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INTERIM GUIDELINES FOR USE OF AMMONIA CARGO AS FUEL

1 The Maritime Safety Committee (MSC), at its 111th session (13 to 22 May 2026), having considered a proposal made by the Sub-Committee on Carriage of Cargoes and Containers at its eleventh session (8 to 12 September 2025), approved the *Interim guidelines for use of ammonia cargo as fuel* (the Interim Guidelines), as set out in the annex, with a view to providing guidance for safe use of ammonia 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 In doing so, the Committee recognized the importance of providing guidance for the safe use of ammonia cargo as fuel on board ships to provide at least the same level of safety as comparable LNG-fuelled main and auxiliary machinery installations.

3 The Committee notes MSC.1/Circ.1681, which allows voluntary early implementation of the amendment to 16.9.2 of the IGC Code to allow the use of ammonia cargo as fuel.

4 Member States are invited to bring the Interim Guidelines to the attention of shipbuilders, manufacturers, shipowners, ship managers, masters and ship crews, bareboat charterers and all other parties concerned.

5 Member States are also invited to recount their experience gained through the use of these Interim Guidelines to the Organization, for the Committee to keep the Interim Guidelines under review.

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ANNEX

INTERIM GUIDELINES FOR USE OF AMMONIA CARGO AS FUEL

1 PREAMBLE

1.1 The purpose of these Interim Guidelines is to provide unified and specific guidance for gas carriers, as defined in SOLAS regulation VII/11.2, using ammonia cargo as fuel and complying with the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk as amended (the IGC Code).

1.2 Chapter 16 of the IGC Code provides specific provisions for the use of liquefied natural gas (LNG) cargo as fuel. For the use of other cargo gases as fuel, 16.9 of the IGC Code requires that the same level of safety as natural gas is ensured.

1.3 These Interim Guidelines are a supplement to the existing provisions of chapter 16 of the IGC Code.

1.4 The provisions in these Interim Guidelines take into account the goal-based approach contained in MSC.1/Circ.1394/Rev.2, as 16.9 of the IGC Code allows for an alternative fuel and technologies on this basis. Therefore, the goals and functional requirements are specified, forming the basis for the design, construction and operation. Equivalencies should be established in accordance with 1.3 of the IGC Code and SOLAS regulation II-1/55.

2 GUIDANCE

2.1 Application and definitions

2.1.1 These Interim Guidelines, referenced in 16.9 of the IGC Code, apply to gas carriers complying with the requirements of the IGC Code using ammonia as fuel. They are applicable outside the cargo area in accordance with 16.4.1.1 of the IGC Code, except where required as a result of a risk assessment or where specifically required.

2.1.2 For the purposes of these Interim Guidelines and application of chapter 16 of the IGC Code, ammonia fuel consists of anhydrous ammonia as listed in chapter 19 of the IGC Code. It can be in either a liquefied or gaseous state. Ammonia in the liquefied state is referred to as ammonia liquid, and ammonia in the gaseous state is referred to as ammonia vapour. References to "gas" in the requirements in chapter 16 of the IGC Code are to be taken as referring to ammonia, in liquid or gaseous state.

2.1.3 The ammonia fuel storage and distribution systems' design and arrangements should be in accordance with the general requirements of the IGC Code and the special requirements for ammonia as given in 17.12 of the IGC Code. The requirements of 14.4, 17.2.1 and 17.12 of the IGC Code, indicated as required for carriage of anhydrous ammonia by chapter 19 of the IGC Code, should also be applicable for the carriage, containment, distribution and use of ammonia as fuel.

2.1.4 An ammonia fuel consumer is any unit within the ship using cargo ammonia vapour or liquid as a fuel.

2.1.5 An ammonia fuel preparation room means any space containing pumps, compressors, treatment systems or vaporizers for ammonia fuel preparation purposes and should be considered as a cargo machinery space in accordance with 1.2.10 of the IGC Code.

2.1.6 An ammonia release mitigation system (ARMS) is a system that processes ammonia released from the fuel supply system.

2.2 Goal

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

2.3 Functional provisions

2.3.1 All ammonia fuel storage and processing equipment should be located within the cargo area as defined in 1.2.7 of the IGC Code.

