RULES FOR CLASSIFICATION(STEEL SHIPS)

(Rule for the Classification of Ships Using Low-flashpoint Fuels)

2021.07.

Hull Rule Development Team

- Main Amendments -

(1) Enter into force on 1 July 2022 (the contract date for ship construction)

◉ To reflect Request for Establishment/Revision of Classification Technical Rules

- To reflect the revision item of UR W1

Present	Amendment	Reason
CHAPTER 1 ~ CHAPTER 5 <Omitted> **CHAPTER 6 FUEL CONTAINMENT SYSTEM** **Section 1 ~ Section 3 <Omitted>** **Section 4 Liquefied Gas Fuel Containment** 401. ~ 412. 〈Omitted〉 413. Materials [See Guidance] 1. 〈Omitted〉 2. Materials of primary and secondary barriers (1) Metallic materials used in the construction of primary and secondary barriers not forming the hull, are to be suitable for the design loads that they may be subjected to, and be in accordance with Table 7.1, ~~7.2~~ or 7.3. (2) Materials, either non-metallic or metallic but not covered by Table 7.1, ~~7.2~~ and 7.3, used in the primary and secondary barriers may be approved by the Society considering the design loads that they may be subjected to, their properties and their intended use. 【See Guidance】 (3) ~(6) 〈Omitted〉 3. 〈Omitted〉 414. ~ 416. 〈Omitted〉 **Section 5 ~ Section 14 <Omitted>**	**CHAPTER 1 ~ CHAPTER 5 <Same as the present Rule>** **CHAPTER 6 FUEL CONTAINMENT SYSTEM** **Section 1 ~ Section 3 <Same as the present Rule>** **Section 4 Liquefied Gas Fuel Containment** 401. ~ 412. 〈Same as the present Rule〉 413. Materials [See Guidance] 1. 〈Same as the present Rule〉 2. Materials of primary and secondary barriers (1) Metallic materials used in the construction of primary and secondary barriers not forming the hull, are to be suitable for the design loads that they may be subjected to, and be in accordance with Table 7.1, 7.2a, 7.2b or 7.3. (2) Materials, either non-metallic or metallic but not covered by Table 7.1, 7.2a, 7.2b and 7.3, used in the primary and secondary barriers may be approved by the Society considering the design loads that they may be subjected to, their properties and their intended use. 【See Guidance】 (3) ~(6) 〈Same as the present Rule〉 3. 〈Same as the present Rule〉 414. ~ 416. 〈Same as the present Rule〉 **Section 5 ~ Section 14 <Same as the present Rule>**	Reflection of Request for Revision of Classification Technical Rules

Present	Amendment	Reason
CHAPTER 7 MATERIAL AND GENERAL PIPE DESIGN **Section 1 ~ Section 3 <Omitted>** **Section 4 Materials** 401. Metallic materials 1. Materials for fuel containment and piping systems are to comply with the minimum regulations given in the following tables: Table 7.1: Plates, pipes (seamless and welded), sections and forgings for fuel tanks and process pressure vessels for design temperatures not lower than 0 °C. ~~Table 7.2: Plates, sections and forgings for fuel tanks, secondary barriers and process pressure vessels for design temperatures below 0 °C and down to minus 55 °C.~~ Table 7.3: Plates, sections and forgings for fuel tanks, secondary barriers and process pressure vessels for design temperatures below minus 55 °C and down to minus 165 °C. Table 7.4: 〈Omitted〉 Table 7.5: 〈Omitted〉 2. ~ 5. 〈Omitted〉 6. 〈New〉	**CHAPTER 7 MATERIAL AND GENERAL PIPE DESIGN** **Section 1 ~ Section 3 <Same as the present Rule>** **Section 4 Materials** 01. Metallic materials 1. Materials for fuel containment and piping systems are to comply with the minimum regulations given in the following tables: Table 7.1: Plates, pipes (seamless and welded), sections and forgings for fuel tanks and process pressure vessels for design temperatures not lower than 0 °C. Table 7.2a: Plates, sections and forgings for fuel tanks, secondary barriers and process pressure vessels for design temperatures below 0 °C and down to - 10 °C. Table 7.2b: Plates, sections and forgings for fuel tanks, secondary barriers and process pressure vessels for design temperatures below -10 °C and down to -55 °C. Table 7.3: Plates, sections and forgings for fuel tanks, secondary barriers and process pressure vessels for design temperatures below minus 55 °C and down to minus 165 °C. Table 7.4: 〈Same as the present Rule〉 Table 7.5: 〈Same as the present Rule〉 2. ~ 5. 〈Same as the present Rule〉 6. For fuel tanks using high manganese austenitic steel for cryogenic service, Annex 4 「High manganese austenitic steel for Cryogenic Service」 should be applied.	Reflection of Request for Revision of Classification Technical Rules

Present	Amendment	Reason
Table 7.1 PLATES, PIPES (SEAMLESS AND WELDED) , SECTIONS AND FORGINGS FOR FUEL TANKS AND PROCESS PRESSURE VESSELS FOR DESIGN TEMPERATURES NOT LOWER THAN 0 °C. 【See Guidance】	Table 7.1 PLATES, PIPES (SEAMLESS AND WELDED) , SECTIONS AND FORGINGS FOR FUEL TANKS AND PROCESS PRESSURE VESSELS FOR DESIGN TEMPERATURES NOT LOWER THAN 0 °C. 【See Guidance】	Reflection of Request for Revision of Classification Technical Rules

1. CHEMICAL COMPOSITION AND HEAT TREATMENT		
〈Omitted〉		
2. TENSILE AND TOUGHNESS (IMPACT) TEST REQUIREMENTS		
2.1 frequency		
Plates	〈Omitted〉	
Sections and forgings	〈Omitted〉	
2.2 Mechanical properties		
Tensile properties	〈Omitted〉	
2.3 Toughness (Charpy V-notch test)		
Plates	〈Omitted〉	
Sections and forgings	〈Omitted〉	
Test temperature	Thickness (mm)	Test temperature (°C)
	$t \leq 20$	0
	$20 < t \leq 40$	-20
Notes: (1)~(2) 〈Omitted〉 (3) This table is generally applicable for material thicknesses up to ~~40~~mm. Proposals for greater thicknesses are to be approved by the Society. (4)~(5) 〈Omitted〉		

1. CHEMICAL COMPOSITION AND HEAT TREATMENT		
〈Omitted〉		
2. TENSILE AND TOUGHNESS (IMPACT) TEST REQUIREMENTS		
2.1 frequency		
Plates	〈Same as the present Rule〉	
Sections and forgings	〈Same as the present Rule〉	
2.2 Mechanical properties		
Tensile properties	〈Same as the present Rule〉	
2.3 Toughness (Charpy V-notch test)		
Plates	〈Same as the present Rule〉	
Sections and forgings	〈Same as the present Rule〉	
Test temperature	Thickness (mm)	Test temperature (°C)
	$t \leq 20$	0
	$20 < t \leq 40$	-20
	$\underline{40 < t \leq 50^{(6)}}$	$\underline{-20^{(7)}}$
	$\underline{40 < t \leq 50^{(6)}}$	$\underline{-30^{(8)}}$
Notes: (1)~(2) 〈Same as the present Rule〉 (3) This table is generally applicable for material thicknesses up to 50mm. Proposals for greater thicknesses are to be approved by the Society. (4)~(5) 〈Same as the present Rule〉 (6) A further set of impact test at mid thickness for products with t〉40mm is required except rolled steels specified in Part 2. (7) Applies to type C independent tanks and process pressure vessels. In addition, post-weld stress relief heat treatment shall be performed. Exemption to post-weld stress relief heat treatment based on alternative approach (e.g. Engineering Critical Assessment) shall be approved by the Classification Society or shall be to recognized standards. (8) Applies to fuel tank other than type C.		

