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Ships and marine technology — Specification for bunkering of methanol fuelled vessels

Navires et technologie maritime — Spécification pour le soutage des bâtiments utilisant le méthanol

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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 document 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*, Subcommittee SC 25, *Maritime GHG reduction*.

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.

Introduction

This document has been produced to meet an industry need for additional safety guidance related to the use of alternative fuels on board ships, as 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)[12] and the IMO Interim Guidelines for the Safety of Ships Using Methyl/Ethyl Alcohol as Fuel (IMO MSC.1/Circ.1621). [10]

Due to numerous economic and environmental factors, the use of methanol as a vessel's fuel has increased. The increase in methanol-fuelled vessels corresponds to an increase in methanol bunkering operations. Therefore, there is a need to standardize methanol bunkering operations internationally to a reasonable degree, so that vessel operators have the tools to select vessel fuel providers who meet set safety standards and so that methanol bunkering operations can be conducted safely. This document can be used for vessels involved in both international and domestic service, regardless of size.

This document 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.

Ships and marine technology — Specification for bunkering of methanol fuelled vessels

1 Scope

This document provides requirements for methanol bunkering transfer systems and equipment used to bunker methanol-fuelled vessels. This document covers the following five elements:

a) transfer systems;

b) operational procedures;

c) risk assessment;

d) safety protection;

e) personnel training.

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.

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

IEC 60092-502, *Electrical installations in ships — Part 502: Tankers — Special features*

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
transfer of methanol fuel from land-based or floating facilities into ships' permanent tanks or connection of portable tanks to the fuel supply system

3.2
bunkering facility
facility with methanol storage and *bunkering* (3.1) systems, which can be a fixed facility such as a shore-*based bunkering facility* (3.19) or *mobile facility* (3.13) e.g. *bunkering ships* (3.3), bunkering trucks

3.3
bunkering ship
ship provided with methanol tanks, bunker systems and metering equipment and used for the transfer of methanol fuel to a *receiving ship* (3.16)

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

3.5
dry disconnect
method that reduces methanol liquid or vapours releases into the atmosphere under normal operation to a negligible amount consistent with safety by equipment design

3.6
emergency release coupling
ERC
break-away coupling
coupling installed on methanol liquid and vapour lines, as a component of an *emergency release system* (3.7), 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

3.7
emergency release system
ERS
system that provides a safe shut down, transfer system isolation and quick release of hoses or loading arms between the facility or vessel providing the methanol, and the vessel receiving the methanol, preventing product release at disconnection time

3.8
emergency shutdown system
ESD system
system that safely and effectively stops the transfer of methanol and vapour between the facility or vessel providing the methanol and the vessel receiving the methanol or vice versa

3.9
fender
large pad absorbing the impact energy to the ship while berthing, which has a sufficient width to keep the ships from contacting with each other or a shore facility

3.10
loading arm
articulated metal transfer system used for transferring methanol to the vessel being bunkered

3.11
lower flammable limit
LFL
concentration of flammable gas or vapour in air, below which an explosive gas atmosphere does not form

3.12
management system
set of interrelated or interacting elements of an organization to establish policies and objectives, as well as processes to achieve those objectives

[SOURCE: ISO 9000:2015, 3.5.3]

3.13
mobile facility
trucks, rail car, ship or other mobile device (including portable tanks) used to transfer methanol to a *receiving ship* (3.16)

3.14
methanol transfer system
equipment between the delivering facility and the bunkering manifold on the *receiving ship* (3.16)

3.15
recognized organization
competent organization with delegated authority on behalf of an Administration to assist in the uniform and effective implementation of International Maritime Organization Codes and Conventions

3.16
receiving ship
vessel that uses methanol as a fuel and does not use methanol cargo for fuel purposes

3.17
safety zone
area around the bunkering station where only dedicated and essential personnel and activities are allowed during bunkering

3.18
security zone
area established by the national or local authorities around a bunkering facility (3.2) or area through which vessel and personnel movement is subject to regulatory restrictions

3.19
shore-based bunkering facility
onshore facility which is designed with methanol tanks, bunker systems and metering equipment to directly supply methanol to the *receiving ship* (3.16)

4 Abbreviated terms

Table 1 gives information on the abbreviated terms used in this document.