2.3.2 A single failure in the ammonia fuel system(s) should not lead to a release of ammonia outside the cargo area.

2.3.3 Ammonia fuel preparation rooms may be combined with cargo machinery spaces subject to a risk assessment taking into account any high-pressure fuel preparation equipment leakage.

2.3.4 Effectiveness of the ventilation and detection for ammonia leakage should be ensured taking into account the characteristics and physical properties of ammonia.

2.3.5 The ammonia fuel characteristics and physical properties should be suitable for operation of the fuel consumer.

2.3.6 Fuel supply systems should be designed to prevent fuel from unintended phase changes in the processing of the fuel supply to consumers, considering temperature and pressure at the design conditions.

2.3.7 The uncontrolled and direct release of ammonia may only occur in emergency situations in accordance with 7.1.3 of the IGC Code.

2.3.8 Fire detection, protection and extinction measures appropriate to the hazards concerned should be provided.

2.4 Supplementary guidance to the provisions of chapter 16 of the IGC Code

2.4.1 In addition to the requirements of 18.7 of the IGC Code, the crew should receive appropriate ship- and equipment-specific familiarization.

2.4.2 In accordance with the principles of 16.9 of the IGC Code,[1] ammonia cargoes may be consumed in machinery spaces of category A. In these spaces, they may be consumed only in boilers, internal combustion engines, gas combustion units, gas turbines or other devices designed to consume ammonia as fuel.

2.4.3 The ammonia fuel supply systems and ammonia fuel consumers should be designed for operation considering the characteristics and physical properties of all possible specified compositions of the ammonia. Information about the range of acceptable specifications for ammonia fuel should be available on board.

[1] Refer to MSC.1/Circ.1681 on *Voluntary early implementation of the amendments to chapter 16 of the IGC Code, adopted by resolution MSC.566(109)*.

2.4.4 The exposed exterior surfaces of ammonia fuel supply piping, including double-wall piping, should be coloured in a distinguishable way.

2.4.5 Each ammonia fuel consumer should have a separate exhaust system and exhibit no external visible flame.

2.4.6 The supply piping and, if applicable, return piping of each consumer should be provided with an isolation valve in accordance with 16.4.5 of the IGC Code. With regard to valves:

.1 the function of one of the shut-off valves in series and the bleed valve can be incorporated into one valve body, so arranged that the flow to the consumer will be blocked and the ventilation opened; and

.2 the two shut-off valves should be of the fail-to-close type, while the bleed valve should be fail-to-open.

2.4.7 The ammonia fuel consumers should be designed to prevent the unintended accumulation of ammonia. A design assessment of the ammonia fuel consumer should be carried out using a Failure Mode and Effects Analysis (FMEA) or equivalent engineering methods.

2.5 Additional provisions

2.5.1 Risk assessment[2]

With regard to risk assessment:

.1 a risk assessment should be conducted for the entire ammonia fuel system design and arrangements to document that the same level of safety as natural gas is achieved. The risk assessment should also cover the ammonia fuel arrangements installed in the cargo area to document the same level of safety as when utilizing ammonia as cargo. Consideration should be given to the hazards associated with the arrangement, operation and maintenance of the fuel system, considering all reasonably foreseeable failures;

.2 the risk assessment should address the consequences of fuel leakage, considering the properties of ammonia, taking into account ammonia toxicity and corrosivity and its accumulation or escape into adjacent areas and spaces. The risk assessment should specifically consider the ammonia fuel system integrity with focus on its ability to prevent and isolate leakages and also evaluate potential toxicity hazards, ignition mechanisms and consequences of ignition. Special consideration should be given, but not be limited, to the following specific ammonia-related hazards and topics:

[2] Refer to MSC.1/Circ.1455 on *Guidelines for the approval of alternatives and equivalents as provided for in various IMO Instruments.*

.1 toxic ammonia releases, leakages or spills from a single failure of the ammonia fuel supply system or operation of the ARMS and their consequences, including, but not limited to, dispersion of emergency toxic releases to the atmosphere, the accumulation of ammonia vapours and their spreading throughout the ship's spaces via openings, access to life-saving appliances, muster stations and access to escape routes or the formation of alkaline solutions when in contact with water;

.2 gas detector locations, sample points and suitability for detecting required toxicity levels;

.3 ventilation arrangements, particularly the relative density and dispersion of any potential ammonia releases, since ammonia readily reacts with moisture and may form vapours that are heavier than air;

