies — Vocabulary (ISO 8330:2007)*

EN ISO 9000, *Quality management systems — Fundamentals and vocabulary (ISO 9000:2005)*

EN ISO 9001, *Quality management system — Requirements (ISO 9001:2000)*

3 Terms, definitions and abbreviations

For the purposes of this document, the terms and definitions given in EN ISO 7369 and EN ISO 8330 apply.

NOTE 1 Exception to the above: for this document, the bending radii are measured from the centre line.

NOTE 2 For the purpose of this document **hose assembly** means the hose complete with end fittings, hose handling and lifting devices (pad eyes, collars, …), as described in 4.1.1.

NOTE 3 For the purpose of this document, [**MAWP**] is defined in Clause 6 and Annex C.

NOTE 4 For the purpose of this document, [**D**] and [**ND**] are defined in Clause 6.

3.1
owner (or designated agent)
company or group of companies for whose use the hose assembly as defined in 4.1.1 is provided

3.2
vendor
company selling the hose assembly to the owner, and in charge of completing the hose assembly as defined in 4.1.1

4 Description of typical LNG transfer hose designs and accessories

4.1 A LNG transfer hose assembly shall consist of the following

4.1.1 A flexible hose assembly, comprising

— flexible hose, refer to 4.2;

— associated end terminations and connectors;

— permanent identification marks;

— hose handling device(s) (padeye or lifting lugs, lifting collar, …),

and if required:

— leak detection system;

— insulation system (to minimize build up of external ice);

— intermediate leak barrier(s);

— bending stiffeners or restrictors;

— buoyancy.

4.1.2 Connection system to LNGC

— Hose extremity connector flanges shall permit the mounting of a QCDC or a spool piece or permit direct connection to LNGC or LNG terminal or another hose assembly.

(A description of QCDC is given in EN 1474-1, for transfer system reference is made to EN 1474-3).

— Hubs, or other connectors if equivalent or superior to flanges, may be used if agreed between owner and vendor.

4.1.3 Emergency release system

— Hose extremity connector shall permit the mounting of an emergency release system with valves and ERC (Emergency Release Coupler).

(A description of emergency release system is given in EN 1474-1 and EN 1474-3).

4.1.4 Handling

— Hose shall include necessary fittings for safe handling, coupling and uncoupling either from the LNGC or the onshore or offshore LNG terminal system as required by the system design (refer to EN 1474-3).

4.1.5 Power systems

— Hose may support (e.g. piggy back mounted) hydraulic or pneumatic hoses, electric cables for the powering of the ERS and QCDC systems (refer to EN 1474-1:2008, Clause 6).

4.1.6 Leak detection, monitoring and alarm systems

— If required by the owner the hose shall incorporate leak detection system e.g. gaseous nitrogen bleeding in the annular space (see 5.11).

4.2 Typical construction of LNG transfer hoses

4.2.1 Main hose categories

At present LNG transfer hoses are categorized in two types according to their method of construction:

— those based on a reinforced corrugated metal hose construction, hereafter called corrugated metal hose;

— those based on a construction in which polymeric films and fabrics are entrapped between a pair of close wound helical wires, hereafter called composite hose;

— as the technology develops, other types of hose may become available and are also to be considered covered by this European Standard.

4.2.2 Corrugated metal hoses

4.2.2.1 Hose

— Inner layer

The inner layer is made of stainless steel corrugations (sometimes called bellows). This ensures the inner leak-proofness of the structure, as well as sustaining the inner radial pressure.

— Armour layers (if required)

These armour layers support the axial loading whilst providing an initial thermal insulation.

— Spiral layer (if required)

This layer ensures that the armours remain in place, as well as providing some thermal insulation.