Present

Table 7.2 PLATES, SECTIONS AND FORGINGS FOR FUEL TANKS, SECONDARY BARRIERS AND PROCESS PRESSURE VESSELS FOR DESIGN TEMPERATURES BELOW 0 ℃ AND DOWN TO ~~-55~~ ℃, Maximum thickness 25 mm 【See Guidance】

1. CHEMICAL COMPOSITION AND HEAT TREATMENT	
〈Omitted〉	
2. TENSILE AND TOUGHNESS (IMPACT) TEST REQUIREMENTS	
2.1 Sampling frequency	
Plates	〈Omitted〉
Sections and forgings	〈Omitted〉
2.2 Mechanical properties	
Tensile properties	〈Omitted〉
2.3 Toughness (Charpy V-notch test)	
Plates	〈Omitted〉
Sections and forgings	〈Omitted〉
Test temperature	〈Omitted〉

Notes

(1) 〈Omitted〉

(2) For material thickness of more than 25 mm, Charpy V-notch tests shall be conducted as follows

Material thickness(mm)	Test temperature (°C)
$25 < t \leq 30$	10°C below design temperature or -20°C, whichever is lower
$30 < t \leq 35$	15°C below design temperature or -20°C, whichever is lower
$35 < t \leq 40$	20°C below design temperature
~~$40 < t$~~	~~Temperature approved by the Society~~

〈Omitted〉

(3)~(5) 〈Omitted〉

Amendment

Table 7.2a PLATES, SECTIONS AND FORGINGS FOR FUEL TANKS, SECONDARY BARRIERS AND PROCESS PRESSURE VESSELS FOR DESIGN TEMPERATURES BELOW 0 ℃ AND DOWN TO -10 ℃, Maximum thickness 25 mm 【See Guidance】

1. CHEMICAL COMPOSITION AND HEAT TREATMENT	
〈Omitted〉	
2. TENSILE AND TOUGHNESS (IMPACT) TEST REQUIREMENTS	
2.1 Sampling frequency	
Plates	〈Same as the present Rule〉
Sections and forgings	〈Same as the present Rule〉
2.2 Mechanical properties	
Tensile properties	〈Same as the present Rule〉
2.3 Toughness (Charpy V-notch test)	
Plates	〈Same as the present Rule〉
Sections and forgings	〈Same as the present Rule〉
Test temperature	〈Same as the present Rule〉

Notes

(1) 〈Same as the present Rule〉

(2) For material thickness of more than 25 mm, Charpy V-notch tests shall be conducted as follows

Material thickness(mm)	Test temperature (°C)
$25 < t \leq 30$	10°C below design temperature or -20°C, whichever is lower
$30 < t \leq 35$	15°C below design temperature or -20°C, whichever is lower
$35 < t \leq 40$	20°C below design temperature
$40 < t \leq 50$(6)	5°C below design temperature or -20°C, whichever is lower(7)
$40 < t \leq 45$(6)	25°C below design temperature(8)
$45 < t \leq 50$(6)	30°C below design temperature(8)

〈Same as the present Rule〉

(3)~(5) 〈Same as the present Rule〉

(6) A further set of impact test at mid thickness for products with t〉40mm is required except rolled steels specified in Part 2.

(7) Applies to type C independent tanks and process pressure vessels. In addition, post-weld stress relief heat treatment shall be performed. Exemption to post-weld stress relief heat treatment based on alternative approach (e.g. Engineering Critical Assessment) shall be approved by the Classification Society or shall be to recognized standards.

(8) Applies to fuel tank other than type C.

(9) This table is generally applicable for material thicknesses up to 50mm. Proposals for greater thicknesses are to be approved by the Society.

Reason

Reflection of Request for Revision of Classification Technical Rules

Present	Amendment	Reason
	Table 7.2b PLATES, SECTIONS AND FORGINGS FOR FUEL TANKS, SECONDARY BARRIERS AND PROCESS PRESSURE VESSELS FOR DESIGN TEMPERATURES BELOW -10 °C AND DOWN TO -55 °C. Maximum thickness 25 mm 【See Guidance】	Reflection of Request for Revision of Classification Technical Rules

1. CHEMICAL COMPOSITION AND HEAT TREATMENT	
〈Omitted〉	
2. TENSILE AND TOUGHNESS (IMPACT) TEST REQUIREMENTS	
2.1 Sampling frequency	
Plates	〈Same as the present Rule〉
Sections and forgings	〈Same as the present Rule〉
2.2 Mechanical properties	
Tensile properties	〈Same as the present Rule〉
2.3 Toughness (Charpy V-notch test)	
Plates	〈Same as the present Rule〉
Sections and forgings	〈Same as the present Rule〉
Test temperature	〈Same as the present Rule〉

Notes
(1) 〈Same as the present Rule〉
(2) For material thickness of more than 25 mm, Charpy V-notch tests shall be conducted as follows

Material thickness(mm)	Test temperature (°C)
$25 < t \leq 30$	10°C below design temperature or -20°C, whichever is lower
$30 < t \leq 35$	15°C below design temperature or -20°C, whichever is lower
$35 < t \leq 40$	20°C below design temperature
$40 < t \leq 50$(6)	5°C below design temperature or -20°C, whichever is lower(7)
$40 < t \leq 45$(6)	25°C below design temperature(8)
$45 < t \leq 50$(6)	30°C below design temperature(8)

〈Same as the present Rule〉
(3)~(5) 〈Same as the present Rule〉
(6) A further set of impact test at mid thickness for products with t〉40mm is required except rolled steels specified in Part 2.
(7) For type C tanks of carbon and carbon-manganese steel, post-weld heat treatment shall be performed after welding, if the design temperature is below -10 °C. Post-weld heat treatment in all other cases and for materials other than those mentioned above shall be to recognized standards. The soaking temperature and holding time shall be to the recognized standards.
Exemption to post-weld stress relief heat treatment based on alternative approach(e.g. Engineering Critical Assessment) shall be approved by the Society or shall be to recognized standards.
(8) Applies to fuel tank other than type C.
(9) This table is generally applicable for material thicknesses up to 50mm. Proposals for greater thicknesses are to be approved by the Society.

Present

Table 7.3 PLATES, SECTIONS AND FORGINGS FOR FUEL TANKS, SECONDARY BARRIERS AND PROCESS PRESSURE VESSELS FOR DESIGN TEMPERATURES BELOW -55 °C AND DOWN TO -165 °C . Maximum thickness 25 mm See Guidance】

Minimum design temp. (°C)	Chemical composition(5) and heat treatment	Impact test temp.(°C)
-60	〈Omitted〉	-65
-65	〈Omitted〉	-70
-90	〈Omitted〉	-95
-105	〈Omitted〉	-110
-165	〈Omitted〉	-196
-165	〈Omitted〉	-196
-165	〈Omitted〉	Not required
-165	〈Omitted〉	Not required
1. TENSILE AND TOUGHNESS (IMPACT) TEST REQUIREMENTS		
1.1 Sampling frequency		
Plates	〈Omitted〉	
Sections and forgings	〈Omitted〉	
1.2 Toughness (Charpy V-notch test)		
Plates	〈Omitted〉	
Sections and forgings	〈Omitted〉	

Notes:

(1)~(2) 〈Omitted〉

(3) For materials 1.5 % Ni, 2.25 % Ni, 3.5 % Ni and 5 % Ni, with thicknesses greater than 25 mm, the impact tests shall be conducted as follows:

Material thickness(mm)	Test temperature
$25 < t \leq 30$	10°C below design temperature
$30 < t \leq 35$	15°C below design temperature
$35 < t \leq 40$	20°C below design temperature

The energy value is to be in accordance with the table for the applicable type o test specimen. For material thickness of more than ~~40~~mm, the Charpy V-notch values are to be specially considered.

(4)~(9) 〈Omitted〉

Amendment

Table 7.3 PLATES, SECTIONS AND FORGINGS FOR FUEL TANKS, SECONDARY BARRIERS AND PROCESS PRESSURE VESSELS FOR DESIGN TEMPERATURES BELOW -55 °C AND DOWN TO -165 °C . Maximum thickness 25 mm See Guidance】

Minimum design temp. (°C)	Chemical composition(5) and heat treatment	Impact test temp.(°C)
-60	〈Same as the present Rule〉	-65
-65	〈Same as the present Rule〉	-70
-90	〈Same as the present Rule〉	-95
-105	〈Same as the present Rule〉	-110
-165	〈Same as the present Rule〉	-196
-165	〈Same as the present Rule〉	-196
-165	〈Same as the present Rule〉	Not required
-165	〈Same as the present Rule〉	Not required
1. TENSILE AND TOUGHNESS (IMPACT) TEST REQUIREMENTS		
1.1 Sampling frequency		
Plates	〈Same as the present Rule〉	
Sections and forgings	〈Same as the present Rule〉	
1.2 Toughness (Charpy V-notch test)		
Plates	〈Same as the present Rule〉	
Sections and forgings	〈Same as the present Rule〉	

Notes:

(1)~(2) 〈Same as the present Rule〉

(3) For materials 1.5 % Ni, 2.25 % Ni, 3.5 % Ni and 5 % Ni, with thicknesses greater than 25 mm, the impact tests shall be conducted as follows:

Material thickness(mm)	Test temperature
$25 < t \leq 30$	10°C below design temperature
$30 < t \leq 35$	15°C below design temperature
$35 < t \leq 40$	20°C below design temperature
$40 < t \leq 45^{(10)}$	25°C below design temperature
$45 < t \leq 50^{(10)}$	30°C below design temperature

The energy value is to be in accordance with the table for the applicable type o test specimen. For material thickness of more than 50mm, the Charpy V-notch values are to be specially considered.

(4)~(9) 〈Same as the present Rule〉

(10) A further set of impact test at mid thickness for products with t〉40mm is required except rolled steels specified in Part 2.

(11) This table is generally applicable for material thicknesses up to 50mm. Proposals for greater thicknesses are to be approved by the Society.

