Rules Relating to Rules for Classification of Ships using Low-Flashpoint Fules

2024. 2.

Machinery Rule Development Team

- Main Amendments -

(1) Reflecting Request for Revision of Classification Technical Rules 〈Ships for construction on or after 2024/01/01〉

◉ Res.MSC.458(101) : Amendments to IGF Code

Present	Amendment	Note
CHAPTER 9 FUEL SUPPLY TO CONSUMERS	**CHAPTER 9 FUEL SUPPLY TO CONSUMERS**	
Section 1 to Section 4 **〈omitted〉**	**Section 1 to Section 4** **〈same as the present〉**	
Section 5 Fuel Distribution Outside of Machinery Space	**Section 5 Fuel Distribution Outside of Machinery Space**	
501. Fuel distribution outside of machinery space	**501. Fuel distribution outside of machinery space**	
1. Where fuel pipes pass through enclosed spaces in the ship, they are to be protected by a secondary enclosure. This enclosure can be a ventilated duct or a double wall piping system. The duct or double wall piping system is to be mechanically underpressure ventilated with 30 air changes per hour, and gas detection as required in **Ch 15, 801.** is to be provided. Other solutions providing an equivalent safety level may also be accepted by the Society. **【See Guidance】**	**1.** Where fuel pipes pass through enclosed spaces in the ship, they are to be protected by a secondary enclosure. This enclosure can be a ventilated duct or a double wall piping system. The duct or double wall piping system is to be mechanically underpressure ventilated with 30 air changes per hour, and gas detection as required in **Ch 15, 801.** is to be provided. Other solutions providing an equivalent safety level may also be accepted by the Society. 【See Guidance】	
2. The requirement in **1** need not be applied for fully welded fuel gas vent pipes led through mechanically ventilated spaces.	**2.** The requirement in **1** need not be applied for fully welded fuel gas vent pipes led through mechanically ventilated spaces.	
〈Newly added〉	**3.** Liquefied fuel pipes are to be protected by a secondary enclosure able to contain leakages. If the piping system is in a fuel preparation room or a tank connection space, the Administration may waive this requirement. Where gas detection as required in **Ch 15, 801.1 (1)** is not fit for purpose, the secondary enclosures around liquefied fuel pipes are to be provided with leakage detection by means of pressure or temperature monitoring systems, or any combination thereof. The secondary enclosure is to be able to withstand the maximum pressure that may build up in the enclosure in case of leakage from the fuel piping. For this purpose, the secondary enclosure may need to be arranged with a pressure relief system that prevents the enclosure from being	
〈hereafter omitted〉	〈hereafter same as the present〉	

Present	Amendment	Note
CHAPTER 10 POWER GENERATION INCLUDING PROPULSION AND OTHER GAS CONSUMER	**CHAPTER 10 POWER GENERATION INCLUDING PROPULSION AND OTHER GAS CONSUMER**	
Section 1 to Section 2 〈omitted〉	**Section 1 to Section 2 〈same as the present〉**	
Section 3 Internal Combustion Engines of Piston Type	**Section 3 Internal Combustion Engines of Piston Type**	
301. General	**301. General**	
1. The exhaust system is to be equipped with explosion relief ventilation sufficiently dimensioned to prevent excessive explosion pressures in the event of ignition failure of one cylinder followed by ignition of the unburned gas in the system.	**1.** The exhaust system is to be equipped with explosion relief ventilation sufficiently dimensioned to prevent excessive explosion pressures in the event of ignition failure of one cylinder followed by ignition of the unburned gas in the system.	
〈newly added〉	(1) The exhaust system is to be equipped with explosion relief systems unless designed to accommodate the worst case overpressure due to ignited gas leaks or justified by the safety concept of the engine. A detailed evaluation of the potential for unburnt gas in the exhaust system is to be undertaken covering the complete system from the cylinders up to the open end. This detailed evaluation is to be reflected in the safety concept of the engine.“	
〈hereafter omitted〉	〈hereafter same as the present〉	

Guidance Relating to Rules for Classification of Ships using Low-Flashpoint Fules

2024. 2.

Machinery Rule Development Team

- Main Amendments -

(1) Reflecting Request for Revision of Classification Technical Rules 〈Ships for construction on or after 2024/01/01〉

◉ UI GF 13 (rev.1) : Fire Protection for FPR

(2) Reflecting Request for Revision of Classification Technical Rules 〈Ships for construction on or after 2024/07/01〉

◉ MSC.1/Circ.1667 IGF Code UI : Design of fuel preparation rooms not located on an open deck

◉ MSC.1/Circ.1670 IGF Code UI : Using the single common flange on fuel supply to gas consumers

Present	Amendment	Note
# CHAPTER 11 FIRE SAFETY ## Section 3 Fire Protection **301. Fire protection** **1.** In applying **301. 1** of this Rules, fire protection means structural fire protection, not including menas of escape. **2.** In applying **301. 1** of this Rules, enclosed spaces containing equipment for fuel preparation such as pumps or compressors or other potential ignition sources are to be provided with a fixed fire-extinguishing system complying with **Pt 8, Ch 8, 301. 1** of **Rules for the classification of steel ships,** the **FSS Code** and taking into account the necessary concentrations/application rate required for extinguishing gas fires. **【See Rules】** **3.** 〈omitted〉 〈hereafter omitted〉	# CHAPTER 11 FIRE SAFETY ## Section 3 Fire Protection **301. Fire protection** **1.** In applying **301. 1** of this Rules, fire protection means structural fire protection, not including menas of escape. **2.** ~~In applying **301. 1** of this Rules, enclosed spaces containing equipment for fuel preparation such as pumps or compressors or other potential ignition sources are to be provided with a fixed fire-extinguishing system complying with **Pt 8, Ch 8, 301. 1** of **Rules for the classification of steel ships,** the **FSS Code** and taking into account the necessary concentrations/application rate required for extinguishing gas fires.~~ Notwithstanding paragraph 1, any enclosed spaces containing equipment for fuel preparation such as pumps or compressors orf other potential ignition sources are to comply with **Ch 11 Sec 8 of Rules** 【See Rules】 **3.** 〈same as the present〉 〈hereafter same as the present〉	