Table 1 — Abbreviated terms

Term	Description	Explanation
IBC Code	International Maritime Organization's International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk	The IBC Code[11] applies to ships involved in the carriage of bulk dangerous chemicals and prescribes the design and construction standards of ships involved in such carriage and the equipment they should carry.
IGF Code	International Maritime Organization's International Code of Safety for Ships using Gases or other Low-flashpoint Fuels	The IGF Code[12] applies to ships fuelled by gases or other low-flashpoint fuels. The Code contains mandatory provisions for the arrangement, installation, control and monitoring of machinery, equipment and systems using low-flashpoint fuels.
IACS	International Association of Classification Societies	An organization that establishes, reviews, promotes and develops minimum technical requirements in relation to the design, construction, maintenance and survey of ships and other marine related facilities. IACS assists international regulatory bodies and standards organizations to develop, implement and interpret statutory regulations and industry standards in ship design, construction and maintenance, with a view to improving safety at sea and the prevention of marine pollution.
IMO	International Maritime Organization	A specialized agency of the United Nations whose purpose is to promote cooperation among governments in relation to the regulation and practices affecting international shipping, to encourage the adoption of high standards for navigational efficiency, and to prevent and control pollution from ships.
OCIMF	Oil Companies International Marine Forum	Association that was formed in response to the growing public concern about marine pollution, particularly by oil. OCIMF focuses on promoting best practice in the design, construction and operation of tankers, barges and offshore vessels and their interfaces with terminals inshore, onshore and offshore.
STCW	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers	This Convention[13] promotes the safety of life and property at sea and the protection of the marine environment by establishing training, certification and watchkeeping for seafarers, in common agreement with international standards.

5 Transfer system provisions

5.1 Facility requirements

5.1.1 Mobile facilities including their tanks, piping, hoses, pumps and valves shall be designed and fabricated to ensure safe handling and transfer of methanol under the intended operating conditions.

5.1.2 The bunkering terminal shall ensure safe methanol bunkering operations. The terminal operator shall obtain a document issued by a competent organization or individual, such as a qualified engineer, confirming that the terminal achieves a level of safety consistent with good industry practice.

5.1.3 Proper devices or arrangements shall be fitted to the bunkering facility to avoid dispersal or venting methanol vapour to the atmosphere other than when necessary for emergency/safety reasons (e.g. use of vapour return lines from receiving ship to the bunkering ship).

5.2 Transfer equipment

5.2.1 All equipment used in the transfer system should meet the requirements defined for each specific piece of equipment as prescribed in 5.2.2 to 5.2.4. All the components of the transfer system should be

fabricated to meet or exceed the applicable standards indicated in Table 2. It is also expected that these components meet the IBC Code[11] and IGF Code. [12]

Table 2 — Standards relevant to transfer system components

Component	Function	Standards
Hoses	Transfer of methanol	ISO 27126 or EN 13765 or EN 12115
Flanges	Product line connections	ASME B16.5
Loading arms	Methanol bunkering loading solution	OCIMF *Design and Construction Specification for Marine Loading Arms* [16]
Emergency shutdown systems	Emergency shutdown	OCIMF *Linked Ship/Shore Emergency Shut-down Systems for Oil and Chemical Trans-fers*[17]

5.2.2 All flanges used in transfer system should be at least Class 150 according to ASME B16.5. Flanges shall be of the welded-neck, slip-on or socket-welded type. However, socket-welded-type flanges shall not be used in nominal size above 50 mm.

5.2.3 If dry disconnect couplings of up to and including the nominal pipe size of 6 inches are used, the dimensions and tolerances should be according to ASTM F1122-22 to meet compatibility requirements.