.4 the location of double-wall fuel piping ventilation inlets and outlets;

.5 risks associated with any ammonia fuel storage tank locations, such as the open deck;

.6 the impact of reactions of ammonia with water and mitigation provided by water spray systems;

.7 risks associated with drip trays, bilge systems or holding tanks for ammonia-contaminated water;

.8 the location for leak detection in the ammonia fuel system is to be assessed by means of a gas dispersion analysis where gas could be present outside the cargo area. The gas dispersion analysis should consider the implications for both toxicity and flammability;

.9 fuel supply system vent arrangements, including the possibility of two-phase release from any pressure relief system and the requirement for blowdown vessels;

.10 arrangements for closed fuel return and vent systems, together with associated arrangements for ammonia capture and treatment;

.11 arrangements for purging and inerting, including proposed alternatives to nitrogen as the inerting media;

.12 control, monitoring and safety system failure modes and conditions, considering criticality and safety requirements;

.13 fail-safe positions of all remotely operated valves in the ammonia fuel system;

.14 risks associated with the chosen exhaust gas abatement technology and piping between the consumers and such equipment;

.15 risk of mechanical damage to the fuel piping and fuel supply system in accordance with 16.4.1.1 of the IGC Code; and

.3 risks that cannot be eliminated should be mitigated, as necessary. Details of risks, and the means by which they are mitigated, should be documented.

2.5.2 Arrangements of spaces containing ammonia fuel consumers

With regard to arrangements of spaces containing ammonia fuel consumers:

.1 machinery spaces with ammonia-fuelled machinery should be gas-safe machinery spaces;

.2 a single failure of fuel systems in the machinery space should not lead to a gas release in the machinery space;

.3 fuel piping should be of double-wall design or ducted, and the outer boundary should be continuous and gastight in the space. Non-continuous double barriers should not be used in the machinery space; and

.4 in accordance with 3.2 of the IGC Code, direct access from a space containing ammonia fuel consumers to an ammonia fuel supply system space or ammonia fuel preparation room should not be permitted.

2.5.3 Ammonia fuel supply

With regard to ammonia fuel supply:

.1 where fuel supply systems supply ammonia liquid, the venting and purging systems should drain to dedicated tanks, gas-liquid separator or similar device. Heating arrangements for the gas-liquid separator may be required when the ship is operating in cold areas;

.2 the use of expansion joints and bellows should be kept to a minimum outside the cargo area. Engine-mounted expansion joints may be accepted based upon evaluation, as reflected in the safety concept of the engine;

.3 where gaseous ammonia fuel is supplied to an ammonia fuel consumer, provisions should be made to prevent ammonia condensate from entering the consumer;

.4 except in an emergency, the release of ammonia directly to the atmosphere from the ammonia fuel supply system should be avoided;

.5 the fuel supply system should include ARMS capable of collecting and handling ammonia releases, including but not limited to:

.1 bleed from double-block and bleed valves; and

.2 releases from purging and draining operations of fuel pipes;

.6 where dedicated ammonia fuel tanks or service tanks are installed, the pressure and temperature of ammonia should be maintained within the tank design range at all times in accordance with chapter 7 of the IGC Code. Venting of fuel vapour for control of the tank pressure should not be acceptable, except in emergency situations;

.7 in application of 16.4.3 of the IGC Code, the ventilation inlets for the double-wall piping or ducts should be in a safe location outside the engine-room. Ventilation outlets for the double-wall piping or ducts should be in a safe location in the cargo area. Inerting of the annular space may be accepted as an alternative to ventilation;

.8 the ammonia fuel treatment or ARMS should be arranged to be independent of any other water treatment or bilge systems and arranged to collect residues or ammonia-contaminated water in appropriate holding tanks for further processing; and

.9 ARMS should be capable of reducing the ammonia vapour concentrations to a level that does not present a health hazard as identified by the risk assessment, to the satisfaction of the Administration. The capacity and operating conditions should be established as part of the risk assessment, considering the operating profile of the ship.

