

TECHNICAL REFERENCE

LNG bunkering

– Part 2 : Requirements for custody transfer



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First published, 2017

First revision, 2020

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| | Mr Yao Yikai | <i>Maritime and Port Authority of Singapore</i> |
| | Mr Zheng Huijian | <i>Energy Market Authority</i> |

The Technical Committee set up the Working Group on LNG Bunkering Specification to prepare this standard. The Working Group consists of the following experts who contribute in their *individual capacity*:

| | Name |
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| Members | : Mr Steve Allen Mr Costas Arvanitis Mr Naveen Hegde Dr Kai Fuu Ming Mr Gary Lim Dr Serena Lim Mr Andrew J Manton Mr Bhavin Mehta Ms Katelyn Ng Mr Pang Jun Jie Mr Andreas Salim Mr James Seow Mr Dennis Sim Ms Faith Tan |

Members : Mr Tan Yew Hui
Mr Teoh Seng Eng
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Dr Zeng Yan

The organisations in which the experts of the Working Group are involved are:

Ascenz Solutions Pte Ltd
Emerson Process Management Marine Solutions Singapore Pte Ltd
Endress+Hauser (S.E.A.) Pte Ltd
Enterprise Singapore
ExxonMobil Research and Engineering Company
FueLNG Pte Ltd
Intertek Testing Services (S) Pte Ltd
Krohne (South East Asia) Pte Ltd
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Foreword

This Technical Reference (was prepared by the Working Group on LNG Bunkering Specification set up by the Technical Committee on LNG Bunkering under the purview of CSC.

TR) for liquefied natural gas (LNG) 56 consists of the following parts under the generic title “LNG bunkering comes in a series of four parts:”:

- Part 1: General introduction
- Part 2: Requirements for custody transfer
- Part 3: Procedures and safety distances
- Part 4: Competency requirements for personnel

This Part of the TR was prepared by the Working Group (WG) on LNG Bunkering Specifications appointed by the Technical Committee on LNG Bunkering under the direction of the Chemical Standards Committee (CSC). The CSC endorsed the TR on 13 January 2017.

This TR is a provisional standard made available for application over a period of three years. The aim is to use the experience gained to update the TR so that it can be adopted as a Singapore Standard. Users of the TR are invited to provide feedback on its technical content, clarity and ease of use. Feedback can be submitted using the form provided in the TR. At the end of the three years, the TR will be reviewed, taking into account any feedback or other considerations, to further its development into a Singapore Standard if found suitable.

In this revision, the following changes were made:

- Inclusion of new requirements and recommendations for the use of quality and quantity measurement equipment (such as custody transfer measurement systems, ultrasonic volumetric flow meter, gas chromatography and Raman analyser) for ship-to-ship mode;
- Enhanced the list of documentation for LNG bunkering;
- Amendments to the dispute resolution requirements in Clause 9;
- Amendments to LNG bunker delivery note in Annex B;
- Inclusion of new informative Annexes on disputes resolution procedures (Annex G and H).

At the end of the three years, the TR will be reviewed, taking into account any feedback or other considerations, to further its development into a Singapore Standard if found suitable.

In preparing this Part of the TR, reference was made to the following documents: listed under Normative references and Bibliography.

| |
|---|
| ASTM International |
| ASTM D1945 Standard test method for analysis of natural gas by gas chromatography |
| ASTM D7940 Standard practice for analysis of liquefied natural gas (LNG) by fiber-coupled Raman spectroscopy |
| ASTM 3588 Standard practice for calculating heat value, compressibility factor, and relative density of gaseous fuels |
| Materials reprinted in Annexes B and C of this TR, with permission, from ASTM D7940-14, copyright ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428. A copy of the complete standard may be obtained from ASTM, www.astm.org. |

