IMO News flash
CCC 11

The 11th session of the Sub-Committee on Carriage of Cargoes and Containers (hereinafter "CCC") was held in a hybrid format from 8 to 12 September 2025. The session primarily focused on the safety of cargoes and containers, the development of regulations related to alternative fuels, and other matters under the purview of the Sub-Committee. This News Flash provides information on the key outcomes of CCC 11 related to major technical issues. The outcomes of the CCC are only valid upon approval or adoption by Maritime Safety Committee (MSC).

Summary of Outcomes

CCC 11 finalized key safety guidelines on hydrogen fuel and ammonia cargo as fuels and on the carriage of liquefied hydrogen in bulk, in support of IMO's decarbonization strategy. During this session, the Sub-Committee developed: interim safety guidelines for hydrogen-fuelled ships, interim safety guidelines for ships using ammonia cargo as fuel, and draft amendments to the Interim Recommendations for carriage of liquefied hydrogen in bulk (introducing a new Part D on membrane-type vacuum-insulated tanks). These documents are expected to be approved or adopted at MSC 111 in May 2026.

(a) **Interim safety guidelines for ships using ammonia cargo as fuel**: Supplementing chapter 16 of the IGC Code, these guidelines address the risk assessment, release management to the atmosphere, fuel plant ventilation and arrangement, liquid/gas detection and alarm & shutdown, as well as combustion equipment

(b) **Interim safety guidelines for hydrogen-fuelled ships**: Based on the IGF Code, these guidelines establish design requirements for fuel tanks, piping, machinery, and control/monitoring systems, and include hydrogen-specific risk control measures such as ventilation, integration with fuel cells, and emergency shutdown devices.

(c) **Amendments to the Interim Recommendations for carriage of liquefied hydrogen in bulk**: Revising and consolidating MSC.565(108), the amendments introduce Part D covering membrane-type vacuum-insulated cargo containment system, including requirements for structural integrity, vacuum maintenance and monitoring, and emergency response.

In addition, a group of experts was convened to follow up on MSC 110 decisions and to further review amendments to the IGC Code. The discussions focused on retroactive application to existing ships and consistency with the IGF Code. It was ultimately agreed that new structural and design requirements would apply only to newbuildings, while existing ships would remain under current provisions.

Unified Interpretations (UI) were also developed for membrane containment systems, clarifying the meaning of terms such as "anticipated leakage," "effective," and "complete secondary liquid-tight barrier." The UI established testing and inspection criteria for bonded secondary barriers (including leak testing before and after initial cooldown and reference to regular survey criteria), providing the industry with consistent standards applicable from design through construction and inspection stages.

The CCC further revised its work plan for follow-up tasks, including methanol/ethanol, fuel cells, and low-flashpoint oil fuels, and agreed to prioritize onboard carbon capture systems (OCCS) in coordination with MEPC. Meanwhile, most amendments to the IMDG and IMSBC Codes were referred to the Editorial and Technical (E&T) Group. Issues such as the carriage of electric and alternative-fuel vehicles and new safety standards for mineral cargoes will be discussed in future sessions. On cargo securing, the Sub-Committee agreed to re-establish Correspondence Group to further review performance standards for lashing software as a supplement of the Cargo Securing Manual.

Development of interim safety guidelines for ships using ammonia cargo as fuel

Background and Development Process

The International Maritime Organization (IMO) has highlighted ammonia as a next-generation marine fuel in pursuit of its 2050 carbon neutrality goal. While ammonia offers the advantage of being a carbon-neutral fuel that does not emit CO_2 upon combustion, its high toxicity and unique physical characteristics necessitate special safety considerations.

The Maritime Safety Committee (MSC), recognizing these issues, has been refining relevant regulations to enable the safe introduction of ammonia fuel. At MSC 109, held in late 2024, the Committee adopted amendments to the IGC Code removing the existing prohibition on the use of ammonia cargo as fuel, with entry into force on 1 July 2026. To allow early application before the formal entry into force, the Committee also approved MSC.1/Circ.1681, *Voluntary Early Implementation of the Amendments to Chapter 16 of the IGC Code*. These actions were intended to lift the prohibition on the use of ammonia fuel under the IGC Code.

For ships subject to the IGF Code, separate *Interim Guidelines for the Safety of Ships using Ammonia as Fuel* were approved at MSC 109 (December 2024) and issued as MSC.1/Circ.1687. However, these Interim Guidelines did not address the case of ships using ammonia cargo as fuel. Accordingly, the IMO decided to develop additional guidelines specifically for this case, and the matter was taken up for substantive discussion at CCC 11.

Draft Interim Safety Guidelines on the Use of Ammonia Cargo as Fuel

One of the key outcomes of the CCC 11 is the finalization of the *Draft Interim Guidelines for the Safety of Ships Using Anhydrous Ammonia Cargo as Fuel*. These Interim Guidelines were developed in a goal-based manner and supplement the mandatory provisions of chapter 16 of the IGC Code (*Use of Cargo as Fuel*). In other words, the Guidelines establish additional design and operational requirements to ensure the safe use of ammonia carried as cargo on gas carriers as fuel for propulsion.

The draft Guidelines have been structured in line with the general principles of the IGC Code and contain specific requirements for the arrangement, installation, control, and monitoring of ammonia fuel systems, with the aim of minimizing risks to the ship, crew, and the environment.

CCC 11 developed this draft Interim Guidelines package and agreed to submit it to MSC 111 for final approval. Upon MSC approval, the Guidelines will be issued as an IMO MSC Circular, enabling the industry to apply them as official guidance for the design and operation of ammonia-fuelled ammonia carriers. At this stage, the Guidelines are issued on an *interim* basis, with the understanding that they will be reviewed and refined as operational experience is accumulated.

