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Ships and marine technology — Specification for bunkering of liquefied natural gas fuelled vessels

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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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 of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 282, *Installation and Equipment for LNG,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 20519:2017), which has been technically revised.

The main changes are as follows:

— in 5.5.5, dry connect and disconnect couplings, if used, are required to meet the applicable requirements of ISO 21593, however, it is permitted to use, under specified conditions, couplings manufactured before the publication of ISO 21593;

— in 6.2.2 a), if flowmeters are used to measure LNG being bunkered, the LNG provider to inform the party receiving the LNG if the flowmeter conforms to ISO 21903.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

This document has been produced to meet an industry need identified by the International Maritime Organization (IMO). It has been designed to support the IMO International Code of Safety for Ships using Gases or other Low-flashpoint Fuels (IGF Code).

Due to numerous economic and environmental factors, the use of liquefied natural gas (LNG) as a vessel's fuel has increased. While LNG fuelled ships and vessels have been in service since the early 2000s, most of these vessels have operated within small defined areas using LNG bunkering operations designed for that particular vessel service. The increase in LNG fuelled vessels corresponds with an increase in the number of the regions that these vessels service. Therefore, there is a need to standardize LNG bunkering operations internationally to a reasonable degree so that vessel operators have the tools to select vessel fuel providers that meet set safety and fuel quality standards for LNG bunkering operations to be conducted safely.

This document can be applied in many situations and under various regulatory regimes. Existing regulations can cover the topics addressed in this document.

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Ships and marine technology — Specification for bunkering of liquefied natural gas fuelled vessels

1 Scope

This document specifies requirements for LNG bunkering transfer systems and equipment used to bunker LNG fuelled vessels, which are not covered by the IGC Code. This document is applicable to vessels involved in international and domestic service regardless of size, and addresses the following five elements:

a) hardware: liquid and vapour transfer systems;

b) operational procedures;

c) requirement for the LNG provider to provide an LNG bunker delivery note;

d) training and qualifications of personnel involved;

e) requirements for LNG facilities to meet applicable ISO standards and local codes.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 16904, *Petroleum and natural gas industries — Design and testing of LNG marine transfer arms for conventional onshore terminals*

ASME B16.5, *Pipe flanges and flanged fittings: NPS 1/2 through NPS 24 metric/inch standard*

BS 4089, *Specification for metallic hose assemblies for liquid petroleum gases and liquefied natural gases*

EN 1474-2, *Installation and equipment for liquefied natural gas — Design and testing of marine transfer systems — Design and testing of transfer hose*

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

EN 12434, *Cryogenic vessels — Cryogenic flexible hoses*

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

IMO, *International Code of Safety for Ships using Gases or other Low-flashpoint Fuels* (IGF Code)

IMO, *International Code of the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk* (IGC Code)

Oil Companies International Marine Forum, *Design and Construction Specification for Marine Loading Arms*. Third edition, 1999. London, England: Oil Companies International Marine Forum

Society of International Gas Tanker and Terminal Operators (SIGTTO), *ESD Arrangements & Linked Ship/Shore Systems for Liquefied Gas Carriers* [online]. First edition, 2009. Scotland, UK: Witherby Seamanship International Ltd

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3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
bunkering
operation of transferring LNG fuel to a *vessel* (3.24)

Note 1 to entry: For the purposes of this document, it refers to the delivery of *LNG* (3.12) only. This document does not address the transfer of CNG, propane or fuels other than LNG that can be covered by the IGF Code (see Clause 4).

3.2
bunkering terminal
fixed operation on or near shore that is not regulated as a *vessel* (3.24), and that can be used to provide LNG bunkers to a receiving vessel

3.3
classification
process in which the design and condition of a *vessel* (3.24) is evaluated to determine its compliance with rules and standards developed by the *Classification Society* (3.4) issuing the classification

3.4
Classification Society
non-governmental organization that establishes and maintains technical standards for the construction and operation of ships and offshore structures

Note 1 to entry: They also validate that construction is according to these standards and carry out regular surveys in service to verify compliance with the standards.

3.5
competent authority
legal authority within a member state that has jurisdiction over maritime or port activities within that state

3.6
controlled zones
areas extending from the bunkering manifolds on the LNG receiving *vessel* (3.24) and the LNG supply source during LNG bunkering operations that have restrictions in place

Note 1 to entry: These restrictions include limitation on personnel access, sources of ignition and unauthorized activities. The controlled zones are subdivided into hazardous zones, *safety zones* (3.22) and the *monitoring and security areas* (3.16) as defined in Annex B.

