

Standards and Guidelines for Natural Gas Fuelled Ship Projects

Photo courtesy of Wartsila



This document was produced by the **LNG Ship Fuel Safety Advisory Group** and published on its behalf by The Society of International Gas Carrier and Terminal Operators (SIGTTO) and the Society for Gas as a Marine Fuel (SGMF).

The 22 members of this newly formed group have extensive experience in the LNG industry and come from ship and terminal operators, manufacturers, shipbuilders, regulators and Classification Societies.

The objectives of the group are to:

- Promote the use of natural gas as a safe and environmentally friendly marine fuel while retaining a safety level equivalent to that of the large scale LNG transport industry
- interface with and proactively support stakeholders in the marine gas fuel industry
- identify issues and provide guidance and information based on the experience of group members
- provide practical guidance and assistance to SIGTTO as it assists in the development of sound and practical policies for the implementation of NG as a marine fuel.

Introduction

The LNG marine transportation industry has an enviable safety record and, in the 49 years since the first commercial cargo was transported from Algeria to the UK, 7,200 million m³ of LNG has been safely delivered on approaching 75,000 loaded voyages.

This excellent safety record stems from adherence to rigorous codes and standards for the design, construction and operation of both the vessels employed and the marine terminals where they load and discharge their cargo. The codes, standards and industry guidelines were written by drawing on the expertise of the people engaged in the industry and they have been continuously updated and reviewed in light of experience.

With the advent of 'small scale' LNG usage, particularly in its use as a marine bunker fuel, it is essential that the knowledge and experience is publicised to new participants in the LNG industry. This document provides a description of all guidance available and sufficient details to enable copies to be found.

For ease of document navigation the guide is split into 4 sections; Project Development, Design, Operations and Training

A. Project Development

1. **NFPA 59A- Standard for the Production, Handling and Storage of Liquefied Natural Gas (LNG) 2013 edition**

This National Fire Protection Association standard applies to the location, design, construction, maintenance and operation of all facilities that liquefy, store, vaporise and handle natural gas. It also deals with the training of personnel involved with LNG.

<http://www.nfpa.org>

2. **NFPA 52 - Vehicular Gaseous Fuel Systems Code**

This National Fire Protection Association code applies to the design, installation, operation and maintenance of LNG engine fuel systems on vehicles of all types, as well as to their associated fueling (dispensing) facilities. It also applies to LNG to CNG facilities with LNG storage in ASME containers of 70,000 gal (265 m³) or less.

<http://www.nfpa.org>

3. **EN 1473:2007 Installation and Equipment for LNG - Design of Onshore Installations**

This European Standard gives guidelines for the design, construction and operation of all onshore liquefied natural gas installations, including those for the liquefaction, storage, vaporisation, transfer and handling of LNG. Plants with a storage capacity of less than 200 tonnes are covered by EN 13645.

ISBN: 9 780 58050 229 3

4. Seveso III Directive EU Directive 2012/18/EU

The Seveso Directive deals with the control of onshore major accident hazards involving dangerous substances. The current directive, Seveso III, entered into force in August 2012 and will become fully applicable in June 2015.

<http://ec.europa.eu/environment/seveso>

5. USCG - Guidance Related to Waterfront LNG Facilities – Including Information on Assessing the Suitability of Waterways for LNG Marine Traffic

This circular provides guidance to an applicant seeking a permit to build and operate a shore side LNG terminal. It looks at the timing and scope of the process that is necessary to ensure full consideration is given to the safety and security of the port, the facility and the vessels transporting the LNG.

<http://www.uscg.mil/hq/cg5/nvic/pdf/2011/NVIC%2001-2011%20Final.pdf>

6. Guide to Contingency Planning for Marine Terminals Handling Liquefied Gases in Bulk – SIGTTO

Covers the safe storage and transfer of liquefied gases at marine terminals.

ISBN: 9 781 85609 215 9

7. Guidance on performing risk assessment in the design of onshore LNG installations including the ship/shore interface – ISO draft 116901

This Technical Specification provides a common approach and guidance to those undertaking assessment of the major safety hazards as part of the planning, design and operation of LNG facilities onshore and at shoreline, using risk based methods and standards, to enable a safe design and operation of LNG facilities. The environmental risks associated with an LNG release are not addressed.

The Specification aims to be applied both to export and import terminals, but can be applicable to other facilities such as satellite and peak shaving plants.

It applies to all facilities inside the perimeter of the terminal, and all hazardous materials including LNG and associated products.

www.ogp.org.uk/index.php/download_file/view/408/2876/

8. LNG Operations in Port Areas – SIGTTO

Provides guidance to best practice in managing gas shipping operations within ports. It also carries a useful profile of the risks associated with gas operations.