Reason

Reflection of Request for Revision of Classification Technical Rules

Present

Table 7.4 〈Omitted〉

Table 7.5 PLATES AND SECTIONS FOR HULL STRUCTURES REQUIRED BY Ch 6, 413. 1 (2) 【See Guidance】

Minimum design temperature of hull structure (°C)	Maximum thickness (mm) for steel grades							
	A	B	D	E	AH	DH	EH	FH
0 and above								
down to -5								
down to -10								
down to -20								
down to -30								
Below -30	In accordance with Table ~~7.2~~ except that the thickness limitation given in Table ~~7.2~~ and in note (2) of that table does not apply.							

〈Below Omitted〉

Amendment

Table 7.4 〈Same as the present Rule〉

Table 7.5 PLATES AND SECTIONS FOR HULL STRUCTURES REQUIRED BY Ch 6, 413. 1 (2) 【See Guidance】

Minimum design temperature of hull structure (°C)	Maximum thickness (mm) for steel grades							
	A	B	D	E	AH	DH	EH	FH
0 and above								
down to -5								
down to -10								
down to -20								
down to -30								
Below -30	In accordance with Table 7.2a and 7.2b except that the thickness limitation given in Table 7.2a and 7.2b and in note (2) of that table does not apply.							

〈Below Same as the present Rule〉

Reason

Reflection of Request for Revision of Classification Technical Rules

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

2021.06.

- Main Amendments -

(1) Effective date : 22 June 2021

◉ Has been added application requirement for ships using methyl/ethyl alcohol as fuel

Present	Amendment
# CHAPTER 1 GENERAL	# CHAPTER 1 GENERAL
## Section 1 General	## Section 1 General
101. Application	**101. Application**
1. This Rules applies to ships using low-flashpoint fuels. However, does not apply to the ships specified in the following. (1) Ships carrying liquefied gases in bulk using their cargoes as fuel and complying with the requirements of **Pt 7**, **Ch 5** of **Rules for the classification of steel ships** (2) Ships carrying liquefied gases in bulk using other low-flashpoint gaseous fuels provided that the fuel storage and distribution systems design and arrangements for such gaseous fuels comply with the requirements of **Pt 7**, **Ch 5** of **Rules for the classification of steel ships .** (3) 〈newly added〉	**1.** This Rules applies to ships using low-flashpoint fuels. However, does not apply to the ships specified in the following. (1) Ships carrying liquefied gases in bulk using their cargoes as fuel and complying with the requirements of **Pt 7**, **Ch 5** of **Rules for the classification of steel ships** (2) Ships carrying liquefied gases in bulk using other low-flashpoint gaseous fuels provided that the fuel storage and distribution systems design and arrangements for such gaseous fuels comply with the requirements of **Pt 7**, **Ch 5** of **Rules for the classification of steel ships.** (3) Notwithstanding the requirement specified in (1) and (2), some requirements of this rules may be applied if specified in **Pt 7**, **Ch 5** of **Rules for the classification of steel ships.** *(2021)*
2. Notwithstanding the requirement specified in **1**, for the ships specified in the following (1) or (2), some requirements of this Rules may be modified, as appropriate. (1) ships to which **SOLAS II-1** does not apply; or (2) ships which are subjected to Korean Ship Safety Act and Notification having a restricted to domestic service.	**2.** Notwithstanding the requirement specified in **1**, for the ships specified in the following (1) or (2), some requirements of this Rules may be modified, as appropriate; (1) ships to which **SOLAS II-1** does not apply; or (2) ships which are subjected to Korean Ship Safety Act and Notification having a restricted to domestic service.
3. **Ch 5** to **Ch 15** of this Rules applies to ships using natural gas as fuel, either in its liquefied or gaseous state.	**3.** **Ch 5** to **Ch 15** of this Rules applies to ships using natural gas as fuel, either in its liquefied or gaseous state.
4. 〈newly added〉	**4. Annex 5** applies to ships using methyl/ethyl alcohol as fuel.*(2021)*
4. In addition to the requirements in this Rules, they meet other related requirements in **Rules for the classification of steel ships.**	**5.** In addition to the requirements in this Rules, they meet other related requirements in **Rules for the classification of steel ships.**

Present	Amendment
CHAPTER 4 CLASSIFICATION AND SURVEYS	**CHAPTER 4 CLASSIFICATION AND SURVEYS**
Section 1 〈omitted〉	**Section 1 〈omitted〉**
Section 2 Classification	**Section 2 Classification**
201. Class notations Ships satisfying the requirements of this Rules may be given a notation "LFFS" as additional special feature notations and details are as follows. *(2020)* **1.** LFFS(DF-LNG): Dual fuel engines using LNG as fuel are installed **2.** LFFS(SF-LNG): Single fuel engines using LNG as fuel are installed **3. ~ 7.** 〈newly added〉	**201. Class notations** Ships satisfying the requirements of this Rules may be given a notation "LFFS" as additional special feature notations and details are as follows. *(2021)* **1.** LFFS(DF-LNG): Dual fuel engines using LNG as fuel are installed **2.** LFFS(SF-LNG): Single fuel engines using LNG as fuel are installed **3.** LFFS(DF-Methanol): Dual fuel engines using methyl alcohol as fuel are installed **4.** LFFS(SF-Methanol): Single fuel engines using methyl alcohol as fuel are installed **5.** LFFS(DF-Ethanol): Dual fuel engines using ethyl alcohol as fuel are installed **6.** LFFS(SF-Ethanol): Single fuel engines using ethyl alcohol as fuel are installed

Amendments of Guidances Relating to the Rules for Classification of Ships Using Low-flashpoint Fuels

2021.06.

- Main Amendments -

(1) Effective date : 22 June 2021

◉ Has been added application requirement for ships using methyl/ethyl alcohol as fuel reflecting IMO MSC.1/Circ.1621 (Annex 5)

〈Newly Added〉

Annex 5 Requirements for Ships Using Methyl/Ethyl Alcohol as Fuel *(2021)*

Section 1 General

101. Application

The requirements of this **Annex** apply to ships using methyl/ethyl alcohol as fuel.

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. **Bunkering** means the transfer of fuel from land-based or floating facilities into ship's permanent tanks or connection of portable tanks to the fuel supply system.
2. **Fuel** means methyl/ethyl alcohol fuels, containing allowable additives or impurities, suitable for the safe operation on board ships, complying with an international standard.
3. **Fuel tank** is any integral, independent or portable tank used for storage of fuel. The spaces around the fuel tank are defined as follows:
   (1) **Fuel storage hold space** is the space enclosed by the ship's structure in which a fuel tank is situated. If tank connections are located in the fuel storage hold space, a fuel storage hold space should also be considered as tank connection space. Integral fuel tanks do not have a fuel storage hold space;
   (2) **Cofferdam** is a structural space surrounding a fuel tank which provides an added layer of gas and liquid tightness protection against external fire, toxic and flammable vapours between the fuel tank and other areas of the ship; and
   (3) **Tank connection space** is a space surrounding all tank connections and tank valves that is required for tanks with such connections in enclosed spaces.
4. **Fuel preparation space** means any space containing equipment for fuel preparation purposes, such as fuel pumps, fuel valve train, heat exchangers and filters.
5. **Gas freeing** is the process carried out to achieve a safe tank atmosphere. It includes two distinct operations:
   (1) purging the hazardous tank atmosphere with an inert gas or other suitable medium (e.g. water) to dilute the hazardous vapour to a level where air can be safely introduced; and
   (2) replacing the diluted inert atmosphere with air.
6. **Independent tanks** are self-supporting, do not form part of the ship's hull and are not essential to the hull strength.
7. **Integral tank** means a fuel-containment envelope tank which forms part of the ship's hull and which may be stressed in the same manner and by the same loads which stress the contiguous hull structure and which is normally essential to the structural completeness of the ship's hull.
8. **Portable tank** means an independent tank being able to be:
   (1) easily connected and disconnected from ship systems; and
   (2) easily removed from ship and installed on board ship.
9. **Single failure** is where loss of intended function occurs through one fault or action.
10. **Single fuel engine** means an engine capable of operating on a fuel defined as in **2** only.

103. Alternative design

1. This **Annex** contains functional requirements for all appliances and arrangements related to the usage of methyl/ethyl alcohol fuels.
2. Appliances and arrangements of methyl/ethyl alcohol fuel 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.

〈Newly Added〉

Section 2 Goal and Functional Requirements

201. Goal

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

202. Functional requirements

1. The safety, reliability and dependability of the systems should be equivalent to that achieved with new and comparable conventional oil-fuelled main and auxiliary machinery.

2. The probability and consequences of fuel-related hazards should be limited to a minimum through arrangement and system design, such as ventilation, detection and safety actions. In the event of fuel leakage or failure of the risk reducing measures, necessary safety actions should be initiated.

3. The design philosophy should ensure that risk-reducing measures and safety actions for the fuel installation do not lead to an unacceptable loss of power.