| |
|---|
| Bureau International des Poids et Mesures |
| JCGM 100 Evaluation of measurement data — Guide to the expression of uncertainty in measurement (GUM) |
| JCGM 200 International vocabulary of metrology — Basic and general concepts and associated terms (VIM) |
| European Committee for Standardization |
| BS EN 12838 Installations and equipment for liquefied natural gas. Suitability testing of LNG sampling systems |
| EN 16726 Gas infrastructure — Quality of gas — Group H |
| EN 60079-28 Explosive atmospheres — Protection of equipment and transmission systems using optical radiation |
| EN 60825-1 Safety of laser products — Equipment classification and requirements |
| Gas Processors Association |
| GPA 2261 Analysis for natural gas and similar gaseous mixtures by gas chromatography |
| GPA 2145 Table of physical properties for hydrocarbons and other compounds of interest to the natural gas industry |
| GPA 2172 Calculation of gross heating value, relative density, compressibility and theoretical hydrocarbon liquid content for natural gas mixtures for custody transfer |
| Energy Institute |
| IP 337 Determination of composition of non-associated natural gas — Quantitative gas chromatography method |
| HM 21 Calculation procedures for static and dynamic measurement of light hydrocarbon liquids (LNG, LPG, ethylene, propylene and butadienes) |
| International Group of Liquefied Natural Gas Importers |
| Materials from the GIIGNL LNG Custody Transfer Handbook (available at: http://www.giignl.org/publications) has been adapted in Annexes B, C and D of this TR with the kind permission of GIIGNL |
| International Maritime Organization |
| IGF Code MSC.391 (95) International code of safety for ships using gases or other low flashpoint fuels |
| Annex E (LNG bunker delivery note) of this TR is adapted from the Annex LNG BDN of IGF Code adopted by IMO. |
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| |
|---|
| International Organization for Standardization |
| ISO 6142 Gas analysis — Preparation of calibration gas mixtures |
| ISO 6143 Gas analysis — Comparison methods for determining and checking the composition of calibration gas mixtures |
| ISO 6974 Natural gas — Determination of composition and associated uncertainty by gas chromatography |
| ISO 6976 Natural gas — Calculation of calorific values, density, relative density and Wobbe indices from composition |
| ISO 8943 Refrigerated light hydrocarbon fluids — Sampling of liquefied natural gas — Continuous and intermittent methods |
| ISO 10715 Natural gas — Sampling guidelines |
| ISO 15403-1 Natural gas — Natural gas for use as a compressed fuel for vehicles — Part 1: Designation of the quality |
| Enterprise Singapore |
| TR 48 Technical Reference for bunker mass flow metering |
| SS 600 Code of practice for bunkering |

Acknowledgement is made ~~for the use of information~~ to the following organisations for use of materials from their publications:

ASTM international

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GIIGNL International Group of Liquefied Natural Gas Importers

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Annexes F, G and H of this TR are modified from the ~~above publications~~. Annexes L, M and N of SS 600.

Acknowledgement is also made to The Society for Gas as a Marine Fuel (SGMF) for their kind assistance in the development of this ~~series of standards on LNG bunkering~~ Technical Reference and for their permission to reproduce/adapt the works from the following SGMF Guidelines:

- ~~— SGMF LNG Bunkering Safety Guidelines — ISBN 978-0-9933164-0-1~~
- ~~— SGMF Training and Competency Guidelines — ISBN 978-0-9933164-3-2~~
- ~~— SGMF Quality and Quantity Contractual Guidelines — ISBN 978-0-9933164-1-8~~

~~In this Part of the TR, Clause 5.4 of the SGMF Quality and Quantity Contractual Guidelines was adapted as Annex G of this TR.~~

- SGMF Quality and Quantity – Contractual Guidelines (definitions into TR 56 : Part 1 : 2020 and clause 5.4 into TR 56 : Part 2 : 2020)
- SGMF LNG Bunkering Safety Guidelines (clauses 4.1.1 and 4.2 into TR 56 : Part 3 : 2020)
- SGMF Training and Competency Guidelines (definitions into TR 56 : Part 1 : 2020 and clauses 4.1 to 4.8 and clause 5 into TR 56: Part 4 : 2020)
- SGMF Recommendation of Controlled Zones during LNG Bunkering (clause 4 controlled zones definitions into TR 56 : Part 1 : 2020)

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This TR is expected to be used by all stakeholders involved in the LNG bunker supply chain including LNG bunker suppliers, bunker tanker owners/operators, LNG fuel receiving vessels, ship owners/operators, training institutions, third party agencies and relevant authorities.

Attention is drawn to the possibility that some of the elements of this TR may be the subject of patent rights. Enterprise Singapore shall not be held responsible for identifying any or all of such patent rights.

NOTES

1. *Singapore Standards (SSs) and Technical References (TRs) are reviewed periodically to keep abreast of technical changes, technological developments and industry practices. The changes are documented through the issue of either amendments or revisions. Where SSs are deemed to be stable, i.e. no foreseeable changes in them, they will be classified as "Mature Standards". Mature Standards will not be subject to further review, unless there are requests to review such standards.*
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