Present	Amendment	Note
CHAPTER 5 SHIP DESIGN AND ARRANGEMENT **Section 4 to Section 7 〈omitted〉** **Section 8 Fuel Preparation Room** **801. Fuel preparation room 【See Rules】** **1. to 4.** 〈omitted〉 〈newly added〉	**CHAPTER 5 SHIP DESIGN AND ARRANGEMENT** **Section 4 to Section 7** **〈same as the present Guidance〉** **Section 8 Fuel Preparation Room** **801. Fuel preparation room 【See Rules】** **1. to 4.** 〈same as the present Guidance〉 **5.** The followings provides clarification on applying certain tank connection space requirements to the design of a fuel preparation room not located on an open deck. (1) Access Arrangements and Associated Hazardous Area (a) The bolted hatch requirement in **1101. 3** of the Rule and the associated Zone 2 hazardous area requirement in **Ch 12. 5. 503. 2** of the Rules do not apply to a fuel preparation room located below deck unless that space can also be defined as a tank connection space using the definition in **Ch 1. 102. 15. (3)** of the Rules. (b) A fuel preparation room opening into another enclosed space on the ship which is a non-hazardous space is required to be fitted with an airlock according to **1101. 2** of the Rules. (c) A fuel preparation room with direct access onto an open deck, or to a semi-enclosed space on deck, does not require an airlock. In the absence of an airlock, the area outside the door will be classified as a hazardous area according to **Ch 12. 502. 4** and **Ch 12. 503. 1** of the Rules. (2) Bilge Well Requirements (a) The bilge well requirements in **Ch 15. 301. 2** of the Rules only apply to a fuel preparation room located below deck if that fuel preparation room handles fuel in its liquid phase.	- Reflecting MSC.1/Circ.1667 Revision of IGF Code about the Guidance for design of Fuel Preparation Room not located on an open deck.

Present	Amendment	Note
CHAPTER 9 FUEL SUPPLY TO CONSUMERS **〈Newly added〉**	**CHAPTER 9 FUEL SUPPLY TO CONSUMERS** **Section 2 Functional Requirements** **201. Functional Requirements 【See Rules】** **1.** In applying **201. 2, 601. 1,** and **Ch 7. 306. 3** of the Rules, two independent safety barriers are to be in place, while, as far as practicable, using a minimum of flange connections. There is no single common flange or other component where one single failure itself overcome both primary and secondary barriers and result in a gas leak into the surrounding area causing danger to the persons on board, the environment or the ship. A single common flange (with two sealing systems) is accepted at the fuel connection to the gas consumers including GCUs, boilers and components on the engine, such as gas regulating units.	- In applying MSC. 1/Circ. 1670 about using the single common flange on fuel supply to gas consumers.

Guidance Relating to Rules for Classification of Ships using Low-Flashpoint Fuels

(Development Review : External Opinion Inquiry)

Feb. 2024

Machinery Rule Development Team

- Main Amendments -

(1) Reflecting MSC Circular 〈Ships for construction on or after 2024/07/01〉

◉ Added Annex 6 to reflect MSC.1/Circ.1666(INTERIM GUIDELINES FOR THE SAFETY OF SHIPS USING LPG FUELS)

Present	Amendment	Note
CHAPTER 1 GENERAL **Section 1 General** **〈newly added〉** **102. 〈omitted〉**	**CHAPTER 1 GENERAL** **Section 1 General** **101. Application** **1.** In applying **101. 1** of this **Rules**, **Annex 6** applies to ships using LPG as fuels. *(2024)* **102. 〈same as the present〉**	

Annex 6 Requirements for Ships Using LPG Fuels *(2024)*

Section 1 General

101. Application

1. The requirements of this **Annex** apply to ships using LPG fuels.
2. The requirements of this **Annex** are prescribed in addition to the requirements in the **Rules for the Classification of Ships Using Low-flashpoint Fuels.** Except where specially required in this **Annex**, the relevant requirements in the **Rules** are to be applied. (The terms 'LNG' and 'natural gas' are to be construed as 'LPG' respectively.)

102. Definitions

Except where specified in this **Annex**, the relevant definitions in **Rules for the Classification of Ships Using Low-flashpoint Fuels** (hereafter referred to "this **Rules**") and **Pt 8** of **Rules for the classification of steel ships** are to be applied.

1. **LPG** means liquefied petroleum gas. It is mainly composed of propane, butane or a mixture of propane (C_3H_8) and butane (C_4H_{10}). In this **Annex** , not only liquid but also gaseous petroleum gas is referred to as LPG. However, when it is necessary to distinguish between the liquid state and the gas state, LPG in the liquid state is referred to as LPG liquid, and LPG in the gaseous state is referred to as LPG gas.
2. **Fuel** in this **Annex** means LPG.
3. **Autoignition temperature** means the lowest temperature at which it spontaneously ignites in normal atmosphere without an external source of ignition, such as a flame or spark.
4. **Gas dispersion analysis** means the analysis of the dispersion behavior of gases using appropriate modeling techniques such as computational fluid dynamics (CFD) analysis.
5. **Ventilation analysis** means the analysis of the ventilation efficiency of a space performed using appropriate modeling techniques such as computational fluid dynamics (CFD) analysis.
6. **Degree of dilution** means a measure of the ability of ventilation or atmospheric conditions to dilute a release to a safe level. The degree of dilution is defined as high ventilation, medium ventilation, and low ventilation. (See **IEC 60079-10-1, 6.5.4**)

103. Alternative design

1. This **Annex** contains functional requirements for all appliances and arrangements related to the usage of LPG fuels.
2. Appliances and arrangements of LPG fuels systems may deviate from those set out in this **Annex**, provided such appliances and arrangements meet the intent of the goal and functional requirements concerned and provide an equivalent level of safety to the relevant sections.
3. **Ch 1, 103. 3** of this **Rules** is to be applied.

Section 2 Goal and Functional Requirements

201. Goal

Ch 2, 101. of this **Rules** is to be applied.

202. Functional requirements

Ch 2, 201. of this **Rules** is to be applied.

Section 3 General Requirements

301. Goal

Ch 3, 101. of this **Rules** is to be applied.

302. Risk assessment

In addition to **Ch 3, 201.** of this **Rules,** risk assessment is also addressed **508. 1, 603. 2, 1004. 1, 1303. 2 (1), 1304.** and **1504. 1.**

303. Limitation of explosion consequences

Ch 3, 301. of this **Rules** is to be applied.