4. Hazardous areas should be restricted, as far as practicable, to minimize the potential risks that might affect the safety of the ship, persons on board and equipment.

5. Equipment installed in hazardous areas should be minimized to that required for operational purposes and should be suitably and appropriately certified.

6. Unintended accumulation of explosive, flammable or toxic vapour and liquid concentrations should be prevented.

7. System components should be protected against external damage.

8. Sources of ignition in hazardous areas should be minimized to reduce the probability of fire and explosions.

9. Safe and suitable fuel supply, storage and bunkering arrangements should be provided, capable of receiving and containing the fuel in the required state without leakage.

10. Piping systems, containment and overpressure relief arrangements that are of suitable design, material, construction and installation for their intended application should be provided.

11. Machinery, systems and components should be designed, constructed, installed, operated, maintained and protected to ensure safe and reliable operation.

12. Suitable control, alarm, monitoring and shutdown systems should be provided to ensure safe and reliable operation.

13. Fixed fuel vapour and/or leakage detection suitable for all spaces and areas concerned should be arranged.

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

15. Commissioning, trials and maintenance of fuel systems and fuel utilization machinery should satisfy the goal in terms of safety, availability and reliability.

16. The technical documentation should permit an assessment of the compliance of the system and its components with the applicable rules, guidelines, design standards used, and the principles related to safety, availability, maintainability and reliability.

17. A single failure in a technical system or component should not lead to an unsafe or unreliable situation.

Section 3 General Requirements

301. Goal

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

302. Risk assessment

1. A risk assessment should be conducted to ensure that risks arising from the use of fuels affecting persons on board, the environment, the structural strength or the integrity of the ship are addressed. Consideration should be given to the hazards associated with physical layout, operation and maintenance, following any reasonably foreseeable failure.
2. In risk assessment required by **1** for ships using fuels, the followings are to be as a minimum considered, but not limited to:
   (1) **510. 2**
   (2) **803. 1** (1)
   (3) **903. 2**
   (4) **1507. 1** (8)
3. The risks should be analysed using acceptable and recognized risk analysis techniques. Loss of function, component damage, fire, explosion, toxicity and electric shock should, as a minimum, be considered. The analysis should ensure that risks are eliminated wherever possible. Risks which cannot be eliminated should be mitigated as necessary.
4. Details of risks, and the means by which they are mitigated, should be documented in accordance with applicable requirements in **Guidance for Approval of Risk-based Ship Design.**

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-Methanol, SF-Methanol, DF-Ethanol, SF-Ethanol) 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 methyl/ethyl alcohol-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

(1) Arrangement plans showing location of:
  (A) Machinery spaces, accommodation, service and control station spaces
  (B) Fuel containment systems
  (C) Fuel preparation spaces
  (D) Fuel bunkering pipes with shore connections
  (E) Tank hatches, ventilation pipes and any other openings to the gas tanks
  (F) Ventilating pipes, doors and openings to fuel preparation spaces 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"

(2) Following plans and data of the fuel containment system:
  (A) Drawing of fuel tanks including information on non-destructive testing of welds and strength and tightness testing of tanks
  (B) Drawings of support and staying of fuel tanks
  (C) Welding procedures for fuel tanks
  (D) Drawings and specifications of fuel tank insulation
  (E) Arrangement and specifications fuel tank including tank connections and tank connection space

(3) Following plans and data of piping systems:
  (A) Drawings and specifications of fuel piping including vent lines or similar piping
  (B) Drawings and specifications of offsets, loops, bends and mechanical expansion joints, such as bellows, slip joints(only inside tank) or similar means in the fuel piping
  (C) Drawings and specifications of flanges, valves and other fittings in the fuel piping system
  (D) Specification of means for removal of liquid contents from bunkering pipes prior to dis-connecting the shore connection
  (E) Cooling or heating water system in connection with fuel system, if fitted.
  (F) Drawings of piping systems for gas freeing and purging of fuel tanks
  (G) Bilge and drainage arrangements in fuel preparation spaces and tank connection spaces, if fitted.

(4) Drawings and specifications for pressure/vacuum valves and associated ventilation piping

(5) Following plans and data for equipment and systems regarding fire protection :
  (A) Arrangement and specification of water spray system, including pipes, valves, nozzles and fit-tings
  (B) Arrangement of ventilation duct required for fuel pipes lead through enclosed spaces
  (C) Arrangement of ventilation duct for fuel tank fitted below deck, if applicable
  (D) Arrangement of fire insulation for storage tank and pipes, ventilation trunks for storage tank connection space

(6) Following plans and data for electrical installations :
  (A) Drawings showing location of all electrical equipment in hazardous areas
  (B) Data for verification of the compatibility between the barrier and the field component
  (C) Single line diagram for intrinsically safe circuits
  (D) List of explosion protected equipment

(7) Following control and monitoring systems :
  (A) Vapour detection and leak detection system
  (B) Fuel tank monitoring system
  (C) Fuel engines control and monitoring system.

(8) A test procedure for the safety functions of the fuel installation (may be included in programme for sea trials or on-board test)

4. Plans and documents for reference

(1) Plans and data of the following equipment and systems
  (A) Drawings showing location and construction of air locks with alarm equipment, if fitted
  (B) Drawings of gastight bulkhead penetrations, if fitted
  (C) Arrangements and specifications of mechanical ventilation systems in spaces covering fuel system, giving capacity and location of fans and their motors. Drawings and material specifi-cations of rotating parts and casings for fans and portable ventilators
  (D) For fixed vapour/leak detection and alarm systems: specification and location of detectors, alarm devices and call points, and cable routing layout drawing

(2) Operation manual (including bunkering, gas freeing, normal operation, emergency operation).
(3) Data for a risk analysis according to **302.**.
(4) Chemical and physical properties and other special properties of fuels
(5) Data of reactivity hazard between fuels and coating or lining in fuel tanks and of piping and equipment that may come into contact with fuel liquid or vapour (if applicable)
(6) Data of suitability of corrosion-resistance materials for the fuels (if applicable)
(7) Specification of design loads and structural analysis of fuel tanks (Hull structural analysis may be covered for integral tanks.)

405. Periodical Surveys

1. Annal Survey

The following is to be carried out during the survey of the Fuel Storage, Fuel Bunkering System and Fuel Supply System.

(1) Operating and Maintenance Instruction Manuals
The manufacturer/builder instructions and manuals covering the operations, safety and maintenance requirements and occupational health hazards relevant to fuel storage, fuel bunkering, and fuel supply and associated systems for the use of the fuel, are to be confirmed as being aboard the vessel.
(2) Control, Monitoring and Safety Systems
(A) Vapour detection and other leakage detection equipment in compartments containing fuel storage, fuel bunkering, and fuel supply equipment or components or associated systems, including indicators and alarms, is to be confirmed in satisfactory operating condition. Recalibration of the vapour detection systems should be verified in accordance with the manufacturers' recommendations.
(B) Verification of the satisfactory operation of the control, monitoring and automatic shutdown systems as far as practicable of the fuel supply and bunkering systems.
(3) Fuel Handling Piping, Machinery and Equipment
(A) Fuel handling piping
(a) Pipings, hoses, double wall piping or duct are to be external examined.
(b) Emergency shut-down valves and remote operating valves are to be external examined and function-tested.
(c) Safety valves of fuel piping are to be external examined.
(B) Machinery and Equipment
(a) Machinery and equipment for fuel storage, fuel bunkering and fuel supply or otherwise handling the fuel is to be examined, as far as practicable.
(b) Means for inerting is to be examined.
(4) Ventilating System
(A) Examination of the ventilation system, including portable ventilating equipment where fitted, is to be made for spaces containing fuel storage, fuel bunkering, and fuel supply units or components or associated systems, including air locks, pump rooms, compressor rooms, fuel preparation rooms, fuel valve rooms, control rooms and spaces containing gas burning equipment.
(B) Where alarms, such as differential pressure and loss of pressure alarms, are fitted, these should be operationally tested as far as practicable.
(5) Drip Trays
Portable and fixed drip trays and insulation for the protection of the ship's structure in the event of leakage are to be examined.
(6) Hazardous Areas
Electrical equipment and bulkhead/deck penetrations including access openings in hazardous areas are to be examined for continued suitability for their intended service and installation area.
(7) Electrical Bonding
(A) Electrical bonding arrangements in hazardous areas, including bonding straps where fitted, are to be examined.
(B) Bonding straps are to be examined for fuel tanks and fuel systems and pipings which are not permanently connected to the hull of the ship.
(8) Fuel Storage System
(A) External examination of the fuel tanks
(B) General examination of the fuel storage hold place
(C) Internal examination of tank connection space (if applicable)

(D) External examination of tank and P/V valves and vent systems
(E) Verification of satisfactory operation of tank monitoring system
(F) Examination and testing of installed bilge alarms and means of drainage of the compartment
(G) Testing of the remote and local closing of the installed main tank valve

(9) Bunkering System
(A) Examination of bunkering stations and the fuel bunkering system
(B) Verification of satisfactory operation of the fuel bunkering control, monitoring and shutdown systems

(10) Fuel Supply System
Examination of the fuel supply system during working condition as far as practicable
(A) Verification of satisfactory operation of the fuel supply system control, monitoring and shut-down systems.
(B) Testing of the remote and local closing of the master fuel valve for each engine compartment

(11) Water spray systems
Water spray systems are to be examined.