Development of Safety Requirements

While maintaining the framework of the IGC Code, supplementary measures were introduced to address the new operational reality of using ammonia cargo as fuel. The Guidelines take into account not only the toxicity but also the flammability of ammonia. Instead of prescriptive technical provisions, a Risk Assessment–based approach was adopted to accommodate a wide range of ship designs and technological maturity levels. The main points of discussion and agreement in developing the safety requirements are as follows:

(d) Arrangement

In terms of arrangement, there were initial views that the fuel preparation room should be separated from the cargo machinery space. It was concluded that the two spaces may be combined, subject to Risk Assessment. In such cases, sufficient consideration shall be given to the potential leakage of high-pressure ammonia fuel equipment

(e) Safety Criteria for Ammonia Leak Detection Systems

Regarding alarm and emergency shutdown set-points for ammonia detection, it was decided, in view of the limited technological maturity of ammonia-fuelled ships, to allow flexible design based on Risk Assessment rather than prescribing fixed values. However, in determining such set-points, recognized references such as MSC.1/Circ.1687 should be taken into account, and the established set-points are subject to flag State approval

(f) Controlling discharge

Considering the high toxicity of ammonia, the philosophy of atmospheric emission management was revised. Ammonia released during double-block-and-bleed valve (DBBV) operations, purging, or draining should be treated through an Ammonia Release Mitigation System (ARMS), with exceptions allowed only for emergency situation. Taking into account the current maturity of ARMS technologies and the diversity of projects, the permissible emission concentration is to be determined through Risk Assessment, subject to flag State approval.

(g) Safe Haven

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Referring to the special requirements for ships carrying type 1G cargoes, the need for a Safe Haven to protect against large-scale ammonia leaks was discussed. However, it was decided not to adopt such a provision, noting that the outcome of the Interim Guidelines should not in itself trigger amendments to the IGC Code. Instead, taking into account cases of ammonia dispersion onboard, the Guidelines require that, where necessary, mitigation measures be established through Risk Assessment.

(h) Risk Assessment

To ensure an equivalent level of safety to that of using ammonia as cargo, a comprehensive Risk Assessment should be carried out for the entire ammonia fuel supply system. Unlike ammonia as cargo, this assessment must include potential ignition scenarios and their consequences. The Risk Assessment should be documented to the satisfaction of the flag State.

(i) Ventilation of Fuel Preparation Rooms

A proposal was made to strengthen the ventilation capacity of ammonia fuel preparation rooms to 45 air changes per hour by introducing the concept of a Gas Evacuation System for rapid removal of leaked ammonia. However, it was recognized that excessive ventilation might itself contribute to gas dispersion within the ship. Therefore, the existing IGC Code requirements were maintained. Nonetheless, the effectiveness of ventilation systems and duct arrangements in fuel preparation rooms should be validated, for example through Computational Fluid Dynamics (CFD) analysis

(j) Machinery Spaces and Fuel Piping Design

The gas-safe concept for machinery spaces was reaffirmed. Fuel piping in machinery spaces shall be of continuous and gas-tight double-walled or ducted design, regardless of design pressure. Identification of ammonia fuel piping was reinforced: all exposed piping, including double-walled arrangements, should be externally identifiable by color coding or markings. The specific method of identification may be determined flexibly, in line with company or industrial standards.

(k) Stress Analysis

A proposal to require stress analysis to verify the structural integrity of ammonia fuel piping was considered. It was ultimately decided not to mandate such analysis, in order to maintain consistency with existing ammonia cargo piping, and recognizing that, unlike LNG, ammonia is not stored at cryogenic temperatures.

(l) Expansion Joints and Bellows

Expansion joints and bellows were identified as more vulnerable to leakage compared to fixed piping. Their use is therefore to be minimized outside cargo areas.

The nine key decisions outlined above retain the framework of the IGC Code while reflecting the specific characteristics of ammonia fuel, thereby establishing a distinct safety regime different from that of LNG cargo-fuelled ships.

In other words, new requirements have been introduced in areas such as toxicity detection, emission reduction, and double-walled piping design, while the adoption of a Risk Assessment–based approach allows for the accommodation of technological diversity.

Table 1 below summarizes the main differences in safety requirements between LNG cargo-fuelled ships and ammonia cargo-fuelled ships by category.

Table 1. Comparison of Requirements between LNG Cargo and Ammonia Cargo-Fuelled Ships

Item	LNG Cargo-Fuelled Ships	Ammonia Cargo-Fuelled Ships
Risk Assessment	No specific requirement	Comprehensive Risk Assessment required for the ammonia fuel system. Results should be documented and approved by the flag State.
Ammonia Release Mitigation System	No specific requirement	Required to prevent atmospheric release of ammonia from the fuel supply system. Capacity and emission limits should be determined by Risk Assessment.
Fuel Preparation Room Arrangement	Can be combined with cargo machinery space	May be combined with cargo machinery space based on Risk Assessment.
Identification of Fuel Piping	No specific requirement	Ammonia fuel supply pipes, including double-walled pipes, should be externally identifiable by markings.
Master Fuel Valve	Required Installed on fuel supply piping	Required on fuel supply piping and, where applicable, on return piping.
Automatic Purge after Engine Shutdown	No specific requirement	Section downstream of the master fuel valve should be automatically purged in case of emergency shutdown.