ISBN: 9 781 85609 256 2

9. BS EN 13645:2002 - Installations and equipment for LNG – Design of onshore installations with a storage capacity between 5 t and 200 t

This European Standard specifies requirements for the design and construction of onshore stationary LNG installations with a total storage capacity of between 5 t and 200 t. This standard

is not applicable to liquefaction process facilities based on hydrocarbon refrigerants. Larger installations are treated according to EN 1473:1997.

The installations to which this standard is applicable include:

- LNG satellite plants. The LNG may be supplied by road tankers, barge or rail carriers. After storage, LNG is vaporized and sent out to consumers
- LNG gas fuelling stations for vehicles.

The installation is limited from the gas inlet or the loading LNG area to the gas outlet or the unloading LNG area. Filling systems are not covered.

ISBN: 0 580 39202 3

10. 33 CFR Part 127 – Waterfront Facilities Handling LNG and LHG

This CFR includes guidance on general requirements for design and construction, equipment, operations, maintenance, personnel training, fire fighting, and security. It covers any structure on, in, or under the navigable waters of the United States, or any structure on land or any area on shore immediately adjacent to such waters, used or capable of being used to transfer LNG, in bulk, to or from a vessel. The regulations apply to large and small scale LNG projects, including tank truck operations.

<http://www.ecfr.gov>

11. Port Marine Safety Code – UK DfT 2000

The Code includes a brief general summary of the main duties and powers that are common to many harbour authorities in relation to marine operations. It also contains guidance as to how some of these duties and powers should be exercised consistent with good practice.

There are several general principles:

- A harbour authority has statutory and non-statutory duties
- duties include an obligation to conserve and facilitate the safe use of the harbour; and a duty of care against loss caused by the authority's negligence
- duties to ensure the safety of marine operations are matched with general and specific powers to enable the authority to discharge these duties.

The Code does not, for example, relate to duties and responsibilities deriving from health and safety legislation, 2 and (with some exceptions) those relating to the safety of vessels under the Merchant Shipping Acts.

http://www.dft.gov.uk/mca/pmsc_oct_2009.pdf

12. Guidance on Risk Analysis and Safety Implications of a Large LNG Spill Over Water – Sandia National Laboratories, December 2004

This report reviews several existing studies of LNG spills with respect to their assumptions, inputs, models, and experimental data. Based on this review and further analysis, the report provides guidance on the appropriateness of models, assumptions, and risk management to address public safety and property relative to a potential LNG spill over water. It presents a

general scale of possible hazards of spills occurring from LNG class carriers with a cargo capacity ranging of 125,000-150,000 m³.

<http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA442674>

13. Breach and Safety Analysis of Spills Over Water from Large LNG Carriers – Sandia National Laboratories, May 2008

Building on the research and analyses presented in A12, Sandia reassessed emerging accidental and intentional threats and then conducted detailed breach analyses for the new large LNG carrier designs. The report is based on the estimated breach sizes, breach locations, and LNG carrier configurations from LNG class carriers with cargo capacities up to 265,000 m³. The report estimates LNG spill rates and volumes, and analyzes thermal hazard and vapor dispersion distances. It looks at the expected range of potential hazards from a large LNG carrier spill over water, and discusses the risk management approaches to minimize.

http://www.energy.ca.gov/lng/documents/2008-09-11_SANDIA_2008_Report.PDF

14. Recommendations on the Prediction of Thermal Hazard Distances from Large LNG Pool Fires on Water for Solid Flame Models – Sandia National Laboratories, December 2011

Provides recommendations on predicting thermal hazard distances resulting from large LNG pool fires on water by looking at burn rate, flame height, surface emissive power (SEP), and transmissivity. The recommendations are based upon knowledge gained from A12 and A13.

<http://prod.sandia.gov/techlib/access-control.cgi/2011/119415.pdf>

15. Fuel Storage Transportation and Supply Agreements - Witherby Seamanship

First published in 2004, this book analyses the legal and commercial issues associated with the structuring arrangements for the storage, transportation and supply of processed fuels from the perspective of the relationship between the sales company and the independent contractors who provide services to it.