2. Intermediate Survey

At the Intermediate Survey, in addition to all the requirements for Annual Survey, the following items are to be surveyed.

(1) Vapour detectors, temperature sensors, pressure sensors, level indicators, and other equipment providing input to the fuel safety system are to be randomly tested to confirm satisfactory operating condition.
(2) Proper response of the fuel safety system upon fault conditions is to be verified. Pressure, temperature and level indicating equipment are to be calibrated in accordance with the manufacturer's requirements.
(3) Alarms and shutdown function for fuel pumps and engines are to be verified. In case where a proper record of testing is maintained consideration should be given to accepting recent readings.

3. Special Survey

(1) General
The Special Survey is to include, in addition to the requirements of the Annual Survey, examination, tests and checks of sufficient extent to ensure that the fuel installations are in a satisfactory condition and is fit for its intended purpose for the new period of class of 5 years to be assigned, subject to proper maintenance and operation and to periodical surveys being carried out at the due dates.

(2) Fuel Handling and Piping
All piping for fuel storage, fuel bunkering, and fuel supply or otherwise handling the fuel and liquid nitrogen installations are to be examined. Removal of insulation from the piping and opening for examination may be required. Where deemed suspect, a hydrostatic test to 1.25 times the Maximum Allowable Relief Valve Setting (MARVS) for the pipeline is to be carried out. After reassembly, the complete piping is to be tested for leaks. Where water cannot be tolerated and the piping cannot be dried prior to putting the system into service, the Surveyor may accept alternative testing fluids or alternative means of testing.

(3) Fuel Valves
Fuel valves in (1) and (2) are to be examined and proven operable. A random selection of valves is to be opened for examination.
(A) Emergency shut-down valves, check valves, block and bleed valves, master gas valves, remote operating valves
(B) Isolating valves for safety valves in the fuel storage, fuel bunkering, and fuel supply piping systems are to be examined and proven operable.

(4) Fuel Handling Equipment
Fuel pumps, process pressure vessels, inert gas generators, heat exchangers and other components used in connection with fuel handling are to be examined as required in the **Rules for the classification of steel ships**.

(5) Electrical Equipment
(A) Examination of electrical equipment to include the physical condition of electrical cables and supports, intrinsically safe, explosion proof, or increased safety features of electrical equipment.
(B) Functional testing of pressurized equipment and associated alarms.

(C) Testing of systems for de-energizing electrical equipment which is not certified for use in hazardous areas.
(D) An electrical insulation resistance test of the circuits terminating in, or passing through, the hazardous zones and spaces is to be carried out.

(6) Safety Systems
Vapour detectors, temperature sensors, pressure sensors, level indicators and other equipment providing input to the fuel safety system are to be tested to confirm satisfactory operating condition.
(A) Proper response of the fuel safety system upon fault conditions is to be verified.
(B) Pressure, temperature and level indicating equipment are to be calibrated in accordance with the manufacturer's requirements.

(7) Fuel Storage Tanks
(A) All Fuel tanks are to be examined internally.
(B) External of the fuel tanks and tank support arrangements should be visually examined.
(C) Non-destructive testing is to supplement fuel tank inspection with special attention to be given to the integrity of the main structural members, tank shell and highly stressed parts, including welded connections as deemed necessary by the surveyor.
(D) The tightness of all fuel tanks is to be verified by an appropriate procedure. Provided that the effectiveness of the ship's vapour detection equipment has been confirmed, it will be
(E) The pressure/vacuum valves and other pressure relief devices for fuel tanks are to be opened, examined, tested and readjusted as necessary, depending on their design.

Section 5 Ship Design and Arrangement

501. Goal

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

502. Functional requirements

Functional requirements **1~7, 12, 14, 16** of **202.** of this **Rules** are to be applied.

1. Functional requirements **1**, **4** and **5** of **Ch 5, 201**. of this **Rules** are to be applied.

2. Fuel containment systems, fuel piping and other fuel release sources should be located and arranged such that released fuel, either as vapour or liquid, is led to safe locations;

3. The access or other openings to spaces containing potential sources of fuel release should be arranged such that flammable, asphyxiating or toxic vapours or liquids cannot escape to spaces that are not designed for the presence of such substances;

4. The probability of a fire or explosion in a machinery space as a result of a fuel release should be minimized in the design, with special attention to the risk of leakage from pumps, valves and connections.

503. General Requirements of Fuel containment system Arrangement

1. Tanks containing fuel should not be located within accommodation spaces or machinery spaces of category A.

2. Integral fuel tanks should be surrounded by protective cofferdams, except on those surfaces bound by shell plating below the lowest possible waterline, other fuel tanks containing methyl/ethyl alcohol, or fuel preparation space. When located above the lowest possible waterline, the fuel tanks are to be located no less than 800 mm from the ship's side.

3. The fuel containment system should be abaft of the collision bulkhead and forward of the aft peak bulkhead.

4. Fuel tanks located on open decks should be protected against mechanical damage.

5. Fuel tanks on open decks should be surrounded by coamings and spills should be collected in a dedicated holding tank.

6. For chemical tankers using cargo as fuel, a fuel service tank is to be installed in the cargo area. In case the related requirements of **Pt 7, Ch 6** of the **Rules for the Classification of Steel Ships** are applied, this requirement need not be applied.

504. Independent fuel tanks

1. Independent tanks may be accepted on open decks or in a fuel storage hold space.
2. Independent tanks should be fitted with:
   (1) mechanical protection of the tanks depending on location and cargo operations;
   (2) if located on an open deck, drip tray arrangements for leak containment and water spray systems for emergency cooling; and
   (3) if located in a fuel storage hold space, the space should meet the provisions of **Sec.11** and **Sec.13.**
3. Independent fuel tanks should be secured to the ship's structure. The arrangement for supporting and fixing the tanks should be designed for the maximum expected static, dynamic inclinations and accidental loads as well as the maximum expected values of acceleration, taking into account the ship characteristics and the position of the tanks.

505. Portable tanks

1. Portable fuel tanks should be located in dedicated areas fitted with:
   (1) mechanical protection of the tanks depending on location and cargo operations;
   (2) if located on an open deck, drip tray arrangements for leak containment and water spray systems for emergency cooling; and
   (3) if located in a fuel storage hold space, the space should meet the provisions of **Sec.11** and **Sec.13**.
2. Portable fuel tanks should be secured to the deck while connected to the ship systems. The arrangement for supporting and fixing the tanks should be designed for the maximum expected static and dynamic inclinations, as well as the maximum expected values of acceleration, taking into account the ship characteristics and the position of the tanks.
3. Consideration should be given to the ship's strength and the effect of the portable fuel tanks on the ship's stability.
4. Connections to the ship's fuel piping systems should be made by means of approved flexible hoses suitable for methyl/ethyl alcohol or other suitable means designed to provide sufficient flexibility.
5. Arrangements should be provided to limit the quantity of fuel spilled in case of inadvertent disconnection or rupture of the non-permanent connections.
6. The pressure relief system of portable tanks should be connected to a fixed venting system.
7. Control and monitoring systems for portable fuel tanks should be integrated in the ship's control and monitoring system. A safety system for portable fuel tanks should be integrated in the ship's safety system (e.g. shutdown systems for tank valves, leak/vapour detection systems).
8. Safe access to tank connections for the purpose of inspection and maintenance should be ensured.
9. When connected to the ship's fuel piping system:
   (1) each portable tank should be capable of being isolated at any time;
   (2) isolation of one tank should not impair the availability of the remaining portable tanks; and
   (3) the tank should not exceed its filling limits.

506. Machinery space

1. A single failure within the fuel system should not lead to a release of fuel into the machinery space.
2. All fuel piping within machinery space boundaries should be enclosed in gas and liquid tight enclosures in accordance with **904**..

〈Newly Added〉

507. Location and protection of fuel piping

1. Fuel pipes should not be located less than 800 mm from the ship's side.
2. Fuel piping should not be led directly through accommodation spaces, service spaces, electrical equipment rooms or control stations as defined in **Pt 8** of the **Rules for the Classification of Steel Ships**.
3. Fuel pipes led through ro-ro spaces, special category spaces and on open decks should be protected against mechanical damage.
4. Fuel piping should comply with the following:
   (1) Fuel piping that passes through enclosed spaces in the ship should be enclosed in a pipe or duct that is gas and liquid tight towards the surrounding spaces with the fuel contained in the inner pipe. Such double walled piping is not required in cofferdams surrounding fuel tanks, fuel preparation spaces or spaces containing independent fuel tanks as the boundaries for these spaces will serve as a second barrier
   (2) All fuel pipes should be self-draining to suitable fuel or collecting tanks in normal condition of trim and list of the ship. Alternative arrangements for draining the piping may be accepted by the Society.

