MARITIME AND PORT AUTHORITY OF SINGAPORE
LICENSING STANDARDS FOR PORT LIMIT LNG BUNKER VESSELS

INTRODUCTION

The “Standards for Port Limit LNG Bunker Vessels” covers construction, propulsion, equipment, operational safety and efficiency of LNG bunker vessels. All LNG bunker vessels operating in the Port of Singapore shall comply with the standards as set out in this document before the owners / operators apply for the SB licence.

All LNG bunker vessels licensed by MPA must be registered with the Singapore Registry of Ships (SRS) and classed by any one of the MPA Recognised Organization (RO) according to the mandatory codes of safety adopted by the International Maritime Organisation (IMO).

All cargo tanks, cargo pipes, pumps, valves in contact with LNG or LNG vapour must be compatible with LNG.

All LNG bunker vessels licensed by MPA must comply with the requirements and conditions of licensing as imposed by MPA, including compliance with standards listed in this document, Technical References, Singapore Standards, Port Marine Circulars and other applicable requirements that may be in force or amended from time to time.

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LICENSING STANDARDS

All LNG bunker vessels shall comply with all items of this document:

1 Manoeuvring Requirements

1.1 Manoeuvring Flexibility

(i) The following propulsion types and requirements are set:

a. 250 to less than 500 GT

Single Screw or equivalent performance to fulfil requirements stipulated in **para 1.3**

b. 500 to less than 1,500 GT

Twin Screw or Single Screw with Bow Thruster(s) or equivalent performance to fulfil requirements stipulated in **para 1.3**

c. 1,500 GT and above

Twin Screw with Bow Thruster(s) or equivalent performance to fulfil requirements stipulated in **para 1.3**

(ii) MPA may also consider the use of any other innovation or novel concepts that can fulfil the requirements stipulated in para 1.3, under "equivalent performance" such as the use of azimuth thrusters, azipod propulsion etc. If a vessel is being constructed with the intent of being licensed as a port limit LNG bunker vessel, MPA should be consulted on the proposed "equivalent performance" during the design stage of the vessel.

1.2 Speed

(i) For LNG bunker vessels of 500 GT and above with twin-screw propulsion, single screw propulsion with bow thruster(s), or twin-screw with bow thruster(s) or equivalent, a minimum speed of 8 knots measured at 100% of engine rated load at the time of sea trial under loaded condition shall be attained.

1.3 Engine Reliability

For LNG bunker vessels, the following standards shall apply:

(i) Number of Main Engine Consecutive Starting

a. The minimum number of successful consecutive starts attainable by the main engine shall at least meet the requirement set by the vessel's Recognised Organisation (RO) authorised by MPA.

(ii) Engine Response time

a. With the LNG bunker vessel travelling at a speed of at least 4 knots, the

engine response time from stop to ahead or astern shall not exceed 3 seconds.

(iii) Stopping Distance at Load Draft

a. The stopping distance at loaded draft with a speed of 5 knots shall not be greater than three ships' length.

(iv) Turning Circle in Confined Waters

a. The LNG bunker vessel shall have a turning circle of not more than 1.5 times of its own length, and the time taken to complete a swing of 180 degrees from a stationary position shall not exceed 2 minutes.

b. For LNG bunker vessels of 5,000 GT and above, the time taken to complete a swing of 180 degrees from a stationary position shall not exceed 4 minutes.

(v) Bridge-controlled Propulsion Machinery

a. The LNG bunker vessel shall have Centralized Bridge Control for the main propulsion system which shall incorporate stopping, reversing and speed control of the main engine(s).

2 Operating Requirements

2.1 Manifold requirements

Manifold flanges, valves and other fittings shall comply with recognized standards, taking into account the material selected and the design pressure of the cargo piping system in accordance with the IGC code and requirements by Recognised Organisation (RO) authorised by MPA.

2.2 Loading and Discharging rate

The loading and discharging rates shall comply with all safety requirements as per IGC code and requirements of the Recognised Organisation (RO) authorised by MPA.

2.3 Drip tray

(i) The manifold(s) or any other point of flanged connection where there is potential for accidental release of LNG on the LNG bunker vessel shall be fitted with a drip tray and/or splash guards to contain the spill or direct contact of LNG onto crew or materials.