2.5.4 Fuel plant ventilation and liquid/gas detection

With regard to fuel plant ventilation and liquid/gas detection:

.1 the ammonia fuel preparation room should, as far as practicable, have an independent access direct from the open deck. Where a separate access from the deck is not practicable, an airlock that complies with 3.6 of the IGC Code should be provided;

.2 the access or other openings to spaces containing fuel sources of release should be arranged so that flammable, asphyxiating and/or toxic gas cannot escape into spaces that are not appropriately zoned;

.3 in addition to the requirements of 16.3.1 and 16.5.1 of the IGC Code, special consideration should be given to the density, toxicity, corrosivity and lower explosion limit (LEL) of ammonia vapour. Ventilation capacity, including the ventilation inlet and outlet locations, should be supported by numerical calculations, such as a computational fluid dynamics (CFD) analysis. Ammonia fuel preparation rooms should be fitted with ventilation arrangements ensuring that the space can withstand any pressure or vacuum caused by vaporization of the liquefied fuel;

.4 for ammonia fuel preparation room(s), the requirements of chapter 12 of the IGC Code should apply;

.5 the arrangements and ventilation of ammonia fuel preparation rooms should be designed to minimize the accumulation of gases or formation of gas pockets;

.6 a fixed ammonia gas detection system should be installed at the locations specified in 13.6.2 of the IGC Code. In addition, fixed ammonia gas detection should be provided in the following locations:

.1 enclosed spaces containing fuel piping or other fuel-handling equipment;

.2 ventilation inlets to accommodation and machinery spaces based on a risk assessment required by 2.5.1.2; and

.3 ventilated annular spaces of double-wall piping identified in 2.5.2.3;

.7 portable detection equipment, permitted by 13.6.5 of the IGC Code, should not be used as an alternative to a permanently installed system;

.8 in addition to the requirements of 14.4.3 of the IGC Code, decontamination showers and eyewash stations should be available in the following locations:

.1 near the exits from ammonia fuel preparation rooms; and

.2 in machinery spaces containing ammonia fuel consumers; and

.9 the ammonia fuel preparation room should be provided with bilge wells incorporating a high-level alarm. The bilge system should be segregated from other bilge systems.

2.5.5 Alarms and shutdowns

With regard to alarms and shutdowns:

.1 remote stops should be provided in accordance with 16.5.2 of the IGC Code. In addition to the locations specified in 16.5.2, remote stops should be provided adjacent to ammonia fuel preparation rooms;

.2 enclosed spaces containing ammonia fuel equipment, where personnel can be present, should be monitored by continuous gas detection. An audible and visual alarm should be provided in the space, in accordance with 13.6.13 of the IGC Code, to indicate the presence of ammonia vapour. The alarm setpoint, in accordance with a recognized standard, should be approved by the Administration and stated in the document required by 18.2 of the IGC Code;

.3 the leak detection system required by 16.4.2 of the IGC Code should be described in a safety concept and enable continuous monitoring of the fuel piping system to provide suitable information to the crew; and

.4 the alarm and shutdown required by 16.4.8 of the IGC Code should be determined by a risk assessment that includes the health and safety of the crew. The setpoint for alarm and shutdown, in accordance with a recognized standard, should be approved by the Administration.

2.5.6 Combustion equipment

With regard to combustion equipment:

.1 a safety concept should be developed for all ammonia fuel consumers and approved by the Administration;

.2 the ammonia concentration of fuel consumers' exhaust gases released to atmosphere should not present a health hazard at the point of release. The explosion venting of ammonia fuel consumers should be led away from where persons may normally be present;

.3 in addition to demonstrating that the potential explosion hazards have been considered, the safety concepts for the ammonia fuel consumers should also take account of the toxic injury potential and should document the arrangements to prevent toxic injury;

.4 the ammonia fuel supply system to each consumer, downstream of the master gas fuel valve, should be purged automatically outside the cargo area when the master gas fuel valve is shut by a safety action. The purged gas should be led to the ARMS;

.5 for the purpose of maintenance of the ammonia consumers or ammonia fuel supply systems, a suitable purging system should be provided to ensure that they are purged to a level that does not present a health hazard. Compatibility of the purging medium with ammonia should be demonstrated. Arrangements for fuel purging and venting should be in accordance with 2.3.6, 2.4.6 and 2.5.3.1; and

.6 gas turbines should be fitted within a gastight enclosure, unless fuel supply piping meets the requirements of 16.4.3 of the IGC Code and the additional requirements indicated in these Interim Guidelines. The consequences of gas leakage should be evaluated based on the risk assessment in 2.5.1.