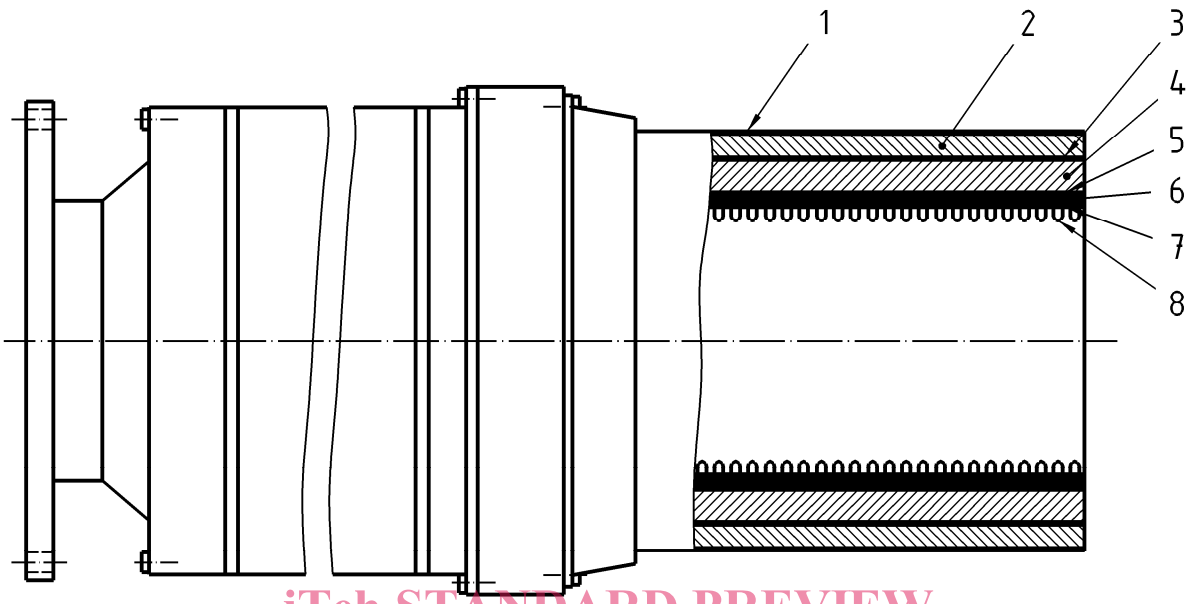
— Thermal insulation layers

This layer (or series of layers) ensures that the inner temperature is conserved whilst preventing any build-up of ice on the exterior of the hose.

— Intermediate and outer leak-proof layers

The intermediate sheath gives the hose a double annulus, thus permitting the detection of any leak of LNG as soon as it may occur. The external sheath prevents any ingress of water from the exterior.

The hose assembly construction shall ensure that all materials are used within their individual range of temperature.

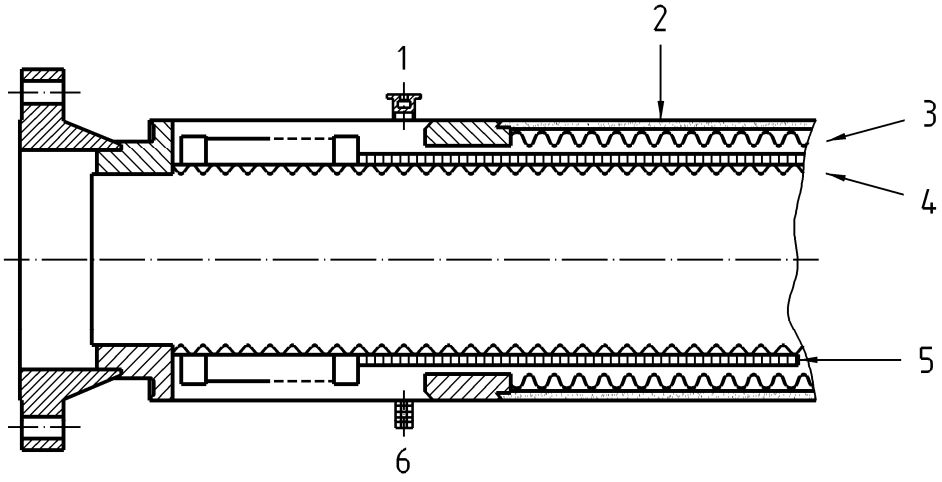


Key

1 leakproof layer
2 insulation
3 leakproof layer
4 insulation
5 supporting layer
6 armouring
7 leakproof layer
8 corrugated inner pipe

Figure 1 — Typical hose assembly – reinforced corrugated metal hose family

Depending on the design, the outer leak proof layer can be a corrugated stainless steel pipe similar to the inner pipe. In this case the annular gap between inner and outer pipe may be evacuated. The pressure supervision of this annular gap results in a leak detection of inner and outer pipe. The thermal insulation may be maintained by layers of super insulation inside the evacuated annular gap.