(ii) The drip tray should be sized to contain the maximum amount of leakage expected and made from materials suitable for handling cryogenic temperatures.

2.4 Reducers for Hose Connection

(i) The LNG bunker vessel shall carry American National Standards Institute (ANSI) standard reducers and adaptors on board to accommodate the different sizes of bunker manifold flanges on the receiving vessels. Japanese Industrial Standards (JIS) standard reducers and adaptors can be considered with the completion of compatibility studies.

(ii) Materials used in the manufacture of the reducers and adaptors are to be compatible with the characteristics of cryogenic fuels, especially LNG at temperatures of -162°C.

(iii) The sizes of the reducers and adaptors carried onboard the LNG bunker vessels may vary to accommodate the different manifold sizes of the receiving vessels. The reducers and adaptors carried onboard the LNG bunker vessels shall be of an appropriate pressure rating and approved by the Recognised Organisation (RO) authorised by MPA.

(iv) The multiple reducers and adaptors should not be connected and used at a single connection side for LNG bunkering. In the event that multiple reducers and adaptors are required to be connected and used at a single connection side, a spreader or equivalent structure should be utilised under these group of reducers and adaptors to support the weight of these additional fittings extending from the bunker line connection. A new lifting arrangement drawing involving the connection and use of multiple reducers and adaptors at a single connection side shall be done.

2.5 Cargo containment/ management

(i) Both the LNG bunker vessel and receiving vessel shall commit to carrying out the bunkering operation without venting LNG or bio-/e-methane to the atmosphere, except in emergency circumstances. During the bunkering process, tank pressures shall be monitored and controlled to prevent over-pressurization through the pressure relief valves. The vapor management methodology shall be included in the bunkering plan.

(ii) The LNG bunker vessel shall be provided with a permanently installed LNG leak detection equipment (e.g. Optical Gas Imaging cameras etc) approved by the Recognised Organisation (RO) authorised by MPA to detect any gas leakage. i.e. bunker boom and/or manifold area.

2.6 Purging

The LNG bunker vessel must have provision to:

(i) Blow through and purge the liquid and vapour return hoses with nitrogen after

each bunkering operation.

(ii) Leak test the liquid and vapour return hoses with nitrogen prior to starting of each bunkering operation no less than the maximum operating pressure that is agreed in the LNG bunkering plan.

2.7 Fire protection

(i) The bunkering station shall comply with the relevant requirements of the IGC Code for safe operation.

(ii) The LNG bunker vessel shall be fitted with lightning arresters installed on its main and fore mast grounded to ship's hull structure. Installation of such lightning arresters must be approved by the Recognised Organisation (RO) authorised by MPA

(iii) Portable lightning detector shall also be provided onboard the LNG bunker vessel.

2.8 Bunkering Connection

(i) The bunkering manifold shall be designed to withstand the external loads during bunkering.

(ii) The technical requirements for the dry-disconnect/connect coupling of the bunkering manifold shall comply with the relevant requirements stated in Technical Reference (TR) 56: Part 3: 2020, as may be amended

3 Cargo Hose Handling Equipment

3.1 All the cargo hose handling equipment shall comply with the requirements in the IGC code for fire detection and fire protection in the cargo area, including hull protection from low temperatures.

3.2 All LNG bunker vessels shall have a bunker boom fitted[1]. The bunker boom and other hose handling equipment onboard the LNG bunker vessel shall meet the requirements as described in 3.3 and 3.4.

3.3 Bunker Boom

The bunker boom shall meet the following standards:

(i) Pneumatically or hydraulically operated by a single person.

(ii) The minimum safe working load (SWL) shall commensurate with the size and weight of the boom during LNG bunkering operation.

[1] Exemptions to bunker boom requirement can be considered on a case-by-case basis.

(iii) The material used in contact with LNG must be suitable for the intended purpose i.e. for transfer of cryogenic cargo and can withstand a temperature of minus 162°C degrees or lower.

(iv) The bunker boom must be able to handle and transfer both the liquid and vapour hoses simultaneously to the receiving vessel safely.

(v) The bunker boom piping components and/or hose(s) are to be leak tested not less than the maximum operating pressure in accordance with the requirements of the Recognized Organisation (RO) authorised by MPA, taking into account of the IGC code.