Section 4 Classification and Surveys

401. General

1. Classification and surveys are to be complied with applicable requirements in this **Section**.
2. In the case of items not specified in this Chapter, the requirements specified in **Pt 1** of **Rules for the classification of steel ships** are to be applied.

402. Class notation

Ships satisfying the requirements of this Part may be given a notation LFFS (DF-LPG, SF-LPG) as additional special feature notations.

403. Maintenance of classification

1. Ships classed with the Society are to be subjected to the surveys to maintain the classification and are to be maintained in good condition in accordance with the requirements specified in this **Section**.
2. Plans and particulars of any proposed alterations to the approved scantlings or arrangements of hull, machinery or equipment are to be submitted for approval by the Society before the work is commenced and such alterations are to be Surveyed by the Society.

404. Classification Survey during Construction.

1. General

At the Classification Survey during Construction, the hull, machinery and equipment are to be examined in detail in order to ascertain that they meet the relevant requirements of this **Annex**. When it is intended to obtain a surveys for alterations, plans and documents equivalent to the survey during construction are to be submitted to the Society for the approval before the work is commenced.

2. Plan and Documents

For a ship in which LPG-fuelled engine installations are installed, plans and documents, specified below **3** and **4**, are to be submitted and approved before the work is commenced. And, the Society, where considered necessary, may require further plans and documents other than those specified below.

3. Plan and data for approval

In addition to **Ch 4, 203. 3** of this **Rules**, the following plans and documents are to be submitted.
(1) detailed drawings of vent mast including head
(2) arrangement of ventilation duct in hazardous area
(3) detailed layout of the gas detector
(4) route of outer pipes and ducts of fuel pipe and location of their ventilation outlets and outlets

4. Plans and documents for reference

In addition to **Ch 4, 203. 4** of this **Rules**, the following plans and documents are to be submitted.

(2) data of ventilation analysis and dispersion analysis performed in accordance with requirements in this **Annex.**
(3) risk assessment data according to **302.**.

405. Periodical Surveys

Ch 4, Sec 3 of this **Rules** is to be applied.

Section 5 Ship Design and Arrangement

501. Goal

Ch 5, 101. of this **Rules** is to be applied.

502. Functional requirements

Ch 5, 201. of this **Rules** is to be applied.

503. General Requirements

Unless expressly provided otherwise, **Ch 5** of this **Rules** is to be applied.

504. Arrangement of machinery space

In addition to **Ch 5, 401.** of this **Rules**, a single failure of fuel systems should not lead to a gas release in the machinery space, i.e. only gas-safe machinery space concept in accordance with **Ch 5, 501.** of this **Rules** should be accepted.

505. ESD-Protected Machinery Spaces

ESD protected machinery space concept is not be permitted. ESD-protected machinery spaces may be permitted, provided that the requirements of alternative design (SOLAS II-1/55) are met to the approval of the Society.

506. Location and protection of fuel piping

In addition to the requirements in **Ch 5, 701**. of this **Rules**, the followings are to be applied :

1. Double barrier around fuel piping systems are continuous and not have openings in machinery spaces.

507. Bilge Systems

In addition to **Ch 5, 901**. of this **Rules**, and the following provisions are to be applied.

1. The bilge systems in the hazardous area are to be arranged separately for each space and discharged overboard or to an enclosed tank fitted with a gas detector. Where bilge piping of two or more hazardous area is connected, means are to be provided to prevent the gas in one area from entering through bilge pipes the connected bilge pipes into other areas.

508. Drip Trays

In addition to the requirements in **Ch 5, 1001.** of this **Rules**, the followings are to be applied :

1. Drip trays containing fuel spill are to be equipped with means to detect leakage and shut off the fuel if required by the risk assessment.

2. **Ch 5, 1001. 3** is not applicable for ships using LPG fuels.

509. Outlets of vent pipe and pressure relieving systems

1. LPG gas line from the followings is to be led to a vent mast.
(1) the pressure relief valve of the tank, and
(2) vent lines and bleed lines for gas fuel systems

2. LPG liquid line from the followings is to be led to a fuel tank. Special consideration is to be given to the fuel tank of refrigerated type other than a fully pressurized type. Where it is not practicable, the line may be led to a vent mast provided that LPG liquid is not released to the atmosphere.
   (1) the pressure relief valve of the liquid fuel supply pipe,
   (2) vent line and bleed line of liquid fuel supply piping, and
   (3) pressure relief valve in bunkering line

Section 6 FUEL CONTAINMENT SYSTEM

601. Goal

Ch 6, 101. of this **Rules** is to be applied.

602. Functional requirements

In addition to the requirements in **Ch 6, 201.** of this **Rules**, the followings are to be applied :

1. The fuel containment arrangement is to be designed considering for various characteristics for all possible composition of the LPG.

603. General Requirements

Unless expressly provided otherwise, **Ch 6** of this **Rules** is to be applied.

1. In applying **Ch 6, 301. 1** of this **Rules**, this provision is not applicable for ships using LPG fuels.
2. In applying **Ch 6, 301. 4** of this **Rules**, for the fuel tank located in enclosed space, a tank connection space is to be provided separately from a fuel storage hold space. For the fuel tank located on open deck, a tank connection space is also to be provided where escaped gas may accumulate on open deck or enter in non-hazardous area such as accommodation space and machinery space based on the risk assessment.

604. Liquefied gas fuel containment

In addition to the requirements in **Ch 6, 402.** of this **Rules**, the followings are to be applied :

1. In applying **Ch 6, 402. 1** of this **Rules**, no secondary barrier is required where the fuel temperature at atmospheric pressure is at or above −10°C.
2. In applying **Ch 6, 402. 1** of this **Rules**, where the fuel temperature at atmospheric pressure is not below −55°C, the hull structure may act as a secondary barrier.

605. Compressed Petroleum Gas Fuel Containment

As storage in compressed gas form is not applicable for LPG, **Ch 6, Sec 6** of this **Rules** is not applied.

606. Pressure Relief System

In addition to the requirements in **Ch 6, 701.** of this **Rules**, the followings are to be applied :

1. In applying **Ch 7, 702. 7 (1)** of this **Rules**, the vapour discharge is to be directed vertically upwards in the form of unimpeded jets. vent exits should be so located that the following are ensured. According to a gas dispersion analysis, if required by the risk assessment.
   (1) escaped gas does not escape to non-hazardous area through the opening around the vent exit,
   (2) escaped gas does not accumulated on open deck and,
   (3) escaped gas does not form flammable atmosphere in the way of exhaust gas outlet and other ignition source.

