

Foreword

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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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The committee responsible for this document is ISO/TC 8, *Ships and marine technology*.

Introduction

This document has been produced to meet an industry need identified by the International Maritime Organization (IMO). This document 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 for over 10 years, 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 will service. Therefore, there is a need to standardize LNG bunkering operations internationally to a reasonable degree so that vessel operators will have the tools to select vessel fuel providers that meet set safety and fuel quality standards and LNG bunkering operations will be conducted safely. This document can be used for both vessels involved in international and domestic service regardless of size.

This document does not replace existing laws or regulations. It is flexible so that it can be applied in many situations and under various regulatory regimes as long as the requirements of this document are met. If, however, local regulations preclude its use and do not provide the safety specified in this document, compliance with this document should not be claimed.

1 Scope

This document sets requirements for LNG bunkering transfer systems and equipment used to bunker LNG fuelled vessels, which are not covered by the IGC Code. This document includes 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

3 Terms and definitions

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

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

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

bunkering

operation of transferring LNG fuel to a **vessel** (3.22)

Note 1 to entry: For the purposes of this document, it refers to the delivery of LNG only. This document does not address the transfer of CNG, propane or fuels other than LNG that may be covered by the IGF Code (see 3.2).

3.2

bunkering terminal

fixed operation on or near shore that is not regulated as a **vessel** (3.22) that can be used to provide LNG bunkers to a receiving vessel

3.3

classed classification

process in which the design and condition of a **vessel** (3.22) is evaluated to determine its compliance with rules and standards developed by the **Classification Society** (3.5) issuing the classification

3.4

controlled zones

areas extending from the bunkering manifolds on the LNG receiving vessel 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 and the monitoring and security areas as defined in Annex B.

3.5

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.

3.6

dry-disconnect

method that reduces **LNG** (3.10) or natural gas releases into the atmosphere under normal operation to a negligible amount consistent with safety, either by equipment design or procedural practice

3.7

emergency release (break-away) coupling

ERC

coupling installed on **LNG** (3.10) 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

3.8

emergency release system

ERS

system that provides a safe shut down, transfer system isolation and quick release of hoses or **transfer arms** (3.19) between the facility or **vessel** (3.22) providing the **LNG** (3.10), 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) and interlocked isolating valves which automatically close on both sides, thereby containing the LNG or vapour in the lines (dry disconnect), and, if applicable, associated control system.

3.9

emergency shutdown system

ESD

system that safely and effectively stops the transfer of **LNG** (3.10) and vapour between the facility or **vessel** (3.22) providing the LNG and the vessel receiving the LNG or vice versa

Note 1 to entry: The operation of this system can be referred to as an "ESD I". Vessel ESD systems should not be confused with other emergency shutdown systems within the terminal or on board vessels.

Note 2 to entry: An informative illustration of an ESD I and ESD II is provided in [Figure C.2](#).

3.10

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 $-161\text{ }^{\circ}\text{C}$ under normal atmospheric pressure.

3.11

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

3.12

management system

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

3.13

member state authority

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

3.14

mobile facility

mobile facilities are trucks, rail car or other mobile device (including portable tanks) used to transfer **LNG** (3.10) to a **vessel** (3.22)

3.15

monitoring and security area

area around the bunkering facility and **vessel** (3.22) where vessel traffic and other activities are monitored to mitigate harmful effects

3.16 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).

3.17 LNG transfer system

consists of all equipment contained between the bunkering manifold flange on the facility or **vessel** (3.22) providing LNG fuel and the bunkering manifold flange on the receiving LNG fuelled vessel including but not limited to; vessel to vessel transfer arms, LNG transfer arms (articulated rigid piping) or hoses, **emergency release system (ERS)** (3.8), insulation flanges; quick connect/disconnect couplings (QC/DC), and in addition the ESD ship/shore or ship/ship link used to connect the supplying and receiving ESD systems

Note 1 to entry: An illustration of a typical LNG transfer system is provided in [Figure C.1](#).

3.18 technical standards

standards that prescribe requirements for one or more of the following: operations, equipment design/fabrications or testing methodology

Note 1 to entry: Auditors cannot issue a certification or approval to a company that claims compliance with a Technical Standard unless that standard is incorporated into a recognized management system as a management objective.

3.19 transfer arm

articulated metal transfer system used for transferring **LNG** (3.10) to the **vessel** (3.22) being bunkered

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

3.20 safety zone

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

3.21 security zone

area established by the national or local authorities around a bunkering facility or area through which **vessel** (3.22) and personnel movement is subject to regulatory restrictions

3.22 vessel

includes ships, barges (self-propelled or no propulsion) or boats of any size in domestic or international service

Note 1 to entry: A bunkering vessel is a vessel used to transport LNG 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.

Only informative sections of standards are publicly available. To view the full content, you will need to purchase the standard by clicking on the "Buy" button.

Bibliography

- [1] INTERNATIONAL SAFETY MANAGEMENT CODE *IMO Resolution A.741(18) as amended by MSC.104(73), MSC.179(79), MSC.195(80), MSC.273(85) and MSC.353(92)* ISO 9001:2015; *Quality Management Systems*. 2015
- [2] International Maritime Organization Resolution A.739(18), *Guidelines for the Authorization of Organizations Acting on Behalf of the Administration*, Adopted November 1993
- [3] [ISO 14004](#), *Environmental management systems — General guidelines on implementation*
- [4] [ISO/TS 29001](#), *Petroleum, petrochemical and natural gas industries — Sector-specific quality management systems — Requirements for product and service supply organizations*

[5] INTERNATIONAL OIL TANKER AND TERMINAL (ISGOTT) *Safety Guide*. 2006

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