(vi) The bunker boom is to be surveyed annually and load tested in accordance with the requirements of the Recognized Organisation (RO) authorised by MPA.

3.4 Hose Handling Equipment

(i) The minimum safe working load (SWL) shall commensurate with the size and weight of the hose handling crane during LNG bunkering operation.

(ii) The material used in contact with LNG must be suitable for the intended purpose i.e. for transfer of cryogenic cargo and can withstand a temperature of minus 162°C degrees or lower.

(iii) The hose handling crane must be able to handle and transfer the liquid and/or vapour hoses to the receiving vessel safely.

(iv) All hose handling cranes on LNG bunker vessels that support the bunker hoses, lifting bridles and saddles shall be provided at suitable positions along the hose handling crane to support the attached bunker hoses and prevent it from bending.

(v) The hose handling crane to be surveyed annually and load tested in accordance with the requirements of the Recognized Organisation (RO) authorised by MPA.

4 Cargo Hose

4.1 Cargo hoses shall meet the following standards:

(i) Liquid and vapour hoses used for cargo transfer shall be compatible with the cargo and suitable for the cargo temperature. Hoses are to be type approved in accordance with internationally recognised standards and requirements of the Recognized Organisation (RO) authorised by MPA.

(ii) The length of each of the hose(s) must be of sufficient length to avoid the need for connecting two or more hoses in series.

(iii) There must be arrangements made for safe storage of the hoses.

(iv) The vapour return hose(s) must be marked clearly to prevent inadvertent use as liquid hose.

(v) Hoses subject to tank pressure, or the discharge pressure of pumps or vapour compressors, shall be designed for a bursting pressure not less than five times the maximum pressure the hose will be subjected to during cargo transfer.

(vi) Each new length of cargo hose 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.

(vii) 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.

(viii) Hoses to be visually inspected and tested (including electrical continuity test) by a Recognised Organisation (RO) authorised by MPA during each annual survey of the LNG bunker vessel.

(ix) The cargo hose(s) shall be subjected to a pressure test at least twice every 5 years. The period between the two tests shall not exceed 3 years. Hose pressure test to be witnessed by Class and relevant Statement/Certificate issued and kept on board for verification by any party concerned.

(x) Hosebun and strops must be provided for supporting the hoses to ensure that they are not narrower than the helix pitch of the hose and able to support several turns of the outer helix. At least four hosebuns of appropriate size to be provided onboard.

(xi) Sufficient number of hose lifting strops with suitable safe working load (SWL) should be provided onboard and all rated and certified by the manufacturer.

5 LNG Bunker Quantity Control - Cargo Measurement System

The LNG bunker vessel shall have the following document and equipment for measuring the quantity of bunkers:

5.1. Tank Calibration Tables

(i) The LNG bunker vessel's tanks shall be calibrated and certified by a surveying company acceptable to the Recognised Organisation (RO) authorised by MPA. An original copy of the tank calibration tables shall be kept onboard.

(ii) The tank calibration tables shall contain the following:

a. Name and SB licence number of the LNG bunker vessel
b. List/trim correction
c. Cargo tanks measurement
d. Reference height of every cargo tank
e. Name and stamp of the company which calibrated the tanks on every page
f. Date of calibration
g. Page number on every page
h. Tank capacity plan of the LNG bunker vessel

(iii) The tank calibration tables shall be sealed and properly bound to prevent any unauthorised tampering.

(iv) The LNG bunker vessel shall only carry its latest certified tank calibration tables for verification by the vessel receiving bunkers and by the relevant authority. An identical copy of the tank calibration tables shall be deposited with MPA.

(v) Should there be any change in the tank capacity of the LNG bunker vessel, the owner and/or operator of the LNG bunker vessel shall not carry out any delivery of bunkers until the new tank calibration tables for the affected or modified tanks, which comply with the requirements mentioned in items 5.1 (i) to 5.1 (iv) above, are placed onboard the LNG bunker vessel and a true copy of the same, with each page certified, deposited with the MPA.