Double-Walled Piping in Machinery Spaces	Openings inside machinery space permitted if ≤1 MPa; not permitted if >1 MPa	Openings inside machinery space not permitted.
Alarm and Shutdown Set-Points	Alarm: 30% of LFL; Shutdown: 60% of LFL	Set-points to be established through Risk Assessment with reference to recognized standards. Values subject to flag State approval.
Use of Expansion Joints and Bellows	No specific requirement	Use to be minimized outside cargo areas.
Ventilation System Arrangement in Fuel Preparation Room	No specific requirement	Effectiveness of ventilation systems and duct arrangements to be validated, e.g. through CFD analysis.
Gas Detection Device Locations	In accordance with IGC Code 13.6.2	Continuous gas detection devices required in spaces containing ammonia fuel equipment accessible to crew.
Explosion-Proof Design	Applied	Application to be determined based on Risk Assessment.
Crew Familiarization Training	No specific requirement	Familiarization training required appropriate to ship and equipment.
Toxicity-Related Provisions	No specific requirement	Same requirements as for ammonia cargo. Emergency showers and eyewash stations to be installed near the entrance of ammonia fuel preparation rooms and additionally in machinery spaces.

As the draft Guidelines were finalized at CCC 11 and are scheduled to be submitted for final approval at MSC 111 before being issued as a circular, it is recommended that the relevant provisions be reviewed in advance to avoid any setbacks in design.

Development of Interim Safety Guidelines for Ships Using Hydrogen as Fuel

Background and Development

The IMO has identified hydrogen as one of the next-generation fuels to achieve the 2050 carbon neutrality goal. Hydrogen is expected to serve as a zero-carbon fuel that does not emit CO_2 upon combustion; however, its unique hazards—such as high flammability and explosiveness, cryogenic properties at –253℃, and hydrogen embrittlement—require special safety considerations distinct from conventional fuels.

Reflecting these risks, the CCC has been working to establish safety standards for hydrogen fuel. At its 11th session, CCC completed the development of the *Draft Interim Guidelines for Ships Using Hydrogen as Fuel*. This marks the first establishment of safety provisions for ships using both compressed hydrogen gas and liquefied hydrogen as fuel. The Guidelines are expected to receive final approval at MSC 111 in May 2026.

Draft Interim Guidelines for Ships Using Hydrogen as Fuel

The draft Guidelines have been structured in line with the IGF Code while reflecting the unique physical and chemical hazards of hydrogen, and are based on a goal-based functional requirements approach. This framework enables innovative designs and the application of diverse safety measures, while ensuring an equivalent or higher level of safety compared to LNG.

The Guidelines directly address ships using compressed hydrogen gas and liquefied hydrogen as fuel, and comprehensively cover design and operational requirements for:

- fuel tanks and piping, ventilation, inerting, and vacuum arrangements, fuel preparation rooms (FPR), tank connection spaces (TCS) and tank connection enclosures (TCE), control and monitoring systems, and material requirements.

In addition, it was agreed to further develop supplementary guidelines for next-generation hydrogen storage and utilization technologies, such as fuel cells and metal hydrides.

Key Safety Provisions and Technical Discussions

The Interim Guidelines maintain the principles of the IGF Code while reflecting the flammability, explosiveness, and cryogenic properties of hydrogen, and are characterized by a significant refinement of safety concepts and design criteria. Unlike LNG, hydrogen can ignite explosively from even small ignition sources in the event of a leak, and cryogenic storage requires consideration of vacuum loss and phenomena such as liquid air formation and oxygen enrichment. Accordingly, a more conservative approach is required.

The Guidelines therefore adopt a Risk Assessment–based design philosophy, mandating tools such as Explosion Risk Analysis (ERA) and gas dispersion analysis, and introducing new safety concepts such as tank connection enclosures (TCE) and vacuum-insulated double piping. They also emphasize performance verification against functional requirements at both the design and operational stages, enabling the acceptance of innovative designs while ensuring a level of safety equal to or greater than that of LNG.

As a result, hydrogen-fuelled ships will be subject to a distinct safety regime separate from that of LNG-fuelled ships, summarized in 11 key requirements as outlined below.

(a) Enhanced Risk Assessment

A holistic Risk Assessment is required to address the flammability and explosiveness of hydrogen fuel. While LNG fuel does not require additional risk assessments beyond explosion hazards, hydrogen fuel systems (particularly vacuum insulation systems) should be evaluated to identify and assess all potential hazards. Scenarios involving vacuum loss in gaseous hydrogen and liquefied hydrogen (LH_2) systems must at least be considered.

(b) Hydrogen-Specific Fire and Explosion Safety Philosophy

The concept of limiting the consequences of fire and explosion has been introduced for hydrogen fuel supply areas. For example, where hydrogen leakage sources exist on open deck, or within non-inerted enclosed spaces, designs must ensure that the impact of fire and explosion is contained. In other words, when hydrogen and air (oxygen) coexist, the possibility of spontaneous ignition should be regarded as very high and safety measures should be established accordingly.

(c) Machinery Space Concept

LNG-fuelled ships permit either gas-safe machinery spaces or those protected by Emergency Shutdown (ESD) arrangements. For hydrogen-fuelled ships, however, only the gas-safe machinery space concept applies. Other ESD-based machinery space concepts may exceptionally be accepted through Alternative Design review, taking into account the hazards specified in guideline 4.2.2.

(d) Gas Detection and Hazard Analysis

From the design stage, detailed hazard analysis reflecting hydrogen's characteristics is required. Gas dispersion analysis, heat radiation, and explosion analysis should be applied in engineering design and risk evaluation to establish mitigation measures for possible hydrogen leakage scenarios. This ensures minimization of hydrogen-related risks during ship operation and secures safety.

(e) Functional Requirements–Based Design

The Guidelines specify comprehensive functional requirements for the safety of ships using hydrogen fuel. These cover fuel containment (tanks), fuel supply piping, bunkering systems, fire prevention and firefighting systems, inerting and ventilation, control and monitoring, material selection, testing, and operation. Designers may freely apply diverse technologies and processes to meet these requirements; however, where necessary, Alternative Design assessment should be undertaken to demonstrate equivalent safety.

