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**INTERIM GUIDELINES FOR USE OF LIQUEFIED PETROLEUM GAS (LPG)
CARGO AS FUEL**

- 1 The Maritime Safety Committee (MSC), at its 108th session (15 to 24 May 2024), having considered a proposal made by the Sub-Committee on Carriage of Cargoes and Containers at its ninth session (20 to 29 September 2023), approved the *Interim guidelines for use of liquefied petroleum gas (LPG) cargo as fuel*, as set out in the annex, with a view to providing guidance for safe use of LPG cargo as fuel in relation to the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code), as amended.
- 2 The Committee agreed to keep the Interim guidelines under review and to amend them in view of the experience gained with their application and/or as and when the circumstances so warrant.
- 3 Member States are invited to bring the annexed Interim guidelines to the attention of all parties concerned.

ANNEX

INTERIM GUIDELINES FOR USE OF LIQUEFIED PETROLEUM GAS (LPG) CARGO AS FUEL

1 PREAMBLE

1.1 Chapter 16 of the IGC Code provides specific provisions for use of liquefied natural gas (LNG) cargo as fuel. For other cargo gases including liquefied petroleum gas (LPG), section 16.9 (Alternative fuels and technologies) of the IGC Code requires that the same level of safety as natural gas is ensured.

1.2 For the purpose of section 16.9 of the IGC Code, the safety level of the design for each ship should be demonstrated as specified in SOLAS regulation II-1/55 for use of LPG cargo as fuel.

1.3 The purpose of these Interim Guidelines is to provide unified specific guidance for ships using LPG cargo as fuel until such provisions are incorporated in the IGC Code, with a view to responding to the industry's urgent need for such guidance.

1.4 The provisions in the Interim Guidelines take into account the goal-based approach (MSC.1/Circ.1394/Rev.2), as they reference existing provisions of the IGC Code, which is a goal-based instrument. Therefore, goals and functional requirements were specified forming the basis for the design, construction and operation.

2 GUIDANCE

2.1 Application

2.1.1 These Interim Guidelines apply to gas carriers as defined in SOLAS regulation VII/11.2 complying with the requirements of the IGC Code using LPG cargoes as fuel, as a supplement to the existing provisions of chapter 16 of the IGC Code.

2.1.2 LPG as provided in chapter 16 of the IGC Code, is composed of propane (C_3H_8), butane (C_4H_{10}), or a propane-butane mixture as listed in chapter 19 of the IGC Code and may contain small amounts of other hydrocarbons and impurities. It can be in either a liquefied or gaseous state. LPG in the liquefied state is referred to as LPG liquid, and LPG in the gaseous state is referred to as LPG vapour.

2.1.3 A gas fuel consumer is any unit within the ship using cargo vapour or liquid as a fuel.

2.2 Goal

2.2.1 The goal of these Interim Guidelines is to ensure safe and reliable operation of fuel supply systems and consumers for use of LPG cargo as fuel.

2.3 Functional provisions

2.3.1 Single failure should not cause leakage of fuel into the space where fuel consumers are installed.

2.3.2 Effectiveness of the ventilation and detection for LPG leakage should be ensured taking into account characteristics of LPG.

2.3.3 Since LPG has different properties depending on the composition ratio of propane and butane, the composition ratio of fuel should be suitable for normal operation of the fuel consumer.

2.3.4 Fuel supply systems should be designed to prevent fuel from unintended phase changes in processing of fuel supply to consumers considering vapour pressure at the working temperature, as follows:

- .1 where fuel is supplied in the gaseous state, measures should be taken so that the temperature of fuel is not lowered to the dew point at the working pressure; and
- .2 where fuel is supplied in the liquid state, measures should be taken so that the pressure of fuel is not lowered to the vapour pressure at the working temperature.

2.3.5 Vent, purging and bleed lines of fuel supply systems should be designed to prevent LPG liquid from being released into the atmosphere.

2.4 Supplementary guidance to the provisions of chapter 16*

2.4.1 In accordance with the principles of paragraph 16.9 of the IGC Code, LPG cargoes may be utilized in machinery spaces of category A. In these spaces, it may be utilized only in systems such as boilers, inert gas generators, internal combustion engines, gas combustion units and gas turbines.

2.4.2 The LPG fuel supply systems and LPG fuel consumers should be designed for operation with the possible range of composition of the intended fuel. Information about the range of acceptable compositions should be provided on board.

2.4.3 The fuel supply system should comply with the requirements of paragraphs 16.4.1, 16.4.2, 16.4.3 and 16.5 of the IGC Code.