5.2. Automatic Gauging (Level or Volume)

(i) Automatic gauging system is to be fitted and the following standards shall apply:

(a) The system shall be able to provide remote LNG temperature readings to allow for volumetric correction of LNG bunker quantity.
(b) Every cargo tank shall be installed with one level and multiple temperature sensors. The level sensors shall preferably be located at the after-bulkheads of the tanks.
(c) The system may also be connected to a computer having volume and mass calculations with specific gravity, pressure and temperature corrections.
(d) The automatic gauging system must be installed in accordance with the

requirements with applicable class rules and certified by Recognised Organisation (RO) authorised by MPA.

5.3. High Level Alarm

(i) All the cargo tanks of the LNG bunker vessel must be fitted with High Level (HL) and High High Level (HHL) alarms providing audio and visual alarms. The HHL alarm system shall be independent from the HL alarm system and shall be accordance with the IGC code.

5.4. Custody Transfer Equipment

(i) Prior to the LNG bunker vessel starting with LNG bunkering operation in the Port of Singapore, the LNG bunker vessel shall adhere to the relevant requirements as laid out under Section 7 (LNG quantity measurement) of Technical Reference (TR) 56: Part 2: 2020, as may be amended.

5.5. Gas Flowmeters

(i) Prior to the LNG bunker vessel starting with LNG bunkering operation in the Port of Singapore, If the vapor return and the gas consumption are considered, the LNG bunker vessel shall adhere to the relevant requirements as laid out under Section 5.4 (LNG quantity measurement) of Technical Reference (TR) 56: Part 2: 2020, as may be amended.

5.6. CTMS Certificate & Gas Flowmeters Certificate

(i) The LNG bunker vessel's CTMS & Gas flowmeters shall be calibrated and certified by a surveying company acceptable to the MPA Recognised Organisation (RO). An original copy of the CTMS & Gas flowmeters calibration tables shall be kept onboard.

(ii) The serial numbers of the CTMS components must match with independent surveying company certificate report with seal numbers. The level measurement, temperature and pressure, trim & list box shall be sealed and properly bound to prevent any unauthorised tampering.

(iii) The Gas flowmeters serial numbers must match with independent surveying company certificate report with seal numbers. The gas flowmeters shall be sealed and properly bound to prevent any unauthorised tampering.

6 LNG Bunker Quality Control

6.1 The LNG bunker vessel shall adhere to the relevant requirements as described in Section 6 (LNG Quality) of the Technical Reference (TR) 56: Part 2: 2020, as may be amended.

6.2 The LNG bunker vessel should be equipped with proper sampling and quality measurement equipment as described in the Annex C of Technical Reference (TR) 56: part 2: 2020, as may be amended.

7 Plans and Diagrams

7.1 General layout plan, tank capacity plan and cargo piping diagram of the LNG bunker vessel shall be conspicuously displayed on board.

7.2 Tank capacity plan, Piping Diagram and Trim and Stability Tables shall be available onboard for inspection by any party concerned.

8 Navigation Equipment / Charts / Nautical Publications

8.1 All vessels regardless of their Gross Tonnage shall be in compliance with SOLAS Chapter IV Radiocommunications and SOLAS Chapter V Safety of Navigation.

8.2 Navigational, Signalling and GMDSS Radio Communication equipment are to meet the vessel flag's requirements. In addition, carriage of nautical publications, navigational charts and listening watch (on VHF channels) should be maintained as specified by the Port Master from time to time. Please refer to the relevant Port Marine Circulars issued by the Port Master for details.

9 Signalling Equipment / Document

9.1 The LNG bunker vessel shall have the following signalling equipment / document on board:

(i) Full complement of flags and pendants.
(ii) A copy of the International Code of signals.
(iii) A daylight signalling lamp.

10 Communication Equipment

10.1 To be in compliance with SOLAS Chapter IV Radiocommunications.

10.2 The LNG bunker vessel shall be equipped with a radiotelephone which is capable of operating in the International Maritime Mobile VHF Radiocommunication Service in the 156-174 MHZ and on such channels as may be specified by the Port Master from time to time.

10.3 A ship-shore link (SSL) or an equivalent means for automatic and manual emergency shut down (ESD) communication should be fitted so that any activation of ESD systems performs a simultaneous shutdown on both the supply ship and the receiving ship.