Section 7 MATERIAL AND GENERAL PIPE DESIGN

Ch 7 of this **Rules** is to be applied.

Section 8 BUNKERING

801. Goal

Ch 8, 101. of this **Rules** is to be applied.

802. Functional requirements

In addition to the requirements in **Ch 8, 201.** of this **Rules**, the followings are to be applied :

1. Bunkering systems are to be suitable temperature, pressure and composition of all expected LPG fuels.
2. Means are to be provided to manage vapour generated during bunker transfer. Where means of vapour management are not provided, vapour return connection is to be fitted at bunkering manifold.

803. General Requirements

Unless expressly provided otherwise, **Ch 8** of this **Rules** is to be applied.

1. In applying **Ch 8, 301. 6** of this **Rules**, this provision is not applicable for ships using LPG as fuel.

Section 9 FUEL SUPPLY TO CONSUMERS

901. Goal

Ch 9, 101. of this **Rules** is to be applied.

902. Functional requirements

In addition to the requirements in **Ch 9, 201.** of this **Rules**, the followings are to be applied :

1. Fuel supply systems are to be able to supply fuel at the required pressure, temperature and flow rate.
2. Where fuel supply systems supply LPG in the liquid phase, purging, drain, vent and leakage are to be subject to special consideration to provide an equivalent level of safety of fuel in the gas phase.

903. General Requirements

Unless expressly provided otherwise, **Ch 9** of this **Rules** is to be applied.

904. Safety Functions of Gas Supply System

Unless expressly provided otherwise, **Ch 9, 401.** of this **Rules** is to be applied.

1. In applying **Ch 9, 401. 4** (1) of this **Rules**, where fuel supply systems supply LPG in the liquid state, relevant bleed lines should be led to the fuel tank or gas-liquid separator or similar device to prevent LPG liquid from being released to the atmosphere.
2. In applying **Ch 9, 401. 7** of this **Rules**, where fuel supply systems supply LPG in the liquid state, vent lines should be led to the fuel tank or gas-liquid separator or similar device.
3. In applying **Ch 9, 401. 10** of this **Rules,** this provision is not applicable for ship using LPG fuels.

905. Fuel Supply to Consumers in ESD-protected Machinery Spaces

As ESD protected machinery space concept is not be permitted, **Ch 9, Sec 7** of this **Rules** is not applied.

906. Design of Ventilated Duct, Outer Pipe Against Inner Pipe Gas Leakage

1. **Ch 9, 801.** of this **Rules** is to be applied.
2. In addition to the requirements in **Ch 9, 802.** of this **Rules**, the followings are to be applied :
   (1) In applying **Ch 9, 802. 1** (2) of this **Rules**, most conservative value is to be selected for k considering expected composition of fuel.
3. **Ch 9, 803.** of this **Rules** is to be applied.
4. **Ch 9, 804.** of this **Rules** is to be applied.

Section 10 POWER GENERATION INCLUDING PROPULSION AND OTHER GAS CONSUMER

1001. Goal

Ch 10, 101. of this **Rules** is to be applied.

1002. Functional requirements

In addition to the requirements in **Ch 10, 201.** of this **Rules**, the followings are to be applied :

1. Fuel consumers should be suitably designed for operation with possible compositions of LPG fuels.

1003. General Requirements

Unless expressly provided otherwise, **Ch 10** of this **Rules** is to be applied.

1004. Gas Turbines

In addition to the requirements in **Ch 10, 501.** of this **Rules**, the followings are to be applied :

1. In applying **Ch 10, 501. 2** of this **Rules**, the gas turbine is to be fitted in a gas-tight enclosure arranged in accordance with the ESD principle outlined in this **Rules.** Gas leakage in the gas-tight enclosure and the consequence are to be evaluated based on the risk assessment.

Section 11 FIRE SAFETY

1101. Goal

Ch 11, 101. of this **Rules** is to be applied.

1102. Functional requirements

Ch 11, 201. of this **Rules** is to be applied.

1103. General Requirements

Unless expressly provided otherwise, **Ch 11** of this **Rules** is to be applied.

1104. Fire Protection

In addition to the requirements in **Ch 11, 301.** of this **Rules**, the followings are to be applied :

1. In applying **Ch 11, 301. 3** of this **Rules**, the fuel preparation room is to be separated from a machinery space of category A and rooms with high fire risks. The separation is to be done by a cofferdam of at least 900 mm with insulation of A-60 class.

1105. Fixed fire-extinguishing system

Fuel preparation rooms are to be provided with a fixed fire-extinguishing system complying with the provisions of the FSS Code and taking into account the necessary concentrations/application rate required for extinguishing gas fires.

Section 12 FIRE SAFETY

1201. Goal

Ch 12, 101. of this **Rules** is to be applied.

1202. Functional requirements

Ch 12, 201. of this **Rules** is to be applied.

1203. General Requirements

Ch 12, 301. of this **Rules** is to be applied.

1204. Area classification

In addition to **Ch 12, 401.** of this **Rules**, the followings are to be applied :

1. In applying **Ch 12, 401. 2** of this **Rules**, classification of hazardous area are to be subject to special consideration from the aspect that LPG gas is heavier than air. **IEC 60079-10-1** may be referred if necessary.

Section 13 VENTILATION

1301. Goal

Ch 13, 101. of this **Rules** is to be applied.

1302. Functional requirements

Ch 13, 201. of this **Rules** is to be applied.

1303. General Requirements

Unless expressly provided otherwise, **Ch 13** of this **Rules** is to be applied.

1. Ventilation of hazardous spaces

In addition to **Ch 13, 301.** of this **Rules**, the followings are to be applied;

(1) The number and location of the ventilation outlets in each space are to be considered taking into account the size, layout of the space. Where bottom arrangements are complicated, it is to be demonstrated based on ventilation analysis that capacity and duct arrangements of ventilation are adequate for the space.

2. Air inlets for hazardous enclosed spaces

In addition to **Ch 13, 305.** of this **Rules**, the followings are to be applied;

(1) Air outlets and air inlets for hazardous enclosed spaces are to be arranged to prevent exhausted gas from re-entering to the space through air inlets, based on the risk assessment in accordance with **302.** of this **Annex** and the satisfaction of the Society.