2.4.4 LPG fuel consumers should exhibit no external visible flame and should maintain the uptake exhaust temperature sufficiently below the auto-ignition temperature of the fuel. In a mixture of gases, the component with the lowest auto-ignition temperature should be the appropriate reference.

2.4.5 LPG vapour or liquid may be used as fuel in systems referenced in paragraph 2.4.1.

2.4.6 Provision should be made for inerting and venting to a safe location the gas fuel piping systems located in the machinery space. For permanent installations, the inert gas piping connected to the fuel piping should be fitted with double block and bleed valves. In addition, a non-return valve should be installed in the inert gas piping upstream of the double block and bleed valves. For liquid fuel supply systems, consideration should be given to draining the piping without release of liquid to the atmosphere.

2.4.7 The supply and return piping of each gas consumer unit should be provided with fuel isolation by automatic double block and bleed, vented to a safe location, under both normal and emergency operation. The automatic valves should be arranged to fail to the closed position on loss of actuating power. In a space containing multiple consumers, the shutdown of one should not affect the gas fuel supply to the others. For liquid fuel supply systems, the piping should be drained without release of liquid to the atmosphere.

* See sections 16.1 to 16.6 of chapter 16 of the IGC Code based on which the supplementary guidance has been provided for use of LPG cargo as fuel.

2.4.8 Gas nozzles and the burner control system should be configured such that gas fuel can only be ignited by an established oil fuel flame, unless the boiler and combustion equipment is designed and approved by the Administration or recognized organization acting on their behalf, to ignite on gas fuel.

2.5 Additional provisions

2.5.1 Risk assessment

2.5.1.1 A risk assessment should be conducted of the LPG fuel arrangements to document an equivalent level of safety to utilizing LNG as fuel. Consideration should be given to the hazards associated with the arrangement, operation and maintenance of the fuel system, considering reasonably foreseeable failures.

2.5.1.2 The risk assessment should address the consequences of fuel leakage, considering the properties of LPG gas and its accumulation or escape into another space.

2.5.2 Arrangements of spaces containing gas fuel consumers

2.5.2.1 A single failure of fuel systems in the machinery space should not lead to a gas release in the machinery space. Fuel piping should be of double wall design or ducted and the outer boundary should be continuous in the space. Non-continuous double barriers should not be used under the circumstances described in paragraph 16.4.6.2 of the IGC Code.

2.5.2.2 The air inlet of the annular space should not be in the machinery space. In addition, the air inlet of the annular space should be in a location which would be safe in the absence of the air inlet. Consideration should be given to the risk of liquid carry-over resulting from a liquid leak.

2.5.3 Fuel supply

2.5.3.1 Where fuel supply systems supply LPG liquid, vent and purging should lead to a fuel tank, gas-liquid separator or similar device. Heating of the gas-liquid separator may be required for ships operating in cold areas.

2.5.3.2 Fuel supply systems referenced in paragraph 2.5.3.1 and vent masts should be fitted with an inert gas purging interface and should include a means for preventing condensation of vapour in the system.

2.5.3.3 In application of paragraph 16.4.3.2 of the IGC Code, the ventilation inlets for the double wall piping and ducts should be in a non-hazardous area, away from ignition sources. Ventilation outlets for the double wall piping and ducts should be in the cargo area.

2.5.4 Fuel plant ventilation and gas detection

2.5.4.1 In addition to the requirements of paragraphs 16.3.1 and 16.5.1 of the IGC Code, special consideration should be given to the density and lower explosion limit (LEL) of LPG vapour. Ventilation capacity, including ventilation inlet and outlet location, should be supported by numerical calculations, such as a computational fluid dynamics (CFD) analysis. Notwithstanding, for spaces within the cargo area, on the open deck and containing LPG fuel conditioning equipment, the requirements of paragraph 12.1.3 of the IGC Code should apply.

2.5.4.2 In addition to the requirements of paragraph 13.6.12 of the Code, gas detection heads should be fitted in spaces where LPG vapour may accumulate particularly where air circulation is reduced or near the bottom of the space. The suitability of their location should be supported by numerical calculations, such as a CFD analysis or physical smoke test.

2.5.5 Combustion equipment

2.5.5.1 Gas fuel consumer exhaust gas temperature should be continuously monitored.

2.5.5.2 Gas turbines should be fitted with a gas-tight enclosure unless fuel supply piping meets the requirements of paragraph 16.4.3 of the IGC Code. The consequences of gas leakage should be evaluated based on the risk assessment in paragraph 2.5.1.