508. Fuel preparation spaces design

Fuel preparation spaces should be located outside machinery spaces of category A.

509. Bilge systems

1. Bilge systems installed in areas where methyl/ethyl alcohol can be present should be segregated from the bilge system of spaces where methyl alcohol or ethyl alcohol cannot be present.
2. One or more holding tanks for collecting drainage and any possible leakage of methyl/ethyl alcohol from fuel pumps, valves or from double walled inner pipes, located in enclosed spaces should be provided. Means should be provided for safely transferring contaminated liquids to onshore reception facilities.
3. The bilge system serving the fuel preparation space should be operable from outside the fuel preparation space.

510. Drip trays

1. Drip trays should be fitted where leakage and spill may occur.
2. Each tray should have a sufficient capacity to ensure that the maximum amount of spill according to the risk assessment can be handled.
3. Each drip tray should be provided with means to safely drain spills or transfer spills to a dedicated holding tank. Means for preventing backflow from the tank should be provided.
4. Drip trays for leakage of less than 10 litres may be provided with means for manual emptying.
5. The holding tank should be equipped with a level indicator and alarm and should be inerted at all times during normal operation.

511. Arrangement of entrances and other openings in enclosed spaces

1. Direct access should not be permitted from a non-hazardous area to a hazardous area. Where such openings are necessary for operational reasons, an airlock which complies with the provisions of **512**. should be provided.
2. Fuel preparation spaces should have independent access direct from open deck. Where a separate access from open deck is not practicable, an airlock complying with **512**. should be provided.
3. Fuel tanks and surrounding cofferdams should have suitable access from the open deck, where practicable, for gas-freeing, cleaning, maintenance and inspection.

4. Without direct access to open deck, an entry space to fuel tanks or surrounding cofferdams should be provided and comply with the following:
   (1) be fitted with an independent mechanical extraction ventilation system, providing a minimum of six air changes per hour; a low oxygen alarm and a gas detection alarm should be fitted;
   (2) have sufficient open area around the fuel tank hatch for efficient evacuation and rescue operation;
   (3) not be an accommodation space, service space, control station or machinery space of category A; and
   (4) a cargo space may be accepted as an entry space, depending upon the type of cargo, if the area is cleared of cargo and no cargo operation is undertaken during entry to the space.
5. The area around independent fuel tanks should be sufficient to carry out evacuation and rescue operations.
6. For safe access, horizontal hatches or openings to or within fuel tanks or surrounding cofferdams should have a minimum clear opening of 600 X 600 mm that also facilitates the hoisting of an injured person from the bottom of the tank/cofferdam. For access through vertical openings providing main passage through the length and breadth within fuel tanks and cofferdams, the minimum clear opening should not be less than 600 X 800 mm at a height of not more than 600 mm from bottom plating unless gratings or footholds are provided. Smaller openings may be accepted provided evacuation of an injured person from the bottom of the tank/cofferdam can be demonstrated.

512. Airlocks

1. **1, 3~7** of **Ch 5, 1201.** of this **Rules**.
2. Airlocks should be mechanically ventilated at an overpressure relative to the adjacent hazardous area or space.

Section 6 Fuel Containment System

601. Goal

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

602. Functional requirements

1. This **section** refers to Functional requirements **1**, **2**, **5** and **8~16** of **202.** are to be applied.
2. **1** (2) ~ (5), **3** and **4** of **Ch 6, 201.** of this **Rules** is to be applied.

603. Fuel tanks venting and gas freeing system

1. The fuel tanks should be fitted with a controlled tank venting system.
2. A fixed piping system should be arranged to enable each fuel tank to be safely gas-freed, and to be safely filled with fuel from a gas-free condition.
3. The formation of gas pockets during gas freeing operation should be avoided by considering the arrangement of internal tank structure and location of gas freeing inlets and outlets.
4. Pressure and vacuum relief valves should be fitted to each fuel tank to limit the pressure or vacuum in the fuel tank. The tank venting system may consist of individual vents from each fuel tank or the vents from each individual fuel tank may be connected to a common header. Design and arrangement should prevent flame propagation into the fuel containment system. If pressure relief valves (PRVs) of the high velocity type are fitted to the end of the vent pipes, they should be certified for endurance burning in accordance with **IMO MSC/Circ.677**. If PRVs are fitted in the vent line, the vent outlet should be fitted with a flame arrestor certified for endurance burning in accordance with **IMO MSC/Circ.677**.
5. Shut-off valves should not be arranged either upstream or downstream of the PRVs. By-pass valves

may be provided. For temporary tank segregation purposes (maintenance) shut-off valves in common vent lines may be accepted if a secondary independent over/underpressure protection is provided to all tanks as per **7**.

6. The fuel tank-controlled venting system should be designed with redundancy for the relief of full flow overpressure and/or vacuum. Pressure sensors fitted in each fuel tank, and connected to an alarm system, may be accepted in lieu of the secondary redundancy requirement for pressure relief. The opening pressure of the PRVs should not be lower than 0.007 MPa below atmospheric pressure.

7. PRVs should vent to a safe location on open deck and should be of a type which allows the functioning of the valve to be easily checked.

8. The fuel tank vent system should be sized to permit bunkering at a design loading rate without over-pressurizing the fuel tank.

9. The fuel tank vent system should be connected to the highest point of each tank and vent lines should be self-draining under all normal operating conditions.

604. Inerting and atmospheric control within the fuel storage system

1. All fuel tanks should be inerted at all times during normal operation.

2. Cofferdams should be arranged either for purging or filling with water through a non-permanent connection. Emptying the cofferdams should be done by a separate drainage system, e.g. bilge ejector.

3. The system should be designed to eliminate the possibility of a flammable mixture atmosphere existing in the fuel tank during any part of the atmosphere change operation, gas-freeing or inerting by utilizing an inerting medium.

4. To prevent the return of flammable liquid and vapour to the inert gas system, the inert gas supply line should be fitted with two shutoff valves in series with a venting valve in between (double block and bleed valves). In addition, a closable non-return valve should be installed between the double block and bleed arrangement and the fuel system. These valves should be located inside hazardous spaces.

5. Where the connections to the inert gas piping systems are non-permanent, two non-return valves may substitute the valves required in **4**.

6. Blanking arrangements should be fitted in the inert gas supply line to individual tanks. The position of the blanking arrangements should be immediately obvious to personnel entering the tank. Blanking should be via removable spool piece.

7. Fuel tank vent outlets should be situated normally not less than 3 m above the deck or gangway if located within 4 m from such gangways. The vent outlets are also to be arranged at a distance of at least 10 m from the nearest air intake or opening to accommodation and service spaces and ignition sources. The vapour discharge should be directed upwards in the form of unimpeded jets.

8. Vapour outlets from fuel tanks should be provided with devices tested and type approved to prevent the passage of flame into the tank. Due attention should be paid in the design and position of the PRVs with respect to blocking and due to ice during adverse weather conditions. Provision for inspection and cleaning should be arranged.

9. The arrangements for gas-freeing and ventilation of fuel tanks should be such as to minimize the hazards due to the dispersal of flammable vapours to the atmosphere and to flammable gas mixture in the tanks. The ventilation system for fuel tanks should be exclusively for ventilating and gas-freeing purposes. Connection between fuel tank and fuel preparation space ventilation will not be accepted.

10. Gas-freeing operations should be carried out such that vapour is initially discharged in one of the following ways:
    (1) through outlets at least 3 m above the deck level with a vertical efflux velocity of at least 30 m/s maintained during the gas-freeing operation;
    (2) through outlets at least 3 m above the deck level with a vertical efflux velocity of at least 20 m/s which are protected by suitable devices to prevent the passage of flame; or

(3) through outlets underwater.

11. In designing a gas-freeing system in conformity with 301. 2 due consideration should be given to the following:

(1) materials of construction of system;
(2) time to gas-free;
(3) flow characteristics of fans to be used;
(4) the pressure losses created by ducting, piping, fuel tank inlets and outlets;
(5) the pressure achievable in the fan driving medium (e.g. water or compressed air); and
(6) the densities of the fuel vapour/air mixture.

605. Inert gas availability on board

1. Inert gas should be available permanently on board in order to achieve at least one trip from port to port considering maximum consumption of fuel expected and maximum length of trip expected and to keep tanks inerted during two weeks in harbour with minimum port consumption.