11 Other Standards

11.1 Identification Marks

(i) The licence number of the LNG bunker vessel shall be painted in large letters on each side of the bow against a contrasting background and carved on, cut in, or centre punched into the main beam.

(ii) The licence number of the LNG bunker vessel shall also be painted or carved in large letters on each side of the navigating bridge and on the bridge front for easy identification purposes.

(iii) The minimum height (with proportionate breadth and thickness) of the letters and numbers comprising the licence number of the LNG bunker vessel at the bow shall be as follows:

Length of LNG Bunker Vessel	Height	Breadth	Thickness of Letter & Number
Between 5 & 20m	20cm	15cm	4cm
Above 20 m	30cm	20cm	5cm

11.2 Lighting and CCTV camera

(i) The LNG bunker vessel shall be fitted with adequate intrinsically safe lighting to cover the bunker manifold connection and hose handling equipment.

(ii) The minimum illumination at night shall be at least 50 lux at the bunker manifold(s).

(iii) CCTVs must be installed so that all the manifolds, the custody transfer equipment on deck and its computer can be continuously monitored at least from the bridge or the cargo control room. Installation of such CCTVs must be approved by a Recognised Organisation (RO) authorised by MPA.

(iv) The CCTV cameras must be connected to a storage and extraction device which can store the video footages for at least 30 days.

11.3 Fender

The LNG bunker vessel shall have appropriate and suitable fender arrangement to prevent damage to the receiving vessel during bunkering.

11.4 Anti Oil-pollution Equipment

The LNG bunker vessel shall carry onboard a Shipboard Oil Pollution Emergency Plan (SOPEP) and shall be approved by MPA, and a minimum of 400 litres of

approved dispersants at all times.

11.5 Operational Safety

(i) The LNG bunker vessel shall have on board a copy of the following documents, as may be amended:

a. International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code)
b. International Code of Safety for Ships Using gases or other Low-flashpoint Fuels (IGF Code)
c. Latest edition of the International Safety Guide for Oil Vessels & Terminals (ISGOTT)
d. Society for Gas as a Marine Fuel (SGMF) LNG As A Marine Fuel - Safety Guidelines – Bunkering
e. Society of International Gas Vessel and Terminal Operations (SIGTTO) Liquefied Gas Handling Principles on Ships and in Terminals
f. TR 56 guidelines, as may be amended

11.6 Training and Certification

(i) The crew of the LNG bunker vessel must be trained in accordance with all statutory requirements.

(ii) In addition, the crew of the LNG bunker vessel must attend the training for LNG handling as developed by the IMO and LNG Bunkering Courses (Management and operational level / Support and Emergency Level) as per TR 56: 2020 Part 4, as may be amended.

(iii) In the event the LNG bunker vessel also burns alternative fuels (such as LNG, methanol, ammonia, etc) for their vessel's own propulsion and power generation, the crew must also hold all relevant certifications under the STCW Convention and Code including regulation V/3 of the STCW Convention and Section A-V/3 of the STCW Code.

(iv) The company shall ensure that seafarers on board ships using other alternative fuels (such as LNG, methanol, ammonia etc) for their vessel's own propulsion and power generations, have completed training to attain the abilities that are appropriate to the capacity to be filled, and duties and responsibilities to be taken up, taking into account the specific hazards of the alternative fuel used.

11.7 Document of Compliance

The ISM manager of the LNG bunker vessel must have a Document of Compliance to operate gas vessels.

11.8 Crew accommodation and recreational facilities

(i) The crew accommodation and recreational facilities must be in accordance with title 3 of the Maritime Labour Convention, 2006 as may be amended.

(ii) A Statement of Fact to be issued by the Recognized Organisation (RO) authorised by MPA and verified every 5 years.

11.9 Digital Bunkering

(i) The LNG bunker vessel must be equipped with provisions capable of transmitting bunkering data to MPA's digitalBunker@SG such as 5G cellular antenna(s) with Wi-Fi access points or similar. The cellular antenna(s) should be located at the highest point of the vessel, preferably at the monkey island.

(ii) Parts that are located outside of the vessel's bridge/accommodation block must be suitable for marine use.

(iii) All such installations must be carried out to the satisfaction of the Recognized Organisation (RO) authorised by MPA.