ISBN: 9 781 85609 250 0

16. LNG Overview - US Federal Energy Regulatory Commission

This overview, which is produced by the Federal Energy Regulatory Commission (FERC), provides useful information to citizens regarding the nature of LNG and its transportation and storage.

www.ferc.gov/for-citizens/citizen-guides.asp

17. The Phoenix Large Scale LNG Pool Fire Experiments – Sandia 2010

This report presents test data and results of a series of five reduced scale (gas burner) tests to assess flame height to fire diameter ratios as a function of non-dimensional heat release rates for extrapolation to large scale LNG fires. Two fire tests of LNG spills of 21 and 81 m in diameter were conducted in 2009 to improve the understanding of flame height, smoke production, and burn rate and, therefore, the physics and hazards of large LNG spills and fires.

<http://prod.sandia.gov/techlib/access-control.cgi/2010/108676.pdf>

18. Site Selection and Design for LNG Ports and Jetties (IP no 14) – SIGTTO

A Guide to the minimum design criteria when a port is built or altered to accommodate LNG carriers.

ISBN: 1 85609 129 5

19. Calculation of Radiation Effects from LNG Fires – Dominic Nedelka - GdFSuez

This document describes a research programme on LNG fires that was conducted by Gaz de France, in cooperation with industry partners, at Montoir in 1987.

<http://onlinelibrary.wiley.com/doi/10.1002/9780470590232.refs/summary>

B. Design

1. IMO draft IGF Code

The purpose of this Code is to provide an international standard for ships that are not covered by the IGC Code, but that are operating with gas or low flashpoint liquids as fuel.

The Code provides mandatory criteria for the arrangement and installation of machinery, equipment and systems to minimize the risk to the ship, its crew and the environment.

www.imo.org

2. IMO IGC Code

This Code provides an international standard for the safe carriage, by sea in bulk, of liquefied gases and certain other substances. Through consideration of the products carried, it prescribes the design and construction standards of the ships involved and the equipment they should carry to minimize risk to the ship, its crew and to the environment.

ISBN: 9 789 28011 277 1

3. BS EN 1160 1997 - Properties and materials for LNG (Being revised as an ISO - CD 16903)

This International Standard gives guidance on the characteristics of liquefied natural gas (LNG) and the cryogenic materials used in the LNG industry. It also gives guidance on health and safety matters. It is intended to act as a reference document for the implementation of other standards in the liquefied natural gas field. It is intended as a reference for use by persons who design or operate LNG facilities.

ISBN: 0 580 26446 7

4. ESD Arrangements and Linked Ship/Shore Systems for Liquefied Gas Carriers – SIGTTO

This SIGTTO guidance note was produced due to members' concerns about the different interpretations of the functional requirements for ESD systems, particularly differences between the needs of the LNG industry and those of the LPG industry, and how these may interact with linked ship/shore shutdown systems (2009).

ISBN: 9 781 90533 190 1

5. Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents - API Recommended Practice 2003, 7th Edition

Presents the current state of knowledge and technology in the fields of static electricity, lightning, and stray currents applicable to the prevention of hydrocarbon ignition in the petroleum industry and is based on both scientific research and practical experience. The principles discussed are applicable to other operations where ignitable liquids and gases are handled.

<http://publications.api.org/>

6. EN 1474-1:2008 - Installation and Equipment for LNG – Design and testing of marine transfer systems – Part 1: Design and testing of transfer arms (Being revised as ISO/DIS 16904)

This European Standard specifies the design, minimum safety requirements and inspection and testing procedures for LNG transfer arms intended for use on conventional onshore LNG terminals. It also covers the minimum requirements for safe LNG transfer between ship and shore. Although the requirements for remote control power systems are covered, the standard does not include all the details for the design and fabrication of standard parts and fittings associated with transfer arms.

ISBN: 9 780 58057 033 2

7. EN 1474-2:2008 - Installation and Equipment for LNG – Design and testing of marine transfer systems – Part 2: Design and testing of transfer hoses

This European Standard provides general guidelines for the design, material selection, qualification, certification, and testing details for LNG transfer hoses for offshore transfer or on coastal weather-exposed facilities for aerial, floating and submerged configurations or a combination of these. While this European Standard is applicable to all LNG hoses, there may be further specific requirements for floating and submerged hoses.

The transfer hoses will be designed to be part of transfer systems (fitted with ERS, QCDC, handling systems, hydraulic and electric components etc.)

ISBN: 9 780 58057 977 6

8. Manifold Recommendations for Liquefied Gas Carriers (SIGTTO)

These recommendations were developed by SIGTTO, in conjunction with OCIMF, to bring together, in one document, the manifold arrangements and strainer guidelines for LPG and LNG carriers. The document's aim is to promote improved safety and efficiency in operations and to assist in planning the position of loading and discharging facilities in new jetties.