(f) Ventilation and Safety Systems

Stricter requirements apply compared with LNG. For fuel preparation rooms (FPR), inerting or vacuum arrangements are required, while mechanical ventilation may only be used if supported by Explosion Risk Analysis (ERA). Enclosures and piping inside the FPR must generally be maintained under vacuum, but mechanical ventilation may be used in other spaces. Where fuel preparation equipment is located on open deck, natural ventilation is permitted.

Tank connection spaces (TCS) for hydrogen must also be arranged with inerting or vacuum; natural ventilation is permitted only for equipment located on open deck. Internal piping and equipment should be arranged under inerting or vacuum, with mechanical ventilation permitted only on a limited basis following ERA.

(g) Tank Connection Enclosure (TCE)

A new concept introduced for hydrogen systems, not present in LNG fuel systems. TCEs are required to enclose valves and fittings of compressed hydrogen storage tanks. These enclosures should be maintained under an inert atmosphere (e.g. nitrogen) to prevent hydrogen dispersion and the formation of explosive atmospheres in the event of leakage. Mechanical ventilation is prohibited in TCEs, which should be managed by inerting.

(h) Vacuum Insulation for LH_2 Fuel Tanks and Piping

LH_2 fuel tanks must apply vacuum insulation technology to maintain cryogenic conditions (−253℃). Unlike LNG insulation, this must also account for air condensation and oxygen enrichment resulting from vacuum loss. Therefore, dedicated pressure relief valves (PRVs), environmental controls, and secondary enclosures are mandatory. LH_2 piping must also employ vacuum-insulated double-wall construction. Mechanically ventilated double pipes may only be accepted subject to ERA.

(i) Strengthened Material and Piping Requirements

Compared with LNG, hydrogen requires materials resistant to hydrogen embrittlement, hydrogen attack, and oxygen-enriched atmospheres at cryogenic temperatures. Expansion joints should be minimized to reduce leakage risk, and the scope of double-wall piping and secondary enclosures has been expanded throughout the system.

(j) Enhanced System Safety

Additional engineering review requirements include PRV sizing, vent system analysis, and ERA, ensuring consideration of combined scenarios involving both fire and vacuum loss.

(k) Expanded Control and Monitoring Functions

Monitoring requirements have been strengthened to ensure real-time surveillance of critical equipment such as compressed hydrogen storage vessels and vacuum systems. This enables immediate response to leakage, overpressure, or vacuum loss.

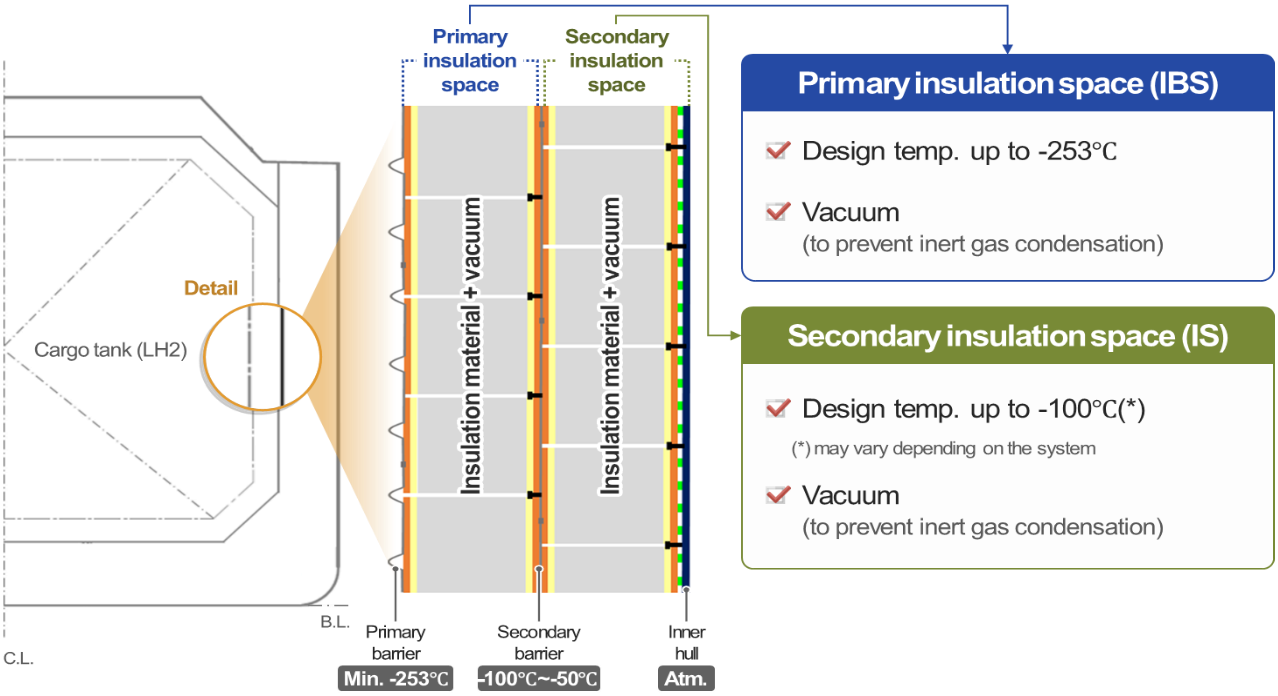
The 11 safety requirements developed in this way retain the framework of the IGF Code while reflecting the specific characteristics of hydrogen, thereby establishing a distinct safety regime clearly differentiated from that of LNG-fuelled ships. To highlight these distinctions more explicitly, the table below summarizes the main changes in safety requirements between LNG-fuelled ships and hydrogen-fuelled ships by category.