2. A production plant and/or adequate storage capacities might be used to achieve availability target defined in 1.

3. Fluid used for inerting should not modify the characteristics of the fuel.

4. The production plant, if fitted, should be capable of producing inert gas with oxygen content at no time greater than 5% by volume. A continuous-reading oxygen content meter should be fitted to the inert gas supply from the equipment and should be fitted with an alarm set at a maximum of 5% oxygen content by volume. The system should be designed to ensure that if the oxygen content exceeds 5% by volume, the inert gas should be automatically vented+ to atmosphere.

5. The system should be able to maintain an atmosphere with an oxygen content not exceeding 8% by volume in any part of any fuel tank.

6. An inert gas system should have pressure controls and monitoring arrangements appropriate to the fuel containment system.

7. Where a nitrogen generator or nitrogen storage facilities are installed in a separate compartment outside of the engine-room, the separate compartment should be fitted with an independent mechanical extraction ventilation system, providing a minimum of six air changes per hour. If the oxygen content is below 19% in the separate compartment, an alarm should be given. A minimum of two oxygen sensors should be provided in each space. Visual and audible alarms should be placed at each entrance to the inert gas room.

8. Nitrogen pipes should only be led through well ventilated spaces. Nitrogen pipes in enclosed spaces should:

(1) have only a minimum of flange connections as needed for fitting of valves and be fully welded; and
(2) be as short as possible.

9. Notwithstanding the provisions of 303., inert gas utilized for gas-freeing of tanks may be provided externally to the ship.

Section 7 MATERIAL AND GENERAL PIPE DESIGN

701. Goal

Ch 7, 101. of this **Rules** is to be applied.

702. Functional requirements

This **Section** relates to functional requirements 1, 6, 8, 9 and 10 of 202.. In particular, all materials used should be suitable for the fuel under the maximum working pressure and temperature.

703. General pipe design

1. The design pressure for any section of the fuel piping system is the maximum gauge pressure to which the system may be subjected in service, taking into account the highest set pressure on any relief valve on the system.
2. The wall thickness of pipes made of steel is to be applied in accordance with **Ch 7, 302. 1** of this **Rules**.
3. The wall thickness of pipes made of steel is to be applied in accordance with **Ch 7, 304. 1** and **2** of this **Rules**.
4. For pipes made of materials other than steel, the allowable stress should be considered by the Society.
5. High pressure fuel piping systems is to be applied in accordance with **Ch 7, 304. 4** of this **Rules**. Whether a fuel system should be considered as a high-pressure system for the purpose of this **Annex** depends on the design and arrangement of the specific system. Accordingly, the stress analysis should be waived or done to the satisfaction of the Society.
6. Fuel pipes and all the other piping needed for safe and reliable operation and maintenance should be colour marked in accordance with a standard at least equivalent to those acceptable to the Society.
7. All fuel piping and independent fuel tanks should be electrically bonded to the ship's hull. Electrical conductivity should be maintained across all joints and fittings. Electrical resistance between piping and the hull should be maximum 10^6 Ohm.
8. Piping other than fuel supply piping and cabling may be arranged in the double wall piping or duct provided that it does not create a source of ignition or compromise the integrity of the double pipe or duct. The double wall piping or duct should only contain piping or cabling necessary for operational purposes.
9. Filling lines to fuel tanks should be arranged to minimize the possibility for static electricity, e.g. by reducing the free fall into the fuel tank to a minimum.
10. The arrangement and installation of fuel piping should provide the necessary flexibility to maintain the integrity of the piping system in the actual service situations, taking potential for fatigue into account. Expansion bellows should not be used.
11. Piping fabrication and joining details
    (1) The inner piping, where a protective duct is required, is to be full penetration butt-welded, and fully radiographed. Flange connections in this piping are to only be permitted within the tank connection space and fuel preparation space or similar;
        (A) during the use of the fuel piping, all doors, ports and other openings on the corresponding superstructure or deckhouse side should normally be kept closed; and
        (B) the annular space in the double walled fuel piping should be segregated at the engine room bulkhead; this implies that there should be no common ducting between the engine-room and other spaces.
    (2) Piping for fuel should be joined by welding except:
        (A) for approved connections to shut-off valve and expansion joints, if fitted; and
        (B) for other exceptional cases specifically approved by the Society.
    (3) The following direct connections of pipe length without flanges may be considered:
        (A) butt-welded joints with complete penetrations at the root;
        (B) slip-on welded joints with sleeves and related welding having dimensions in accordance with recognized standards should only be used in pipes having an external diameter of 50 mm or less; the possibility for corrosion is to be considered; and
        (C) screwed connections, in accordance with recognized standards, should only be used for piping with an external diameter of 25 mm or less.
    (4) Welding, post-weld heat treatment, radiographic testing, dye penetrating testing, pressure testing, leakage testing and non-destructive testing should be performed in accordance with recognized standards. Butt welding should be subject to 100% non-destructive testing, while sleeve welds should be subject to at least 10% liquid penetrant testing(PT) or magnetic particle testing(MT).
    (5) Where flanges are used, they should be of the welded-neck or slip-on type. Socket welds are

not to be used in nominal sizes above 50 mm.

(6) Expansion of piping should normally be allowed for by the provision of expansion loops or bends in the fuel piping system. Use of expansion joints used in high pressure4 fuel systems should be approved by the Society. Slip joints should not be used.

(7) Other connections: Piping connections should be joined in accordance with (2), but for other exceptional cases the Society may consider alternative arrangements.

704. Provisions for materials

1. Due consideration should be taken with respect to the corrosive nature of fuel when selecting materials.

2. Except where specified in this **Annex**, the relevant requirements of **Rules for the classification of steel ships** are to be applied.

Section 8 Bunkering

801. Goal

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

802. Functional requirements

1. This **Section** relates to functional requirements **1~11, 13~16** of **201.**.

2. The piping system for transfer of fuel to the fuel tank should be designed such that any leakage from the piping system cannot cause danger to the persons on board, the environment or the ship.

803. Bunkering Station

1. General

(1) The bunkering station should be located on open deck so that sufficient natural ventilation is provided. Closed or semi-enclosed bunkering stations should be subject to special consideration with respect to provisions for mechanical ventilation. The Society may require special risk assessment.

(2) Entrances, air inlets and openings to accommodation, service and machinery spaces and control stations should not face the bunkering station.

(3) Closed or semi-enclosed bunkering stations should be surrounded by gas and liquid-tight boundaries against enclosed spaces.

(4) Bunkering lines should not be led directly through accommodation, control stations or service spaces. Bunkering lines passing through non-hazardous areas in enclosed spaces should be double-walled or located in gas-tight ducts.

(5) Arrangements should be made for safe management of fuel spills. Coamings and/or drip trays should be provided below the bunkering connections together with a means of safely collecting and storing spills. This could be a drain to a dedicated holding tank equipped with a level indicator and alarm. Where coamings or drip trays are subject to rainwater, provisions should be made to drain rainwater overboard.

(6) Showers and eye wash stations for emergency usage are to be located in close proximity to areas where the possibility for accidental contact with fuel exists. The emergency showers and eye wash stations are to be operable under all ambient conditions.‘

2. Ships bunker hoses

(1) Bunker hoses carried on board are to be suitable for methyl/ethyl alcohol and be type approved as follows.

(A) Each type of bunker hose, complete with end-fittings, should be prototype-tested at a normal ambient temperature, with 200 pressure cycles from zero to at least twice the specified maximum working pressure. After this cycle pressure test has been carried out, the prototype test should demonstrate a bursting pressure of at least 5 times its specified maximum working pressure at the upper and lower extreme service temperature. Hoses used for proto

type testing should not be used for bunker service.

(B) Before being placed in service, each new length of bunker hose produced should be hydrostatically tested at ambient temperature to a pressure not less than 1.5 times its specified maximum working pressure, but not more than two fifths of its bursting pressure. The hose should be stencilled, or otherwise marked, with the date of testing, its specified maximum working pressure and, if used in services other than ambient temperature services, its maximum and minimum service temperature, as applicable. The specified maximum working pressure should not be less than 1 MPa gauge.

(2) Means should be provided for draining any fuel from the bunkering hoses upon completion of operation.

(3) Where fuel hoses are carried on board, arrangements should be made for safe storage of the hoses. Hoses should be stored on the open deck or in a storage room with an independent mechanical extraction ventilation system, providing a minimum of six air changes per hour.

804. Manifold

Ch 5, 401. of this **Rules** is to be applied.

805. Provisions for bunkering system

1. **Ch 8, 101. 4 ~ 7** of this **Rules** is to be applied.
2. In the bunkering line, as close to the connection point as possible, there should be a manually operated stop valve and a remotely operated shutdown valve arranged in series. Alternatively, a combined manually operated and remote shutdown valve may be provided. It should be possible to operate this remotely operated valve from the bunkering control station.
3. For chemical tankers using cargo as fuel, If there is a system that is deemed suitable for its goal and function in this **section**, the requirements of this **section** may not apply.