ISBN: 9 781 85609 494 8

9. Energy Institute Model Code of Safe Practice Part 15: Area Classification Code for Installations Handling Flammable Fluids

(formerly referred to as IP 15) EI 15 provides methodologies for hazardous area classification around equipment that stores or handles flammable fluids in the production, processing, distribution and retail sectors. It is a sector specific approach to achieving the hazardous area

classification requirements for flammable fluids required in the UK by the Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) 2002.

ISBN: 9 780 85293 418 0

10. IEC 60092-502:1999 - Electrical Installations in Ships: Tankers - Special Features

This part of IEC 60092 deals with electrical installations in tankers carrying liquids that are flammable, either inherently or due to their reaction with other substances, or flammable liquefied gases.

ISBN: 0 580 39032 2

11. BS EN 13645:2002 - Installations and equipment for LNG – Design of onshore installations with a storage capacity between 5 t and 200 t

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- LNG gas fuelling stations for vehicles.

The installation is limited from the gas inlet or the loading LNG area to the gas outlet or the unloading LNG area. Filling systems are not covered.

ISBN: 0 580 39202 3

12. Mooring Equipment Guidelines – OCIMF

These guidelines provide an extensive overview of the requirements for safe mooring, from both a ship and terminal perspective, including calculation of a ship's restraint requirements, the selection of rope and fitting types and the retirement criteria for mooring lines.

ISBN: 9 781 90533 132 1

13. BS 4089:1999 Specification for Metallic Hose Assemblies for Liquid Petroleum Gases and Liquefied Natural Gases

This British Standard specifies requirements and test methods for metallic hose assemblies used for the loading and unloading of liquefied petroleum gases under pressure.

NOTE: These hoses are primarily used for road and rail tankers or for ship to shore duties.

ISBN: 0 580 33058 3

14. NFPA 59A - Standard for the Production, Handling and Storage of Liquefied Natural Gas (LNG) 2013 edition

This National Fire Protection Association standard applies to the location, design, construction, maintenance and operation of all facilities that liquefy, store, vaporise and handle natural gas. It also deals with the training of personnel involved with LNG.

<http://www.nfpa.org>

15. EN 1473:2007 Installation and Equipment for LNG - Design of Onshore Installations

This European Standard gives guidelines for the design, construction and operation of all onshore liquefied natural gas installations, including those for the liquefaction, storage, vaporisation, transfer and handling of LNG. Plants with a storage capacity of less than 200 tonnes are covered by EN 13645.

ISBN: 9 780 58050 229 3

16. LNG Operations in Port Areas – SIGTTO

Provides guidance to best practice in managing gas shipping operations within ports. It also carries a useful profile of the risks associated with gas operations.

ISBN: 9 781 85609 256 2

17. Guidance on performing risk assessment in the design of onshore LNG installations including the ship/shore interface – ISO draft 116901

This Technical Specification provides a common approach and guidance to those undertaking assessment of the major safety hazards as part of the planning, design and operation of LNG facilities onshore and at shoreline, using risk based methods and standards, to enable a safe design and operation of LNG facilities. The environmental risks associated with an LNG release are not addressed.

The Specification aims to be applied both to export and import terminals, but can be applicable to other facilities such as satellite and peak shaving plants.

It applies to all facilities inside the perimeter of the terminal, and all hazardous materials including LNG and associated products.

www.ogp.org.uk/index.php/download_file/view/408/2876/

18. Liquefied Gas Fire Hazard Management – SIGTTO

Discusses the principles of liquefied gas fire prevention and firefighting.

ISBN: 9 781 85609 265 4

19. American Bureau of Shipping Publication 181: *ABS Guide for Propulsion and Auxiliary Systems for Gas Fueled Ships*

Provides guidance for the design, construction and survey of vessels utilizing gas as a fuel and is focused on systems and arrangements for propulsion and auxiliary systems. The Guide is for application to ship types not falling under the scope of the IGC Code.

<http://www.eagle.org/eagleExternalPortalWEB/ShowProperty/BEA%20Repository/Rules&Guides/Current/181-GasFueledShips/Guide>

20. A Risk Based Approach for the Provision of Firefighting Equipment on Liquefied Gas Jetties – SIGTTO

The book describes a systematic risk management approach and applies it to two hypothetical but realistic installations, a town jetty and a remote jetty.