Table 2 Safety Requirements for Hydrogen-Fuelled Ships Compared with LNG-Fuelled Ships

Item	LNG-Fuelled Ships	Hydrogen-Fuelled Ships
Definitions	–	14 new definitions added compared with LNG fuel
Risk Assessment	Risk assessment is required only when explicitly specified	Holistic risk assessment required (including explosion and fire)
Limitation of Explosion/Fire Range	Limitation of explosion range	When leak sources exist, explosion/fire range should be limited; if inerted or under vacuum, not required

Machinery Space Concept	Gas-safe machinery spaces and ESD-protected machinery spaces permitted	Only gas-safe machinery spaces permitted; exceptions possible through Alternative Design
Fuel Preparation Room (FPR)	Mechanical ventilation	Inerting/vacuum preferred; mechanical ventilation requires ERA approval
Tank Connection Space (TCS)	Natural/mechanical ventilation permitted	Inerting/vacuum preferred; mechanical ventilation requires ERA approval
Tank Connection Enclosure (TCE)	–	Introduced for compressed hydrogen; inert gas maintained; mechanical ventilation prohibited
Drip Tray	For LNG leak management	For LH_2 leakage + liquid air from vacuum insulation failure
Portable Tanks	Portable LNG tanks	Portable compressed hydrogen tanks additionally permitted
Oxygen Concentration in Inert Gas	≤ 5%	≤ 3%
Compressed Hydrogen Storage Vessels	No special requirement	Mandatory temperature-sensitive pressure relief device
Fuel Tank Types	Type B, Type C, membrane tanks permitted	Only Type C with vacuum insulation permitted; others require Alternative Design
Fuel Storage Compartment Environment Control	Dry air filling	Must withstand liquid air/oxygen enrichment upon vacuum loss
Vacuum System	–	Must isolate vacuum sections to limit loss; PRVs for venting; prevent air ingress
PRV Capacity Sizing	Fire only considered	Fire + vacuum loss simultaneously; larger of the two applied (risk assessment required)
Vent System	Height/distance requirements	Dispersion and radiation analysis mandatory; must minimize internal ignition risk; withstand maximum explosion pressure
Material Requirements	Cryogenic-compatible	Resistant to hydrogen embrittlement, hydrogen attack, and oxygen-enriched cryogenic environment
Expansion Joints	Permitted	Use minimized
Bunkering Piping	Double-wall not mandatory	Double-wall mandatory for LH_2 piping
Double-Walled Fuel Piping	Mechanical ventilation type permitted	Inert/vacuum preferred; mechanical ventilation requires ERA (not required if inerted/vacuum)
Scope of Double-Walled Piping	Applied to cryogenic piping on open deck	Mandatory for liquid/cryogenic hydrogen piping on open deck; gaseous hydrogen may use single wall with ERA
Explosion Risk Analysis (ERA)	–	Mandatory, with conservative leak hole size assumptions
Hazardous Area Classification	Distance-based requirements	IEC 60079-10-1 calculation methods, but at least equivalent to LNG standard
Ventilation	Mechanical ventilation permitted	Alternative design based on ERA required
Control & Monitoring	General monitoring	Includes monitoring of vacuum integrity, inerting loss, compressed hydrogen overheating/overpressure

Amendments to the Interim Recommendations for the Carriage of Ships Carrying Liquefied Hydrogen in Bulk



Background and Development Process

As the importance of maritime transport of liquefied hydrogen has increased as a next-generation clean energy carrier, the IMO has continued to develop corresponding safety standards. Liquefied hydrogen is transported at an extremely low temperature of about –253℃ and is not yet formally listed as a cargo under chapter 19 of the IGC Code (International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk). Accordingly, its actual carriage has so far been permitted only under the framework of tripartite agreements between flag, port, and coastal States.

To minimize safety gaps, IMO adopted the first Interim Recommendations on the carriage of liquefied hydrogen in bulk at MSC 97 in 2016, and subsequently revised them at MSC 108 in 2023 as resolution MSC.565(108), reflecting technological progress and pilot transport experiences.

However, with the rapid advancement of cargo containment system technology—particularly the introduction of membrane-type cargo containment system with vacuum insulation systems—the existing Recommendations were deemed insufficient to address the latest safety requirements. In 2024, IMO accepted a proposal from the Republic of Korea to extend the target completion date for revising the Interim Recommendations to 2026, and agreed to continue discussions at CCC 10 and CCC 11

Introduction to the Interim Recommendations for the Carriage of Liquefied Hydrogen in Bulk

CCC 11 achieved a major step forward in preparing the draft amendments to the Interim Recommendations for the carriage of liquefied hydrogen in bulk. Based on the joint submission by India and the Republic of Korea (CCC 11/11) and the separate submission by the Republic of Korea (CCC 11/11/2), the discussions focused on incorporating new safety requirements for membrane-type cargo containment system employing vacuum insulation into a new Part D.

The draft amendments to the Interim Recommendations developed by the drafting group were consolidated into an integrated document, comprehensively revising and supplementing the existing Recommendations. The document is structured as Part A (general requirements applicable to all tank types) and Parts B, C, and D (special requirements for specific tank types), as follows:

I. **Part A: General (applicable to ships with any type of cargo containment system)**
Existing Part A amended in part to align with modern design concepts.

II. **Part B: Cargo containment systems of independent cargo tanks using vacuum insulation**
Includes safety standards for the structure applied in early pilot carriers, where the space between double shells is maintained under vacuum.

III. **Part C: Cargo containment systems of independent cargo tanks using insulation materials and hydrogen gas in the inner insulation spaces**
Covers the concept of filling internal insulation spaces with hydrogen gas to prevent freezing, including requirements for tank strength analysis, thermal protection, and pressure control.

IV. **Part D: Cargo containment systems of a membrane-type cargo tank maintaining the insulation spaces under vacuum**
Introduces safety measures for new technology in which insulation spaces between membrane-type primary and secondary barriers and the ship's hull structure are maintained under vacuum.