3. Required capacity of the ventilation plant

In addition to **Ch 13, 308.** of this **Rules**, the followings are to be applied;

(1) When determining the required ventilation capacity, special consideration is to be given to the density and lower explosion limit (LEL) of LPG gas, which is to be supported by numerical calculations such as CFD analysis.

1304. Tank Connection Space

In addition to **Ch 12, Sec 4** of this **Rules**, approved automatic fail-safe fire dampers are to be fitted in the ventilation trunk for the tank connection space, fuel preparation room or any other space as deemed necessary by a risk assessment and to the satisfaction of the Society.

1305. Machinery Spaces

Ch 13, Sec 5 of this **Rules** is to be applied. The provisions in **501. 2,, 501. 3** and **501. 4** of this **Rules** do not apply to ships using LPG as fuel.

1306. Ducts and Double Pipes

In addition to **Ch 13, 801.** of this **Rules**, the followings are to be applied :

1. In applying **Ch 13, 801. 3** of this **Rules**, The ventilation inlets for the double wall piping and ducts are always to be located in a non-hazardous open area away from ignition sources. The inlet opening should be fitted with a suitable wire mesh guard and protected from ingress of water.

Section 14 ELECTRICAL INSTALLATIONS

1401. Goal

Ch 14, 101. of this **Rules** is to be applied.

1402. Functional requirements

Ch 14, 201. of this **Rules** is to be applied.

1403. General Requirements

In addition to **Ch 14, 301.** of this **Rules**, the followings are to be applied :

1. In applying **Ch 14, 301. 3** of this **Rules**, equipment for hazardous areas is to be of a certified safe type appropriate for compositions of LPG in accordance with **IEC 60079-20**. **IEC 60079-20** classifies the temperature class and equipment groups for propane and butane as the followings;

	Temperature class	Equipment group
Propane	T2	IIA
Butane	T2	IIA

Section 15 CONTROL, MONITORING AND SAFETY SYSTEMS

1501. Goal

Ch 15, 101. of this **Rules** is to be applied.

1502. Functional requirements

Ch 15, 201. of this **Rules** is to be applied.

1503. General Requirements

Unless expressly provided otherwise, **Ch 15** of this **Rules** is to be applied.

1504. Gas Detection

In addition to **Ch 15, 801.** of this **Rules**, the followings are to be applied :

1. In addition to **Ch 15, 801. 1** of this **Rules**, permanently installed gas detectors are to be fitted at the below following spaces, unless it unnecessary based on a risk assessment.

   (1) Ventilation inlets of bunkering station, accommodation, machinery spaces and other rooms with

high fire risk, as defined in section 2 of the annex to **MSC.1/Circ.1591.**

Section 16 Manufacture, Workmanship and Testing

Ch 16 of this **Rules** is to be applied.

Section 17 Training, Drills and Emergency Exercises

Ch 17 of this **Rules** is to be applied.

Section 18 Operation

Ch 18 of this **Rules** is to be applied.

Section 19 Requiremens for LPG Fuel Ready

1901. General

1. Application

(1) This Guidance applies to ships which are prepared for conversion with the design or the partial installation related with LPG fuel during the new building phase(hereafter referred to as "LPG fuel ready ships" in the Guidance) for the purpose of a conversion from a ship using conventional marine fuels to LPG fuel after delivery.

(2) This Guidance contains levels of readiness for use of LPG as fuel(hereafter referred to as "LPG fuel ready levels" in the Guidance) and requirements applicable thereto, and the scope of preparation is defined by the agreement between the shipowner and the shipbuilder.

(3) The design and the installation of LPG fuel systems of LPG fuel ready ships are to apply this Guidelines in force at the time of contract for construction for the new-building. However, where a LPG fuel ready ship in accordance with this Guidance is converted to a LPG fuelled ship after delivery, the ship shall comply with this Guidelines in force at the time of the ship conversion.

2. LPG fuel ready levels

(1) LPG fuel ready levels are defined in 2 steps as follows:
(a) The level of preparing the generic design
(b) The level of installing parts of the systems with the detailed design in addition to above (1)

(2) The class notations defined in **1902.** may be assigned where the ready level in **1901. 1** is in compliance with this **Annex**.

1902. Class Notation

The class notations specified below may be assigned according to the LPG fuel ready level and the requirements for the class notations are to comply with **1903.** of this **Annex.**

1. LPG Ready D

(1) LPG Ready D as an additional special feature notation may be assigned to ships for which the generic design is prepared.

(2) LPG Ready D is not to be assign to ships having LPG Ready I.

2. LPG Ready I

(1) LPG Ready I as an additional special feature notation may be assigned to ships for which parts

of the systems are installed with the detailed design in addition to the generic design.

(2) In assignment of the LPG Ready I, the characters corresponding to the installed items may be assigned in the bracket one or a combination of them in addition to LPG Ready I. The characters corresponding to the installed items are as follows:

(A) Hull structural reinforcement for LPG fuel tank - SR
(B) LPG fuel tank - FT
(C) LPG fuel tank venting systems - TV
(D) LPG fuel supply systems - FS
(E) LPG fuel bunkering systems - BS
(F) LPG fired main engines - ME
(G) LPG fired auxiliary engines - AE
(H) LPG fired boilers - B
(I) Main engines that can be converted to LPG fuel operation - ME-C
(J) Auxiliary engines that can be converted to LPG fuel operation - AE-C
(K) Boilers that can be converted to LPG fuel operation - B-C

For example, LPG Ready I(SR, FT) may be assigned to the ship on which structural reinforcement for LPG fuel tank and LPG fuel tank are installed, and LPG Ready I(FS, ME) may be assigned to the ship on which LPG fuel supply systems and LPG fired main engines are installed.

1903. Requirements for Levels of LPG Fuel Ready

This Guidance prescribes plans to be submitted and systems to be installed. The design and installation of structures and systems are to be in accordance with applicable requirements in this **Annex**.

1. General Level of Preparing Generic Design(LPG Ready D)

(1) This Section prescribes plans and documents to be submitted for LPG Ready D. The detail requirements for designs are to be in accordance with applicable requirements in this **Annex**.

(2) The plans and documents required in this Section is to be marked "LPG Ready" to separate them from the normal plans and documents of new building.