ISBN: 9 781 85609 184 8

21. Bureau Veritas – ‘Safety Rules for Gas-Fuelled Engine Installations in Ships’ NR 529 (last edition May 2011)

Applies to ships fitted with internal combustion engine installations using natural gas as fuel. The engines may use either a single fuel (gas) or dual fuel (gas and fuel oil), and the gas may be stored in gaseous (CNG) or liquid (LNG) state.

http://www.veristar.com/content/static/veristarinfo/images/4707.9.529NR_2011-05.pdf

22. EU ATEX Directives

ATEX is the name commonly given to the two European Directives for controlling explosive atmospheres:

- 1) Directive 99/92/EC (also known as ‘ATEX 137’ or the ‘ATEX Workplace Directive’) is on minimum requirements for improving the health and safety protection of workers potentially at risk from explosive atmospheres.
- 2) Directive 94/9/EC (also known as ‘ATEX 95’ or ‘the ATEX Equipment Directive’) is on the approximation of the laws of Members States concerning equipment and protective systems intended for use in potentially explosive atmospheres.

<http://ec.europa.eu/enterprise/sectors/mechanical/atex/>

<http://ec.europa.eu/enterprise/sectors/mechanical/documents/legislation/atex/>

23. IMO IMDG Code

The International Maritime Dangerous Goods (IMDG) Code lays down basic principles; detailed recommendations for individual substances, materials and articles, and a number of recommendations for good operational practice including advice on terminology, packing, labelling, stowage, segregation and handling, and emergency response.

ISBN: 9 789 28011 513 0

24. Part 6 Chapter 13, Gas Fuelled Ship Installations, Jan 2012 – Det Norske Veritas

This rule chapter includes requirements from the ship’s gas fuel bunkering connection up to and including the gas consumers. Has requirements for arrangement and location of gas fuel tanks and all spaces with gas piping and installations, including requirements to entrances to such spaces. Hazardous areas and spaces due to the gas fuel installations are defined. Requirements

for control, monitoring and safety systems for the gas installations are included, plus additional monitoring requirements for gas engines and compressors.

<http://exchange.dnv.com/publishing/ruleshslc/2012-04/ts613.pdf>

25. 'Rules and Regulations for the Classification of Natural Gas Fuelled Ships' - July 2012 – Lloyd's Register

These Rules specify requirements for gas fuelled systems in ships other than LNG Carriers and cover both single fuelled (gas only) and dual fuelled (gas and oil fuel) machinery, with gas fuel stored and supplied at 10 bar or less.

<http://www.webstore.lr.org/products/419-rules-and-regulations-for-the-classification-of-natural-gas-fuelled-ships-july-2012.aspx>

26. LNG Fire Protection and Emergency Response, 2007 Edition IChem E

This booklet was written to improve understanding of the nature and hazards of LNG and the special fire hazards management and emergency response measures required for such facilities.

ISBN: 9 780 85295 515 4

27. Accident Prevention - The Use of Hoses and Hard-Arms at Marine Terminals Handling Liquefied Gas - 2nd Ed – SIGTTO

This paper covers accidents relating to hoses, hard-arms and pipeline incidents close to ship or shore manifolds. The report only covers the liquefied gas industry. Where possible, and resulting from incidents, the design and operation of various equipment types is discussed.

ISBN: 9 781 85609 114 5

28. The Selection and Testing of Valves for LNG Applications – SIGTTO

This document provides guidance to designers and operators on the general requirements for valves for LNG service, which are generally designed with an operating temperature range of +80°C to -196°C. This guidance is primarily intended for the shipping and storage of these products but may be applied throughout the LNG and LPG industries as appropriate.

ISBN: 9 781 85609 580 8

29. BS EN 1474 Part 3 2008 - Installation and Equipment for LNG Design and testing of marine Transfer Systems - Offshore transfer systems

This European Standard gives general guidelines for the design of LNG transfer systems intended for use on offshore transfer facilities or on coastal weather exposed transfer facilities. The transfer facilities considered may be between floating units, or between floating and fixed units. The specific component details of the LNG transfer systems are not covered by this European Standard.

ISBN: 9 780 58057 978 3

30. BS EN 60079-0 2009 Explosive Atmospheres

This part of IEC 60079 specifies the general requirements for construction, testing and marking of electrical equipment and Ex-components intended for use in explosive atmospheres. Unless modified by one of the standards supplementing this standard, electrical equipment complying with this standard is intended for use in hazardous areas in which explosive atmospheres exist under normal atmospheric conditions of:

- temperature -20°C to $+60^{\circ}\text{C}$; pressure 80 kPa (0,8 bar) to 110 kPa (1,1 bar); and
- air with normal oxygen content, typically 21 % v/v.