5.2.4 Materials used in transfer equipment in contact with methanol or its vapour shall be compatible with the characteristics of methanol.

5.2.5 Hoses

5.2.5.1 Bunker hoses should be an approved type and be suitable for methanol. The bunker hoses should also conform to the applicable requirements of recognized standards, such as ISO 27126, EN 13765 and EN 12115.

5.2.5.2 Bunker hoses shall be prototype-tested at a normal ambient temperature, with 200 pressure cycles from zero to at least twice the specified maximum working pressure. After this cycle pressure test has been carried out, the prototype test shall demonstrate a bursting pressure of at least 5 times its specified maximum working pressure at the upper and lower extreme service temperature. Hoses used for prototype testing shall not be used for bunker service.

5.2.5.3 Before being placed in service, each new length of bunker hose produced shall be hydrostatically tested at ambient temperature to a pressure not less than 1,5 times its specified maximum working pressure, but not more than two fifths of its bursting pressure. The hose shall be stencilled, or otherwise marked, with the date of testing, its specified maximum working pressure and, if used in services other than ambient temperature services, its maximum and minimum service temperature, as applicable. The specified maximum working pressure shall not be less than 1 MPa gauge.

5.2.5.4 Each hose assembly shall be visually examined with regards to pressure rating, tightness, other performance data if available and the marking as per the following list:

a) manufacturer's name or trademark;

b) identification code of nominal specification of the manufacturer;

c) factory test pressure (equivalent to rated working pressure, maximum working pressure and maximum allowable working pressure);

d) diameter, range of working temperature and minimum bend radius, etc.;

e) date of manufacture and manufacturer’s serial number;

f) instruction of the electrostatic properties and conductivity of hoses;

g) designed service object type.

5.2.5.5 The nominal diameter of the hose line including connectors shall be determined based on the maximum flow velocity and the transfer rate.

5.2.5.6 The hose line shall have sufficient length, based on a detailed compatibility study between the bunkering facility and receiving ship manifold arrangement.

5.2.5.7 Hoses and hose assemblies shall be handled with care. They shall not be dragged over sharp edges or abrasive surfaces. They shall not be subjected to kinking and flattening.

5.2.5.8 Hoses and hose assemblies shall be used under normal operating conditions up to the maximum working pressure.

5.2.5.9 The hose manufacturer's requirements regarding lifetime, inspection and maintenance shall be followed.

5.2.6 Loading arms

5.2.6.1 The condition of the loading arm shall be checked before operation. The pipes and swivels shall be visually examined regarding tightness and free rotation. Purging connections shall be checked for tight fit. Hydraulic or pneumatic lines, to operate the arm or the ERC, shall also be visually examined.

5.2.6.2 The working envelope of the loading arm shall cover the operating range, based on a detailed compatibility study between bunkering facility and receiving ship manifold arrangement.

5.2.6.3 The compatibility of the connector shall be checked before bunkering operation. Spool pieces and adapters may be used to achieve compatibility.

5.2.7 Bunkering connections

5.2.7.1 Dry disconnect couplings may be considered for frequent bunkering operations with hoses. They may be used on loading arms if the load case study shows that the loads are inside the limits of the coupling specification.

5.2.7.2 Before starting the bunker operation, a tightness test of the connection shall be performed.

5.2.7.3 Prior to connection, the connectors shall be checked to be free from debris, other foreign objects and mechanical damage. If necessary foreign objects shall be removed and cleaned from the interface.

5.3 Safety equipment

5.3.1 Emergency release system

5.3.1.1 The transfer system shall be fitted with an emergency release system (ERS) and connected to an emergency shutdown (ESD) system. The bunkering facility and receiving ship ESD systems shall be interconnected with a ship/shore or ship/ship ESD link, or an equivalent means, to ensure the coordinated operation of both the bunkering and receiving ESD systems and ERS.

5.3.1.2 The ERS shall be designed to protect the transfer system and the connections by disconnecting the transfer system, primarily in the event that the vessel drifts out of its operating envelope. The ERS shall