Key Provisions of the Revised Interim Recommendations

The revised Interim Recommendations (Part D) supplement existing LNG carrier standards by reflecting the specific characteristics of membrane-type LH_2 carriers. The main requirements include ensuring the structural integrity of systems with primary and secondary barriers, maintaining vacuum in insulation spaces to secure thermal performance and prevent explosions, and establishing emergency response procedures such as helium injection and PRV release in case of vacuum loss. In addition, the Recommendations require the application of vacuum-insulated double piping for all major pipelines, the use of materials suitable for −253℃ cryogenic conditions and hydrogen embrittlement, and the installation of equipment to prevent oxygen condensation. The principal safety standards are as follows:

(a) Structural Integrity and Containment Safety

Membrane-type LH_2 cargo containment system, consisting of primary and secondary barriers, should maintain structural safety even at cryogenic temperatures (−253℃). Safety should be demonstrated through design, testing, and fatigue analysis, and the secondary barrier should be capable of safely containing liquid hydrogen for a specified period in the event of leakage.

(b) Insulation, Vacuum, and Inerting Requirements

Instead of inert gas filling as prescribed in the IGC Code, primary and secondary insulation spaces should be maintained under vacuum to prevent nitrogen liquefaction and solidification, ensuring thermal performance and explosion prevention. This arrangement is recognized as an equivalent measure to IGC Code 9.2.1.

(c) Safety Measures Against Vacuum Loss and Leakage

As vacuum loss can degrade insulation performance and increase the risk of oxygen ingress, vacuum monitoring, hydrogen leak detectors, and redundant instrumentation should be installed. In case of vacuum loss, inert gas should be injected to prevent air ingress, and PRVs should be designed considering both fire and vacuum-loss scenarios

(d) Material Standards and Oxygen Enrichment

Tanks and piping should use appropriate materials that retain toughness at cryogenic temperatures and are verified against hydrogen embrittlement. Insulation materials should also be suitable for liquid hydrogen and oxygen-enriched environments, with drainage and detection systems installed to address potential oxygen condensation.

(e) Safety Monitoring and Emergency Response

Enhanced monitoring for hydrogen leakage, flame detection, vacuum, and temperature is required, with automatic alarms and shutdowns in abnormal situations. Emergency Shutdown Devices (ESD), PRVs, and vent masts should ensure safe release, and inerting measures should be immediately applied if air ingress occurs into secondary insulation spaces.

Thus, the revised Recommendations comprehensively establish structural, insulation, material, and operational requirements specific to membrane-type LH_2 carriers. **Table 3** below summarizes these key items in comparison with LNG carriers.

Table 3 Safety Requirements for Membrane-Type LH_2 Carriers Compared with Membrane-type LNG Carriers

Item	Membrane-type LNG Carriers	Membrane-type LH_2 Carriers
Structural Integrity	Structural integrity of the cargo containment system should be verified considering cryogenic temperatures, loads, impact, and thermal expansion/contraction.	Structural integrity should also account for the vacuum environment in insulation spaces, requiring verification of all structural elements of the inner hull and cargo containment system.
Primary/Secondary Barriers	Complete secondary liquid-tight barrier required.	Both primary and secondary barriers should be liquid- and gas-tight, with tightness tests and pressure relief systems provided for insulation spaces.
Monitoring & Maintenance	Monitoring of nitrogen in secondary insulation spaces.	Maintenance and monitoring of vacuum in both primary and secondary insulation spaces required; vacuum systems should have redundancy and emergency power.
Insulation Space Control	Circulation of inert gas in insulation spaces.	Verification of vacuum degree in insulation spaces; prevention of condensation/solidification of residual gases.
Atmosphere Control	Continuous supply of inert gas into insulation spaces.	Specific atmosphere control procedures should be established for insulation spaces to manage hydrogen leaks and prevent oxygen ingress.
Cargo Leakage into Insulation Spaces	Pressure and temperature indicators required.	Instrumentation and detection devices required to identify air ingress or hydrogen leakage that would compromise vacuum integrity.
Insulation Materials	Shall withstand cryogenic temperatures below cargo boiling point.	Materials should be tested for hydrogen compatibility and permeability, and withstand environments enriched with oxygen.
Cargo Piping Arrangements	Designed to minimize heat loss and maintain structural safety.	Penetrations through insulation spaces minimized; all joints should be welded to prevent leakage.
Environmental Control in Cargo Hold Space	Shall maintain inerted condition for at least 30 days.	Shall maintain vacuum condition for at least 15 days.

Korean Register has supported the development of eco-friendly ship technologies by addressing the needs of the shipbuilding industry, either by removing regulatory barriers or by filling regulatory gaps in IMO regulation. The revision of this interim recommendation is likewise part of enhancing the global competitiveness of the shipbuilding and shipping industries, pursued through close cooperation with the government.

The revised Interim Recommendations are scheduled to be adopted at MSC 111 in 2026, replacing MSC.565(108), and will serve to supplement and establish safety standards for the carriage of liquefied hydrogen in bulk.

Work Plan for the Development of a Safety Regulatory Framework to Support GHG Reduction in Ships Using New Technologies and Alternative Fuels

Background and Progress

Following the adoption of the Initial IMO GHG Strategy in 2018, the revised 2023 Strategy set the goal of reducing the carbon intensity of international shipping by at least 40% by 2030 compared to 2008 levels, while increasing the share of zero- or near-zero GHG emission fuels to 5–10%. Achieving these targets requires the safe introduction of alternative fuels such as hydrogen and ammonia, as well as new technologies.

Against this backdrop, MSC 110 recommended that each Sub-Committee review and address associated risks, regulatory gaps, and barriers. In response, the CCC developed a work plan covering the safe use and carriage of various alternative fuels, along with the development of safety regulations for onboard carbon capture systems (OCCS).