(3) Where parts of plans and documents required in this Section are not available, alternative documents may be accepted by the Society's review.

(4) The following plans and documents are to be submitted to the Society for review.

(A) General arrangement plans showing location of:
  (a) Machinery spaces, accommodation, service and control station spaces
  (b) LPG fuel containment systems
  (c) fuel preparation room
  (d) LPG fuel piping routing with shore connections
  (e) Tank hatches, ventilation pipes and any other openings to the LPG fuel tanks
  (f) Ventilating pipes, doors and openings to fuel preparation room and other hazardous areas
  (g) Entrances, air inlets and openings to accommodation, service and control station spaces
  (h) Hazardous areas of zone 0, 1 and 2

(B) Following plans and data of the LPG fuel containment system:
  (a) LPG fuel tank type, dimension and volume
  (b) Drawings of support and staying of LPG fuel tanks
  (c) LPG fuel tank arrangement including tank connection space
  (d) Specification of design loads and structural analysis for the LPG fuel tank supporting structure
  (e) Drawing and specification of LPG fuel tank thermal insulation with heat transfer calculation

(C) Following plans and data of LPG fuel supply systems:
  (a) Arrangement of engine room, fuel preparation room and other spaces containing LPG equipment
  (b) LPG fuel supply piping diagram
  (c) Ventilation system arrangement of engine room, fuel preparation room and other spaces containing LPG equipment

(D) Following plans and data of LPG fuel bunkering systems:
  (a) Arrangement of LPG fuel bunkering systems
  (b) LPG fuel bunkering piping diagram
  (c) Ventilation system arrangement of LPG fuel bunkering station

(E) Following plans and particulars for the safety relief valves
  (a) Arrangement for LPG fuel tank relief valves and associated ventilation piping
  (b) Calculation of required LPG fuel tank relief valve capacity
(F) Following plans and data for equipment and systems regarding fire protection :
  (a) Arrangement of construction for fire protection in relation to LPG fuel tank and other spaces containing LPG equipment
  (b) Arrangement and specification of water spray system
  (c) Arrangement and specification of dry chemical powder installation
(G) Data for a risk analysis according to **302.** of this **Annex**.
(H) Stability calculations with LPG fuel tanks included
(I) Longitudinal strength calculations with LPG fuel tanks included

2. Level of Installing Parts of Systems(LPG Ready I)

(1) This Section prescribes parts of the systems to be installed and plans and documents to be submitted for LPG Ready I. The detail requirements for designs and installation of installed systems are to be in accordance with applicable requirements in this **Annex**.
(2) The plans and documents for generic design required in **1903. 1** of this **Annex**. are to be submitted and reviewed by the Society except those required for approval in **1903. 2 (5)** to **(9)** of this **Annex**.
(3) Parts of the systems are categorized in the follows:
  (A) Hull structural reinforcement for LPG fuel tank
  (B) LPG fuel tank
  (C) LPG fuel tank venting systems
  (D) LPG fuel supply systems
  (F) LPG fuel bunkering systems
  (G) LPG fired main engines
  (H) LPG fired auxiliary engines
  (I) LPG fired boilers
  (J) Main engines that can be converted to LPG fuel operation
  (K) Auxiliary engines that can be converted to LPG fuel operation
  (L) Boilers that can be converted to LPG fuel operation
(4) The parts which are installed on board are to be reflected in the normal plans of new building and "LPG Ready" is not to be marked on those plans.

(5) Hull structural reinforcement for LPG fuel tank

(A) The structures below the LPG fuel tanks are to be reinforced in accordance with **Sec 5** of this **Annex**.
(B) The following plans and documents are to be submitted to the Society for approval.
  (a) Detail drawing of LPG fuel tanks and support of LPG fuel tanks
  (b) Material specification for tank support and steel grade selection for the hull in way of the tank
  (c) Welding procedures, stress relieving procedures and non-destructive testing plans
  (d) Specification of design loads and structural analysis for the LPG fuel tank supporting structure
  (e) Drawing and specification of LPG fuel tank thermal insulation with heat transfer calculation

(6) LPG fuel tank

(A) LPG fuel tanks are to be installed in accordance with **Sec 3** and **Sec 6** of this **Annex**.
(B) The plans and documents in **404. 3** and **4** of this **Annex** and LPG fuel tank arrangement including tank connection space are to be submitted to the Society for approval.

(7) LPG fuel tank venting system

(A) LPG fuel tank venting systems are to be installed in accordance with **Sec 3** and **Sec 6** of this **Annex**.
(B) The plans and documents in **404. 3** and **4** of this **Annex** are to be submitted to the Society for approval.

(8) LPG fuel supply systems

(A) LPG fuel supply systems are to be installed in accordance with **Sec 7** and **Sec 9** of this **Annex**.
(B) The following plans and documents are to be submitted to the Society for approval.
  (a) Arrangement of engine room, fuel preparation room and other spaces containing LPG equipment
  (b) Ventilation system arrangement of engine room, fuel preparation room and other spaces

containing LPG equipment
(c) Drawings and specifications of LPG supply piping
(d) Drawings and specifications of offsets, loops, bends and mechanical expansion joints, such as bellows, slip joints(only inside tank) or similar means in the LPG piping
(e) Drawings and specifications of flanges, valves and other fittings in the LPG piping system. For valves intended for piping systems with a design temperature below − 55 °C, documentation for leak test and functional test at design temperature (type test) is required
(f) Documentation of type tests for expansion components in the LPG piping system.
(g) Specification of materials, welding, post-weld heat treatment and non-destructive testing of LPG piping
(h) Specification of pressure tests (structural and tightness tests) of LPG piping
(i) Program for functional tests of all piping systems including valves, fittings and associated equipment for handling LPG (liquid or vapour)
(j) Drawings and specifications of insulation for low temperature piping where such insulation is installed
(k) Specification of electrical bonding of piping
(l) Cooling or heating water system in connection with LPG fuel system, if fitted.