Key

1 pumping port
2 armouring
3 corrugated outer pipe
4 corrugated inner pipe
5 super insulation vacuum
6 vacuum supervision leak detection

Figure 2 — Typical hose assembly – Sketch of a LNG flexible hose with vacuum insulation option

4.2.2.2 End fitting assembly

The end fitting assembly is made of stainless steel, and ensures 2 primary functions.

The flexible termination incorporates the different layers of the flexible and ensures the integrity of each layer at its end. The construction is designed to allow the immediate detection of any LNG leak into the inner annulus.

The end connector is connected to the associated piping at each end of the flexible. This will typically be a standard ANSI flange.

4.2.3 Composite hoses

A composite hose consists of un-bonded, multiple polymeric film and fabric layers trapped between two wire helices which give the hose its shape, one being internal and one being external. Broadly, the film layers provide a fluid-tight barrier to the conveyed product and the fabric layers provide the mechanical strength of the hose.

In sequence, starting from the bore, the construction is as follows:

a) inner metallic wire helix applied at a pre-determined close pitch;

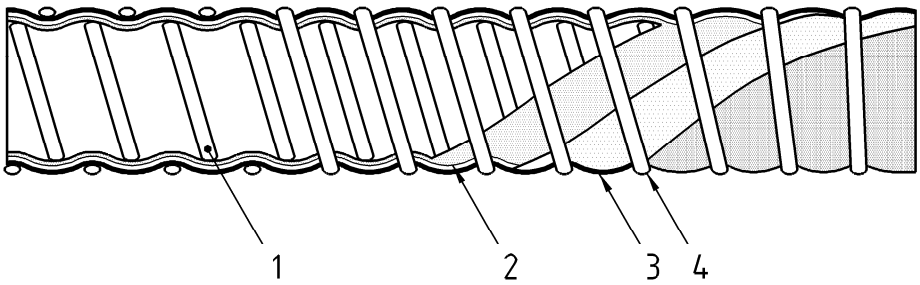
b) polymeric fabric layers forming the bore material;

c) pack of many polymeric film layers. The complete film pack achieves a tubular form and provides the fluid tight barrier to the conveyed product;

d) pack of many polymeric fabric layers which reinforce the hose;

e) outer metallic wire helix applied at half a pitch offset to the inner wire under tension. This forms the hose into the required convoluted structure.

The number and arrangement of the layers in steps c) and d) is specific to the hose size and application. The polymeric film and fabric materials are selected to be compatible with the conveyed product and the extremes of operating temperature.



Key

1 inner wire
2 film
3 fabric
4 outer wire

Figure 3 — Typical hose – composite hose family

5 Design features of the LNG transfer hoses and transfer hoses assemblies

5.1 General

The hose forms part of an overall system for the transfer of LNG – for the requirements which will dictate the exact design of the hose (e.g. static load and dynamic movements, …) refer to EN 1474-3. The design process and required information is outlined below.

5.2 Application data required

The application data required should be determined by the owner and/or the system vendor according to the guidelines given in Annex A.

5.3 Selection of hose length

The overall hose length will be dictated by the system design and shall be sufficient to meet both storage and operational conditions including motion envelopes as defined in EN 1474-3 (see also Annex A).

Depending on the length, system design and type, and other factors such as shipping requirements, the hose shall be either supplied as a continuous length or as a string of discrete sections.

The hose length used in the system shall be such that the motion envelopes as defined in EN 1474-3 are met (see also Annex A).