Key Components

At CCC 11, hydrogen and ammonia (including cargo fuels), methanol/ethanol fuels, , low-flashpoint oil fuels, fuel cells and OCCS were identified as priority items. Each was prioritized based on technology risks, current progress, and the need to close regulatory gaps. Accordingly:

- The Interim Guidelines for hydrogen-fuelled ships are scheduled for adoption at MSC 111 in 2026.
- The Interim Guidelines for methanol/ethanol-fuelled ships are planned to be revised in 2026, and are scheduled for adoption at MSC 113 in 2027.
- Guidelines on fuel cells and low-flashpoint oil fuels are being pursued as medium-term tasks.
- OCCS is being treated as a high-priority matter, under review in coordination with MEPC.

Table 4 below summarizes the priorities, target outputs, and development timelines for the main alternative fuels and new technologies.

Table 4. Planned Regulatory Development for Key Alternative Fuels and New Technologies

Fuel / Technology	Priority	Target Output	Development Timeline
Hydrogen-fuel	High	Interim Guidelines	Approval at MSC 111 (2026)
Ammonia-fuel	High	Interim Guidelines (revised)	Work to begin at CCC 13 (2027)
Ammonia cargo as fuel	High	Interim Guidelines	Approval at MSC 111 (2026)
Methanol/Ethanol-fuel	High	Revised Interim Guidelines / consideration of mandatory provisions	Revision completed in 2026; Approval at MSC 113 (2027)
Fuel cell installations	Medium	Revised Interim Guidelines / consideration of mandatory provisions	Work to begin in 2026; Approval at MSC 114 (2028)
low-flashpoint oil fuels	Medium	Interim Guidelines	Development completed in 2026; Approval at MSC 113 (2027)
LPG-fuel	Low	Revised Interim Guidelines / consideration of mandatory provisions	Work to begin in 2028; Approval at MSC 117(2030)
Onboard CO_2 capture and storage systems (OCCS)	High	Interim Guidelines	Work to begin at CCC 12 (2026); Approval at MSC 116 (2029)
Alternative fuels not yet listed in the IGC Code	Medium	Separate safety guidelines	Review to begin at CCC 12 (2026)

Additional Discussions at CCC 11 on IGC Code Amendments Linked to MSC 110

Background and Development

Since the entry into force of the IGC Code under MSC.370(93) in 2016, industry stakeholders have continuously requested the development of consistent Unified Interpretations (UIs). With the growing need to incorporate new technologies supporting environmental protection and GHG reduction, the IMO initiated a comprehensive revision of the Code in 2022.

The CCC prepared draft amendments during its 8th (September 2022) to 10th (September 2024) sessions, which were approved by MSC 109 (December 2024) and circulated to Member States. However, adoption originally scheduled for MSC 110 (June 2025) was postponed due to technical and editorial divergences.

Accordingly, the MSC decided that Annex 14 (technical matters) and Annex 15 (editorial matters) should be further reviewed by the CCC, with a plan for approval at MSC 111 and adoption at MSC 112, leading to entry into force on or after 1 July 2028.

Key Discussions on Additional Amendments to the IGC Code

At MSC 110, a total of eight related documents were submitted. The drafting group divided these into technical issues and editorial matters, which were reflected in Annexes 14 and 15. MSC instructed that the technical issues contained in Annex 14 should be reviewed first by the CCC. Accordingly, CCC 11 established an experts group to re-examine the key draft provisions. The experts group reported the agreed outcomes to the plenary, thereby laying the groundwork for approval at MSC 111.

The most significant issue during the review was the concern that retroactive application of certain amendments to existing ships would create excessive burdens. It was therefore agreed that requirements involving modifications to design and structure would apply only to new ships constructed on or after 1 July 2028, while existing ships would remain subject to the current provisions.

In addition, discussions covered textual refinements, alignment with the IGF Code, review of consequential amendments and certificate formats, and consideration of early implementation. Supplementary measures were also developed to enhance safety while avoiding operational confusion. The detailed results of these discussions are summarized in **Table 5**.

Table 5 Additionally Discussed IGC Code Amendments

IGC Code Provision	Item	Key Content
3.2.6.3	Prohibition of ordinary steel fire-flaps without gaskets/seals as closure devices for air inlets	Revision applicable only to new ships (constructed on or after 1 July 2028)
3.3.1	Incorporation of Unified Interpretation (MSC.1/Circ.1559)	Alignment with paragraph 11.1.1 of IGC Code to not apply the pump room protection requirements in SOLAS regulation II-2/4.5.10 to cargo machinery spaces and turret compartments.
4.20.1.1.2	Welded joints of independent tanks type A and B	Use of mandatory language for the use of bent plating in lieu of welded tank corner
5.5.3.2, 5.5.3.3	Manual valves on liquid manifolds	Revision applicable only to new ships and clarification of wording
11.2.6.2, 11.2.6.3	Capacity of emergency fire pumps	Clarification of wording on scope of emergency fire pump capacity

13.3.9	High-level alarms and automatic shutdown for cargo tanks	Retaining existing paragraph 13.3.4 applicable for ships constructed before 1 July 2028
13.9.3	Integrated systems	Revision applicable only to new ships
16.3.5, 16.3.6	Ventilation/detection for LPG/ethane fuel systems	Revision applicable only to new ships and clarification of the wording
16.4.1.5	Double block and bleed valves	Revision applicable only to new ships and Alignment with the IGF Code for the separation arrangements between the IG line and the fuel piping.
16.7.1.4	Pressure relief valves for internal combustion engines	Revision applicable only to new ships
16.9.1, 16.9.3, 16.9.4, 16.9.5	Use of LPG/ethane as fuel	Consequential amendments arising from the use of LPG/ethane cargo as fuel
Table in Ch.19	Special requirements for carbon dioxide	Addition of PPE as toxicity requirements

Development of a Unified Interpretation (UI) on Testing and Inspection Criteria for Secondary Barriers of Membrane-Type Cargo Containment Systems

Background and Developments

Membrane-type cargo containment systems are recognized as a key technology for the transport of cryogenic cargoes such as Liquefied Natural Gas. A major concern has been how potential leakage in the interbarrier spaces, and subsequent failure of the primary or secondary barriers, could impact the ship's safety and seaworthiness. To address this, extensive analytical work—including numerical calculations, modeling, experiments, IACS reviews, and independent risk assessments—was undertaken, with preventive and mitigating measures developed for various defect scenarios.