3.7
dry connection and disconnection
method that reduces *LNG* (3.12) or natural gas releases into the atmosphere under normal operation to a negligible amount consistent with safety, either by equipment design or procedural practice

3.8
dry-disconnect/connect coupling
DD/CC
mechanical device used to connect the hose bunkering system to an LNG fuel manifold without employing bolts

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3.9
emergency release coupling
ERC
break-away coupling
coupling installed on *LNG* (3.12) and vapour lines, as a component of ERS, to ensure the quick physical disconnection of the transfer system from the unit to which it is connected, designed to prevent damage to loading/unloading equipment in the event that the transfer system's operational envelope and/or parameters are exceeded beyond a predetermined point

3.10
emergency release system
ERS
system that provides a safe shut down, transfer system isolation and quick release of hoses or *transfer arms* (3.21) between the facility or *vessel* (3.24) providing the *LNG* (3.12), and the vessel receiving the LNG, preventing product release at disconnection time

Note 1 to entry: The ERS consists of an *emergency release coupling (ERC)* (3.9) and interlocked isolating valves that automatically close on both sides, thereby containing the LNG or vapour in the lines (dry disconnect), and, if applicable, associated control system.

3.11
emergency shutdown system
ESD
system that safely and effectively stops the transfer of *LNG* (3.12) and vapour between the facility or *vessel* (3.24) providing the LNG and the vessel receiving the LNG, or vice versa

3.12
liquefied natural gas
LNG
natural gas that has been cooled and condensed into liquid form

Note 1 to entry: It is characterized as a cryogenic liquid having a temperature typically around –161 °C under normal atmospheric pressure.

3.13
lower flammable limit
LFL
concentration of flammable gas or vapour in air below which there is insufficient amount of substance to support and propagate combustion

3.14
management system
set of procedures an organization needs to follow in order to meet its objectives

3.15
mobile facility
facility used to transfer *LNG* (3.12) to a *vessel* (3.24)

EXAMPLE Trucks, rail car or other mobile devices (including portable tanks).

3.16
monitoring and security area
area around the bunkering facility and *vessel* (3.24), where vessel traffic and other activities are monitored to mitigate harmful effects

3.17
nozzle
half part of the coupling, typically mounted on the hose bunkering system of the bunker facility, that permits *dry connection and disconnection* (3.7) of the LNG bunkering system to the *receptacle* (3.18) of the receiving *vessel* (3.24) in a safe manner

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3.18
receptacle
half part of the coupling, typically mounted to the manifold flange of the receiving *vessel* (3.24), that permits *dry connection and disconnection* (3.7) in a safe manner

3.19
recognized organization
competent organization with delegated authority on behalf of an Administration to assist in the uniform and effective implementation of IMO Codes and Conventions

Note 1 to entry: Adapted from IMO A.739 (18).

3.20
LNG transfer system
equipment contained between the bunkering manifold flange on the facility or *vessel* (3.24) providing LNG fuel and the bunkering manifold flange on the receiving LNG fuelled vessel, including but not limited to: vessel to vessel *transfer arms* (3.21), LNG transfer arms (articulated rigid piping) or hoses, *emergency release system (ERS)* (3.10), insulation flanges, *dry-disconnect/connect couplings (DD/CC)* (3.8), and in addition the ESD ship/shore or ship/ship link used to connect the supplying and receiving ESD systems

Note 1 to entry: Illustrations of a typical LNG transfer system and subsystems are provided in Figures C.1 to C.4.

3.21
transfer arm
articulated metal transfer system used for transferring *LNG* (3.12) to the *vessel* (3.24) being bunkered

Note 1 to entry: It can be referred to as a “loading arm” or “unloading arm”.

3.22
safety zone
area around the bunkering station where only dedicated and essential personnel and activities are allowed during *bunkering* (3.1)

3.23
security zone
area established by the national or local authorities around a bunkering facility or area through which *vessel* (3.24) and personnel movement is subject to regulatory restrictions

3.24
vessel
ship, barge (self-propelled or no propulsion) or boat of any size in domestic or international service

Note 1 to entry: A bunkering vessel is a vessel used to transport *LNG* (3.12) to a vessel using LNG as a fuel.

Note 2 to entry: A receiving vessel is a vessel that uses LNG as a fuel and does not transport LNG as a cargo.

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