ISBN: 9 780 58055 443 8

31. BS EN 60079-Part 29-2 2007 Explosive Atmospheres Gas detectors – Selection installation, use and maintenance of detectors for flammable gases and oxygen

This part of IEC 60079-29 gives guidance on, and recommended practice for, the selection, installation, safe use and maintenance of electrically operated group II apparatus intended for use in industrial and commercial safety applications for the detection and measurement of flammable gases, complying with the requirements of IEC 60079-29-1.

This standard applies to apparatus, instruments and systems that indicate the presence of a flammable or potentially explosive mixture of gas or vapour with air by using an electrical signal from a gas sensor to produce a meter reading, to activate a visual or audible pre-set alarm or by other device, or by any combination of these.

ISBN: 9 780 58054 363 0

32. BS EN 12567: 2000 Industrial valves- Isolating valves for LNG – Specification for suitability and appropriate verification tests

This European Standard specifies the general performance requirements of isolating valves (gate valves, globe valves, plug and ball valves and butterfly valves) used in the production, storage, transmission (by pipeline, rail, road or sea) of LNG.

ISBN: 0 580 36423 2

33. The IMO publication “Interim Guidelines on Safety for Natural Gas Fuelled Engine Installations in Ships” IMO Resolution MSC 285 (86)

The Interim Guidelines were developed to provide an international standard for ships, other than vessels covered by the IGC Code, with natural gas fuelled engine installations.

The goal of the Interim Guidelines is the provision of criteria for the arrangement and installation of machinery for propulsion and auxiliary purposes, using natural gas as fuel. This is to create an equivalent level of integrity in terms of safety, reliability and dependability as that which can be achieved with new, and comparable, conventional oil-fuelled main and auxiliary machinery.

C. Operations

1. ISO 28460:2010 – Installation and equipment for LNG Ship-to-shore interface and port operations

Specifies the requirements for ship, terminal and port service providers to ensure the safe transit of an LNG carrier (LNGC) through the port area and the safe and efficient transfer of its cargo. It is applicable to:

- Pilotage and vessel traffic services (VTS)
- Tug and mooring boat operators
- Terminal operators
- Ship operators
- Suppliers of bunkers, lubricants and stores and other providers of services while the LNGC is moored alongside the terminal.

This International Standard applies only to conventional onshore LNG terminals and to the handling of LNGCs in international trade.

ISBN: 9 780 58065 735 1

2. OGP Draft 118683 Guidelines for systems and installations for supply of LNG as fuel to ships

This draft technical specification provides guidance on the minimum requirements for the design and operation of an LNG bunkering facility, including the interface between the LNG supply facilities and receiving ship of both seagoing and inland trading vessel. It provides requirements and recommendations for operator and crew competency, training, and the functional requirements for equipment necessary to ensure safe LNG bunkering operations of LNG fuelled ships.

http://www.ogp.org.uk/index.php/download_file/view/473/2876/

3. LNG STS Transfer Guidelines – SIGTTO

Guidelines for the side by side STS transfer operations of LNG between commercially trading LNG carriers at anchor, alongside a shore jetty or while underway.

The guidance applies to seagoing ships and may also be useful for reference when establishing rules and procedures for transfer operations between seagoing ships and LNG Regasification Vessels (LNGRV) or LNG Floating Storage and Offloading Vessels in inshore waters.

These guidelines may also be used to develop procedures to facilitate emergency STS transfer operations.

ISBN: 9 781 85609 439 9

4. ESD Arrangements and Linked Ship/Shore Systems for Liquefied Gas Carriers – SIGTTO

This SIGTTO guidance note was produced due to members' concerns about the different interpretations of the functional requirements for ESD systems, particularly those differences between the needs of the LNG industry and those of the LPG industry and how these may interact with linked ship/shore shutdown systems (2009).

ISBN: 9 781 90533 190 1

5. IMO Revised Recommendations on the Safe Transport of Dangerous Cargoes and Related Activities in Port Areas

These Recommendations set out a framework within which legal requirements can be prepared by Governments, whether for the first time or as a revision, to ensure the safe transport and handling of dangerous cargoes in port areas. These recommendations do not specify standards of construction and equipment.

ISBN: 9 789 28011 472 0

6. BS EN 1474-3:2008 - Installation and Equipment for LNG. Design and testing of marine transfer systems - Offshore transfer systems

This European Standard gives general guidelines for the design of LNG transfer systems intended for use on offshore transfer facilities or on coastal weather exposed transfer facilities. The transfer facilities considered may be between floating units, or between floating and fixed units. The specific component details of the LNG transfer systems are not covered by this European Standard.

ISBN: 9 780 58057 978 3

7. International Safety Guide for Oil Tankers and Terminals (ISGOTT) – OCIMF/IAPH/ICS

Provides operational advice for personnel involved in tanker and terminal operations. It is NOT a definitive description of how tanker and terminal operations are conducted.