(9) LPG fuel bunkering systems

(A) LPG fuel bunkering systems are to be installed in accordance with **Sec 7** and **Sec 8** of this **Annex**.
(B) The following plans and documents are to be submitted to the Society for approval.
(a) Arrangement of LPG fuel bunkering systems
(b) Ventilation system arrangement of LPG fuel bunkering station
(c) Drawings and specifications of LPG supply piping
(d) Drawings and specifications of offsets, loops, bends and mechanical expansion joints, such as bellows, slip joints(only inside tank) or similar means in the LPG piping
(e) Drawings and specifications of flanges, valves and other fittings in the LPG piping system. For valves intended for piping systems with a design temperature below −55 °C, documentation for leak test and functional test at design temperature (type test) is required
(f) Documentation of type tests for expansion components in the LPG piping system.
(g) Specification of materials, welding, post-weld heat treatment and non-destructive testing of LPG piping
(h) Specification of pressure tests (structural and tightness tests) of LPG piping
(i) Program for functional tests of all piping systems including valves, fittings and associated equipment for handling LPG (liquid or vapour)
(j) Drawings and specifications of insulation for low temperature piping where such insulation is installed
(k) Specification of electrical bonding of piping
(l) Specification of means for removal of liquid contents from bunkering pipes prior to disconnecting the shore connection
(l) Cooling or heating water system in connection with LPG fuel system, if fitted.

(10) LPG fired main engines

Main engines are to be installed in accordance with **Sec 10** of this **Annex**.

(11) LPG fired auxiliary engines

Auxiliary engines are to be installed in accordance with **Sec 10** of this **Annex**.

(12) LPG fired boilers

Boilers are to be installed in accordance with **Sec 10** of this **Annex**.

(13) Main engines that can be converted to gas fuel operation

(A) Main engines of gas-convertible types are to be installed.
(B) Following plans are to be submitted for reference:
(a) details of the gas conversion
(b) list of the components that need to be replaced
(c) list of new components

(14) Auxiliary engines that can be converted to gas fuel operation

(A) Auxiliary engines of gas-convertible types are to be installed.
(B) Following plans are to be submitted for reference:
(a) details of the gas conversion
(b) list of the components that need to be replaced

(c) list of new components

(15) Boilers that can be converted to gas fuel operation

(A) Boilers of gas-convertible types are to be installed.

(B) Following plans are to be submitted for reference:

(a) details of the gas conversion

(b) list of the components that need to be replaced

(c) list of new components

3. Survey

(1) Classification survey during construction

Systems are to be tested at the shops of manufacturer and after installation on board in accordance with this **Annex**.

(2) Periodical survey

In application of this Guidance, the general condition of the relevant systems installed on board is to be examined visually at periodical surveys for the vessels having LPG Ready I notation. The systems are to be surveyed and evaluated for the condition at time of conversion, and the scope of test will be defined depending on time elapsed from new building and maintenance level of the systems. ⚓

Amendments of Guidance relating to the Rules for the Classification of Ships Using Low-flashpoint Fuels

(External Opinion Inquiry)

2024. 01.

Hull Rule Development Team

- Main Amendments -

(1) Effective Date : 1 July 2024(construction contract date)

◉ Reflecting the agreement of CCC 9 (*criteria for the protrusion of suction wells of fuel tank)

- New requirements for the arrangement of suction wells of fuel tanks in Ch 5, 302.

◉ Reflecting MSC.1/Circ.1667 (UI regarding fuel preparation rooms not located on an open deck)

- New design requirements for fuel preparation rooms not located on an open deck in Ch 5, 801., 5.

◉ Reflecting the Machinery Rule Development Team received Revision request (GCH4800-51-2023, Revision of Non-Destructive Testing Requirements for Independent Tank Type C)

- Revision of non-destructive testing methods and criteria for independent tank Type C in Ch 16, 306. (Align Part 2, Appendix 2-7 of the Rules for the Classification of Steel Ships)

◉ Reflecting the results of internal review (revision of fuel tank types to do cold spot inspection)

- Revision of the requirements for fuel tank to carry out cold spot inspection in Ch 16, 501 - Excluding internally insulated tanks and independent tank Type C.

Present	Amendment	Note
CHAPTER 5 SHIP DESIGN AND ARRANGEMENT	CHAPTER 5 SHIP DESIGN AND ARRANGEMENT	
〈newly added〉	Section 3 Arrangement of Fuel Tanks 302. Location of fuel tanks 1. In applying **302.** of this Rules, for vessels with suction wells installed in fuel tanks, the bottom of the suction well may protrude into the vertical extent of the minimum distance specified in **302. 1** (5), provided that such wells are as small as practicable and the protrusion below the inner bottom plating does not exceed 25 % of the depth of the double bottom or 350 mm, whichever is less.	- Reflect the consensus CCC.9(draft amendment of IGF Code)
Section 4 ~ 7 〈omitted〉	Section 4 ~ 7 〈omitted〉	

Present	Amendment	Note
Section 8 Fuel Preparation Room	**Section 8 Fuel Preparation Room**	
801. Fuel preparation room 【See Rules】	**801. Fuel preparation room** 【See Rules】	
1. Fuel preparation rooms, regardless of location, is to be arranged to safely contain cryogenic leakages.	**1.** Fuel preparation rooms, regardless of location, is to be arranged to safely contain cryogenic leakages.	
2. The material of the boundaries of the fuel preparation room is to have a design temperature corresponding with the lowest temperature it can be subjected to in a probable maximum leakage scenario unless the boundaries of the space, i.e. bulkheads and decks, are provided with suitable thermal protection.	**2.** The material of the boundaries of the fuel preparation room is to have a design temperature corresponding with the lowest temperature it can be subjected to in a probable maximum leakage scenario unless the boundaries of the space, i.e. bulkheads and decks, are provided with suitable thermal protection.	
3. The fuel preparation room is to be arranged to prevent surrounding hull structure from being exposed to unacceptable cooling, in case of leakage of cryogenic liquids.	**3.** The fuel preparation room is to be arranged to prevent surrounding hull structure from being exposed to unacceptable cooling, in case of leakage of cryogenic liquids.	- Reflect the amendment of IGF Code(RESOLUTION MSC.458(101))
4. The fuel preparation room is to be designed to withstand the maximum pressure build up during such a leakage. Alternatively, pressure relief venting to a safe location (mast) can be provided. ⚓	**4.** The fuel preparation room is to be designed to withstand the maximum pressure build up during such a leakage. Alternatively, pressure relief venting to a safe location (mast) can be provided.	
〈newly added〉	**5.** certain tank connection space requirements to the design of a fuel preparation room not located on an open deck in compliance with **801.** of this Rules is as follows. (1) Access Arrangements and Associated Hazardous Areas (A) The bolted hatch requirement in **1101. 3** of this Rules and the associated Zone 2 hazardous area requirement in **Ch 12, 503. 2** of Rules do not apply to a fuel preparation room located below deck unless that space can also be defined as a tank connection space using the definition in **Ch 1, 102. 15** (3) of this Rules. (B) A fuel preparation room opening into another enclosed space on the ship which is a non-hazardous space is required to be fitted with an airlock according to **1101. 2** of this Rules. (C) A fuel preparation room with direct access onto an open deck, or to a semi-enclosed space on deck, does not require an airlock. In the absence of an airlock, the area outside the door will be classified as a hazardous area according to **Ch 12, 502. 4** and **503. 1** of this Rules. (2) Bilge Well Requirements (A) The bilge well requirements in **Ch 15, 301. 2** of this Rules only apply to a fuel preparation room located below deck if that fuel preparation room handles fuel in its liquid phase. ⚓	