Against this backdrop, IACS reaffirmed the seaworthiness requirements under paragraph 1.4.3.1 of the IGC Code and developed a Unified Interpretation (UI) providing criteria for assessing the effectiveness of glued secondary barriers. The UI clarifies key terms such as "envisaged leakage," "effectiveness," and "full secondary liquid-tight barrier," thereby ensuring that designers and operators have consistent and predictable standards to apply in both design and operation

Key Elements of the Developed Unified Interpretation

The newly developed UI does not amend or expand the mandatory provisions of the IGC Code but provides clarification and application criteria as follows:

(a) IGC Code 4.6.2.1: Definition and Assessment Method of "Any Envisaged Leakage of Liquid Cargo"

A scenario is envisaged in which, when a leakage occurs in the primary barrier, liquefied gas enters the interbarrier space until hydrostatic equilibrium is reached. Based on this scenario, risk analysis and thermal impact assessment should be carried out, and it is clarified that the designer should demonstrate this, and the flag State Administration should approve it.

(b) IGC Code 4.6.2.4 and 4.3.6: Periodical Survey Requirements and Application of Approved Testing and Inspection Plans

The effectiveness of the secondary barrier should be verified at the new building stage and at each periodical survey through an approved testing and inspection plan. In particular, for glued secondary barriers, tightness tests should be performed before and after initial cool-down, and these values should be used as the reference value for subsequent periodical surveys.

(c) IGC Code 4.4.1 and Table of 4.5: Functional Definition of a "Full Secondary Liquid-Tight Barrier"

The meaning of "full secondary liquid-tight barrier" is clarified, stipulating that in the event of primary barrier leakage, the liquefied gas ingress should be fully contained. This implies that functionality should be ensured through design and verification, rather than emphasizing absolute integrity.

(d) Relevant Provisions of the 1983 IGC Code: Measures to Maintain the Validity of Existing Designs

For ships constructed under the 1983 IGC Code, grandfathering provisions are recognized so that already approved designs and operational methods may maintain their validity. This ensures that the new interpretation will not be applied retroactively in a way that undermines the seaworthiness of existing ships.

In addition, the UI includes criteria for situations in which specific defect indications do not have to be regarded as actual defects, so that a variety of cases that may occur in actual operation can be flexibly accommodated. This UI is intended to ensure clear implementation of IGC Code 1.4.3.1, and procedures are underway for its formal adoption at MSC 111 in May 2026.

Other Matters Discussed

Amendments to the IMDG Code

At CCC 11, corrections to the 42nd edition of the IMDG Code and draft amendments for the 43rd edition were reviewed. Updates reflecting the latest UN Model Regulations (24th edition) included new definitions (e.g. single packaging), new dangerous goods (e.g. new peroxides), six new UN numbers (e.g. lithium and sodium batteries within cargo transport units, UN 3563–3564) with related stowage and segregation provisions, unification of lithium/sodium ion battery labeling under the "BATTERY MARK," and new requirements for FRP portable tank equipment.

The issue of transporting electric and hybrid vehicles as dangerous goods was discussed by the Informal Correspondence Group (ICG). However, due to variations in vehicle power sources, structural differences, and limited data, immediate regulatory amendments were deemed premature. For example, the 2022 proposal for 30% state-of-charge limit for EVs was redirected toward a system where shipment approval would depend on shippers' risk assessments, with amendments to special provisions SP961 and SP962. Ultimately, CCC 11 decided to refer this matter to E&T 43 for further review.

Amendments to the IMSBC Code

CCC 11 reviewed the E&T 41 report (proposed amendments IMSBC 08-25) and examined new schedules for mineral and chemical cargoes. For example, Including Bituminous aggregates (coarse and fine) in IMSBC's schedules was accepted in principle and will be incorporated into amendment 09-27. On the other hands, Proposal on PFAS-contaminated soils required further toxicological review and was deferred to E&T 44.

The proposal to publish unlisted solid bulk cargoes on the IMO GISIS website was also referred to E&T 44 for mechanism development. On lessons learned from fumigation-related cargo hold accidents, Several Member States supported a new output, which will be submitted as a new MSC agenda item. The oxygen-depletion risks associated with some mineral concentrates were also raised, but due to a lack of detailed assessment criteria, they have not yet been incorporated into the Code. All related matters were deferred to E&T 44 for final review and will be reported to CCC 12.

Amendments to the Guidelines for Preparation of Cargo Securing Manual Related to Lashing Software

The Sub-Committee discussed developing performance standards for permitting the use of lashing software as a supplementary means. Work was initiated to revise MSC.1/Circ.1353/Rev.2 and draft performance standards, but time constraints prevented completion. It was agreed to re-establish a correspondence group (CG) to continue developing performance standards for lashing software. It was also confirmed that making lashing software mandatory would require amendments to SOLAS, and Member States were encouraged to submit new outputs (proposals for SOLAS amendments) to the MSC. CCC 11 did not finalize the draft, and it was noted that further discussions will take place at upcoming CCC sessions.

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