It is a general industry recommendation that a copy of ISGOTT is kept and used onboard every tanker and in every terminal so that there is a consistent approach to operational procedures and shared responsibilities for operations at the ship/shore interface.

ISBN: 9 781 85609 291 3

8. Mooring Equipment Guidelines – OCIMF

These guidelines represent best known mooring technology and practice.

The guidelines address conventional and alternative mooring systems but are not intended to apply to vessels operating in extreme environments.

ISBN: 9 781 90533 132 1

9. BS 4089:1999 - Specification for Metallic Hose Assemblies for Liquid Petroleum Gases and Liquefied Natural Gases

This British Standard specifies requirements and test methods for metallic hose assemblies used for the loading and unloading of liquefied petroleum gases under pressure.

NOTE: These hoses are primarily used for road and rail tankers or for ship to shore duties.

ISBN: 0 580 33058 3

10. ISPS Code – IMO

The International Ship and Port Facility Security (ISPS) Code is a comprehensive set of measures. It has two parts, one mandatory and one recommendatory.

The Code provides a standardised, consistent framework for evaluating risk, enabling Governments to offset changes in threat with changes in vulnerability for ships and port facilities through determination of appropriate security levels and corresponding security measures.

ISBN: 9 789 28011 544 4

11. LNG Operations in Port Areas – SIGTTO

Provide guidance to best practice in managing gas shipping operations within ports. It also carries a useful profile of the risks associated with gas operations.

ISBN: 9 781 85609 256 2

12. Contingency Planning and Crew Response Guide for Gas Carrier Damage at Sea and in Port Approaches – SIGTTO

Addresses the aspects of contingency planning that are relevant to the liquefied gas carrier and provides recommended crew responses to emergency situations that cause ship damage. While not an exhaustive guide to all conditions, it will be found to be applicable to the majority of accident situations.

ISBN: 9 781 85609 172 5

13. Liquefied Petroleum Gas Sampling Procedures – SIGTTO

A set of updated recommendations

ISBN: 9 781 90533 199 4

14. Guide to Contingency Planning for the Gas Carrier Alongside and Within Port Limits – SIGTTO

Assists liquefied gas carriers and terminals in developing/reviewing their planning to minimise the consequences of accidents and incidents

ISBN: 9 781 85609 173 2

15. The Safe Transfer of Liquefied Gas in an Offshore Environment (STOLGOE) – OCIMF

This publication primarily addresses the inter-relation between the F(P)SO and conventional gas tankers operating in an SBS mooring configuration. It includes recommendations for mooring equipment, considers mooring loads and operations, motions of the F(P)SO and gas tanker, station keeping, cargo transfer equipment and cargo transfer operations.

Offshore operations involving the transfer of Liquefied Natural Gas (LNG) are not specifically addressed in this document, but will be included in a future update once industry experience is available on which to base guidance.

ISBN: 9 781 85609 400 9

16. Application of Amendments to Gas Carrier Codes Concerning Type C Tank Loading Limits – SIGTTO/IACS

The object of this booklet is to remind ship owners and terminal operators of the improvements in safety that the amendments provide.

ISBN: 9 781 85609 125 1

17. GIIGNL - LNG Custody Transfer Handbook

Serves as a reference manual on the procedures and equipment available to and used by the members of GIIGNL to determine the energy quantity of LNG transferred between LNG ships and LNG terminals. It is neither a standard nor a specification.

http://www.giignl.org/fileadmin/user_upload/pdf/Technical_study_group/Reports/GIIGNL-LNG_CUSTODY_TRANSFER_HANDBOOK_-_final_3.01_03-2011.pdf

18. LNG Transfer Arms and Manifold Draining, Purging and Disconnection Procedure – SIGTTO

This advice has been prepared following reports, from a number of members, that there is confusion and misunderstanding among some ship and jetty operators over the safe conduct of this operation. This advice specifically pertains to terminals employing rigid transfer arms. (The basic principles are applicable for hose systems that may be used for LNG ship-to-ship transfer, but there will be differences in the detail.)

<http://www.sigtto.org/mf.ashx?ID=62769f00-e59d-437c-a7fb-713a5c135bd9>

19. Legal Issues in Bunkering - Trevor Harrison

An introduction to the law relating to the sale and use of marine fuels that offers a wealth of information on key legal aspects of bunkering, including contracts, defaults, ship arrest and dispute resolution. It also contains a section dealing with international conventions and national legislation on environmental issues relevant to bunkering.