Present	Amendment	Note
CHAPTER 16 MANUFACTURE, WORKMANSHIP AND TESTING **Section 1 ~ 2 〈omitted〉** **Section 3 Welding of Metallic Materials and Non-destructive Testing for the Fuel Containment System** 301. ~ 305. 〈omitted〉 306. Non-destructive testing 【See Rules】 1. In applying 306. 1 of this Rules, The following requirements (1) through (4) are to apply as the testing procedures. (1) For radiographic tests, the test may be in accordance with the requirements in KS B 0845, ISO 2437, ISO 2504 and ISO/R1027 where the acceptance criteria are to be KS Grade 2 or higher. In the case of KS Grade 3, acceptance is left to the discretion of the Society in consideration of the importancy of the structural members and nature of defects, etc. 〈newly added〉	**CHAPTER 16 MANUFACTURE, WORKMANSHIP AND TESTING** **Section 1 ~ 2 〈omitted〉** **Section 3 Welding of Metallic Materials and Non-destructive Testing for the Fuel Containment System** 301. ~ 305. 〈omitted〉 306. Non-destructive testing 【See Rules】 1. In applying 306. 4 of this Rules, non-distructive testing procedures are to comply with the requirements in the **Annex 2-7** of **Pt 2** of the **Rules for the Classification of Steel Ships.** (1) For radiographic testing, the acceptance levels and required quality levels are provided in **Table 16.1** below. In case of the criteria in **Table 16.1** are not satisfied, acceptance is left to the discretion of Society in consideration of the importancy of the structural members and nature of defects, etc. Table 16.1 Radiographic Testing | Quality Levels (ISO 5817:2014 applies)(1)	Testing Techniques/ levels (ISO 17636-1:2022 applies)(1)	Acceptance levels (ISO 10675-1:2021 applies)(1)
B	B(class)	1
Note: (1) Or any recognized standard agreed with the Society and demonstrated to be acceptable		| -Align NDT requirement with Pt 2 Annex 2-7 of the Rules.

<table>
<tr><th>Present</th><th>Amendment</th><th>Note</th></tr>
<tr><td>(2) For ultrasonic tests, the requirements in KS B 0896 for cargo tanks and process pressure vessels and in KS D 0250 for piping apply correspondingly.</td><td>(2) For ultrasonic testing, the acceptance levels and required quality levels are provided in Table 16.2 below.

Table 16.2 Ultrasonic Testing<table><tr><td>Quality Levels
(ISO 5817:2014 applies)(1)</td><td>Testing Techniques/Levels
(ISO 17640:2018 applies)(1)</td><td>Acceptance Levels
(ISO 11666:2018 applies)(1)</td></tr><tr><td>B</td><td>at least B</td><td>2</td></tr><tr><td colspan="3">Note:
(1) Or any recognized standard agreed with the Society and demonstrated to be acceptable</td></tr></table></td><td></td></tr>
<tr><td>(3) For magnetic particle test, the requirements in KS D 0213 apply correspondingly.</td><td>(3) For magnetic particle testing, the acceptance levels and required quality levels are provided in Table 16.3 below.

Table 16.3 Magnetic Partcile Testing<table><tr><td>Quality Levels
(ISO 5817:2014 applies)(1)</td><td>Acceptance Levels
(ISO 11666:2018 applies)(1)</td></tr><tr><td>B</td><td>2X</td></tr><tr><td colspan="2">Note:
(1) Or any recognized standard agreed with the Society and demonstrated to be acceptable</td></tr></table></td><td></td></tr>
<tr><td>(4) For dye penetrant testing, the requirements in KS B 0816 apply correspondingly.</td><td>(4) For dye penetrant tests, the acceptance levels and required quality levels are provided in Table 16.4 below.

Table 16.4 Dye Panetrant Testing<table><tr><td>Quality Levels
(ISO 5817:2014 applies)(1)</td><td>Acceptance Levels
(ISO 11666:2018 applies)(1)</td></tr><tr><td>B</td><td>2X</td></tr><tr><td colspan="2">Note:
(1) Or any recognized standard agreed with the Society and demonstrated to be acceptable</td></tr></table></td><td></td></tr>
</table>

Present	Amendment	Note
Section 4 Other Regulations for Construction in Metallic Materials *(2019)*	**Section 4 Other Regulations for Construction in Metallic Materials *(2019)***	
〈omitted〉	〈omitted〉	
Section 5 Testing *(2019)*	**Section 5 Testing *(2019)***	
501. Testing and Inspections during Construction	501. Testing and Inspections during Construction	
1. ~ 3. 〈omitted〉	1. ~ 3. 〈omitted〉	
4. Cold spot inspection 【See Rules】	4. Cold spot inspection 【See Rules】	
(1) The cold spot inspection of fuel tanks specified in **501. 7** of the Rules is to be carried out during the fuel full loading test to capacity specified in **3** (1) for the membrane tank, ~~internal insulation tank,~~ and when necessary, independent tank.	(1) The cold spot inspection of fuel tanks specified in **501. 7** of the Rules is to be carried out during the fuel full loading test to capacity specified in **3** (1) for the membrane tank, and when necessary, independent tank.	
502. ~505 〈omitted〉	502. ~505 〈omitted〉	
Section 7 Testing Regulations	**Section 7 Testing Regulations**	
〈omitted〉	〈omitted〉	