ISBN: 9 780 95480 976 8

20. Guidance for the Prevention of Rollover in LNG Ships – SIGTTO

For receiving terminals, the issues are generally well understood and suitable mitigation methods are in place. For LNG ships, while the circumstances leading to rollover are quite unusual, rollover has occurred, leading to the release of this information paper.

ISBN: 9 781 85609 558 7

21. ISO 6976: 1995 Natural Gas – Calculation of calorific values, density, relative density and Wobbe index from composition

This standard specifies methods for the calculation of the superior and inferior calorific value, density, relative density and Wobbe index of dry natural gas and other combustible gaseous fuels.

http://www.iso.org/iso/catalogue_detail.htm?csnumber=13531

22. LNG Bunkering Safety Checklists – IAPH

Three documents are currently in draft form for:

- Truck to ship
- ship to ship
- shore to ship LNG bunkering.

The final documents should be available in November 2013. These checklists will be made available on the WPCI LNG Fuelled Vessels website and can be requested by sending an email to tessa.major@portofantwerp.com

23. ISO 10976 Refrigerated Light Hydrocarbon Fluids – Measurement of cargoes on board LNG carriers

This International Standard establishes the steps to properly measure and account for the quantities of cargoes on LNG carriers including, but not limited to, the measurement of liquid volume, vapour volume, temperature and pressure and accounting for the total quantity of the cargo on board.

It describes the use of common measurement systems used on board LNG carriers, the aim of which is to improve the general knowledge and processes in the measurement of LNG for all parties concerned. It also provides general requirements for those involved in the LNG trade on ships and onshore.

D. Training

1. STCW Convention – IMO

The Convention prescribes minimum standards relating to training, certification and watchkeeping for seafarers which countries are obliged to meet or exceed.

ISBN: 9 789 28011 528 4

2. Liquefied Gas Handling Principles on Ships and in Terminals – SIGTTO

This book is for serving officers and terminal operational staff responsible for cargo handling operations and personnel about to be placed in positions covering these duties.

ISBN: 9 781 85609 164 0

3. LNG Shipping Suggested Competency Standards – SIGTTO

This document has been prepared for the guidance of ship owners and operators who may be entering LNG ship operation for the first time.

It highlights the statutory requirements for training LNG tanker crews and the provisions of STCW, as it applies to gas tankers.

It also provides advice on the application of the ISM Code to the training and management of tanker crews.

ISBN: 9 781 90533 136 9

4. LNG Shipping Knowledge -Witherby Seamanship

This book provides the underpinning knowledge to the SIGTTO LNG Shipping Competency Standards, by summarising the tasks and knowledge considered necessary to perform in the industry, broken down by rank.

ISBN: 9 781 85609 504 4

5. Liquefied Gas Carriers – Your Personal Safety Guide – SIGTTO

This book contains important advice for the personal safety of those serving on board liquefied gas carriers. It explains the hazards associated with the variety of products that may be encountered and addresses the steps needed to provide personal protection and that of the environment.

ISBN: 9 781 85609 572 3

6. Tanker Safety Training – Liquefied Gas - Witherby Seamanship

This book covers the IMO specialised level course (Model 1.06) for ships' officers serving on both LNG and LPG carriers

ISBN: 9 781 85609 341 5

7. Competence Related to the On Board Use of LNG as Fuel – DNV

The standard identifies a suggested minimum level of knowledge and skills for people in various roles on board a vessel using LNG as fuel. This standard can be used in the following ways:

- As a reference to familiarise or assess people in their specific role in relation to LNG
- as a reference for global competence and defining training requirements
- as a guide to training providers, who are to develop courses according to the requirements of the standard and needs of the industry
- as a reference document for e.g. certification of personnel.

<http://exchange.dnv.com/publishing/stdcert/2013-04/standard3-325.pdf>

8. IMO Specialized Training for Liquefied Gas Tankers: Model Course 1.06 1999 Edition (TA106E)

ISBN: 9 789 28016 109 0

Availability

- All SIGTTO and OCIMF publications are available through Witherby Seamanship
- All ISO, BS and BS. EN standards are available through National Standards Bodies, although drafts (CD and DIS) are not generally in the public domain
- IMO publications are available on their website <http://www.imo.org/>
- NFPA publications are available on their website <http://www.nfpa.org/>
- ABS publications can be downloaded free of charge from http://www.eagle.org/eagleExternalPortalWEB/?_nfpb=true&_pageLabel=abs_eagle_portal_marine_rules_guides_book
- GIIGNL publications are found on their website www.GIIGNL.org