Section 9 Fuel Supply to Consumer

901. Goal

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

902. Functional requirements

This **Section** is related to functional requirements **1~ 6, 8 ~ 11, 13 ~ 17** of **202.**.

903. General requirements for fuel supply system

1. The fuel piping system should be separate from all other piping systems.
2. The fuel supply system should be arranged such that the consequences of any release of fuel will be minimized, while providing safe access for operation and inspection. The causes and consequences of release of fuel should be subject to special consideration within the risk assessment of **302.**.
3. The piping system for fuel transfer to the consumers should be designed in a way that a failure of one barrier cannot lead to a leak from the piping system into the surrounding area causing danger to the persons on board, the environment or the ship.
4. Fuel lines should be installed and protected so as to minimize the risk of injury to persons on board in case of leakage.

904. Requirements for fuel distribution

1. The outer pipe or duct should be gas and liquid tight.
2. The annular space between inner and outer pipe should have mechanical ventilation of underpressure type with a capacity of minimum 30 air changes per hour and be ventilated to open air. Appropriate means for detecting leakage into the annular space should be provided. The double wall

enclosure should be connected to a suitable draining tank allowing the collection and the detection of any possible leakage.

3. Inerting of the annular space might be accepted as an alternative to ventilation. Appropriate means of detecting leakage into the annular space should be provided. Suitable alarms should be provided to indicate a loss of inert gas pressure between the pipes.

4. The outer pipe in the double-walled fuel pipes should be dimensioned for a design pressure not less than the maximum working pressure of the fuel pipes. As an alternative the calculated maximum built-up pressure in the duct in the case of an inner pipe rupture may be used for dimensioning of the duct.

905. Redundancy of fuel supply

Propulsion and power generation arrangements, together with fuel supply systems, should be arranged so that a failure in fuel supply does not lead to an unacceptable loss of power.

906. Safety functions of the fuel supply system

1. All fuel piping should be arranged for gas-freeing and inerting.

2. Fuel tank inlet and outlet valves should be as close to the tank as possible. Valves required to be operated under normal operation, such as when fuel is supplied to consumers or during bunkering, should be remotely operated if not easily accessible.

3. The main fuel supply line to each consumer or set of consumers should be equipped with an automatically-operated master fuel valve. The master fuel valve(s) should be situated in the part of the piping that is outside the machinery space containing methyl/ethyl alcohol-fuelled consumer(s). The master fuel valve(s) should automatically shut off the fuel supply in accordance with 1502. 3 and table 1.

4. Means of manual emergency shutdown of fuel supply to the consumers or set of consumers should be provided on the primary and secondary escape routes from the consumer compartment, at a location outside consumer space, outside the fuel preparation space and at the bridge. The activation device should be arranged as a physical button, duly marked and protected against inadvertent operation and operable under emergency lighting.

5. The fuel supply line to each consumer should be provided with a remotely operated shut-off valve.

6. There should be one manually operated shutdown valve in the fuel line to each consumer to ensure safe isolation during maintenance.

7. Valves should be of the fail-safe type.

8. When pipes penetrate the fuel tank below the top of the tank a remotely operated shut-off valve should be fitted to the fuel tank bulkhead. When the fuel tank is adjacent to a fuel preparation space, the valve may be fitted on the tank bulkhead on the fuel preparation space side.

907. Requirements for Fuel preparation spaces and Pumps

1. Any fuel preparation space should not be located within a machinery space of category A, should be gas and liquid tight to surrounding enclosed spaces and vented to open air.

2. Hydraulically powered pumps that are submerged in fuel tanks should be arranged with double barriers preventing the hydraulic system serving the pumps from being directly exposed to methyl/ethyl alcohol. The double barrier should be arranged for detection and drainage of eventual methyl/ethyl alcohol leakage.

3. All pumps in the fuel system should be protected against running dry (i.e. protected against operation in the absence of fuel or service fluid). All pumps which are capable of developing a pressure exceeding the design pressure of the system should be provided with relief valves. Each relief valve should be in closed circuit, i.e. arranged to discharge back to the piping upstream of the suction side of the pump and to effectively limit the pump discharge pressure to the design pressure of the system.

〈Newly Added〉

Section 10 POWER GENERATION INCLUDING PROPULSION AND OTHER ENERGY CONVERTERS

1001. Goal

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

1002. Functional requirements

1. This **section** is related to functional requirements as described in **1**, **11** and **13** ~ **17** of **202.**. In particular the following apply:
   (1) the exhaust system should be designed to prevent any accumulation of unburnt fuel; and
   (2) each fuel consumer should have a separate exhaust system.
2. One single failure in the fuel system should not lead to an unacceptable loss of power.

1003. General

1. All engine components and engine-related systems should be designed in such a way that fire and explosion risks are minimized.
2. Engine components containing fuel should be effectively sealed to prevent leakage of fuel into the machinery space.
3. For engines where the space below the piston is in direct communication with the crankcase, a detailed evaluation regarding the hazard potential of fuel gas accumulation in the crankcase should be carried out and reflected in the safety concept of the engine.
4. A means should be provided to monitor and detect poor combustion or misfiring. In the event that it is detected, continued operation may be allowed, provided that the fuel supply to the concerned cylinder is shut off and provided that the operation of the engine with one cylinder cut-off is acceptable with respect to torsional vibrations.

1004. Dual-fuel engines

Ch 10, 302. 1~3 of this **Rules** is to be applied.

1005. Single fuel engines

In case of a normal stop or an emergency shutdown, the fuel supply should be shut off not later than the ignition source. It should not be possible to shut off the ignition source without first or simultaneously closing the fuel supply to each cylinder or to the complete engine.

Section 11 Fire Safety

1101. Goal

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

1102. Functional requirements

This **Section** is related to functional requirements in **1**, **2**, **4**, **5**, **12**, **14** and **16** of **202.** is to be applied.

1103. General provisions

The provisions in this **section** are additional to those given in **Pt 8** of **Rules for the classification of steel ships**. For fuel service tanks and fuel preparation spaces located in the cargo area of chemical tankers using cargo as fuel, **Pt 7, Ch 6** of the **Rules for the Classification of Steel Ships** is to be applied in lieu of this **Section**.

〈Newly Added〉

1104. Fire protection

1. For the purposes of fire protection, fuel preparation spaces should be regarded as machinery space of category A. Should the space have boundaries towards other machinery spaces of category A, accommodation, control station or cargo areas, these boundaries should not be less than A-60.
2. Any boundary of accommodation up to navigation bridge windows, service spaces, control stations, machinery spaces and escape routes, facing fuel tanks on open deck should have A-60 fire integrity.
3. For fire integrity, the fuel tank boundaries should be separated from the machinery spaces of category-A and other rooms with high fire risks by a cofferdam of at least 600 mm, with insulation of not less than A-60 class.
4. The bunkering station should be separated by A-60 class divisions towards machinery spaces of category A, accommodation, control stations and high fire risk spaces, except for spaces such as tanks, voids, auxiliary machinery spaces of little or no fire risk, sanitary and similar spaces where the insulation standard may be reduced to class A-0.

1105. Fire main

When the fuel storage tank is located on the open deck, isolating valves should be fitted in the fire main in order to isolate damaged sections of the fire main. Isolation of a section of fire main should not deprive the fire line ahead of the isolated section from the supply of water.

1106. Fire fighting

1. Where fuel tanks were located on open deck, there should be a fixed fire-fighting system of alcohol-resistant foam type, as set out in **chapter 17** of the **IBC Code** and, where appropriate, **chapter 14** of the **FSS Code**.
2. The alcohol-resistant foam type fire-fighting system should cover the area below the fuel tank where a spill of fuel could be expected to spread.
3. The bunker station should have a fixed fire-extinguishing system of alcohol resistant foam type and a portable dry chemical powder extinguisher or an equivalent extinguisher, located near the entrance of the bunkering station.
4. Where fuel tanks are located on open deck, there should be a fixed water spray system for diluting eventual spills, cooling and fire prevention. The system should cover exposed parts of the fuel tank.
5. A fixed fire detection and fire alarm system complying with **FSS Code** should be provided for all compartments containing the fuel system.
6. Suitable detectors should be selected based on the fire characteristics of the fuel. Smoke detectors should be used in combination with detectors which can more effectively detect methyl/ethyl alcohol fires.
7. Means to ease detection and recognition of methyl/ethyl alcohol fires in machinery spaces should be provided for fire patrols and for fire-fighting purposes, such as portable heat-detection devices.

1107. Fire extinguishing of engine-room and fuel preparation space

1. Machinery space and fuel preparation space where methyl/ethyl alcohol-fuelled engines or fuel pumps are arranged should be protected by an approved fixed fire-extinguishing system in accordance with **Pt 8, Ch 8** of **Rules for the classification of steel ships** and the **FSS Code**. In addition, the fire-extinguishing medium used should be suitable for the extinguishing of methyl/ethyl alcohol fires.
2. An approved alcohol-resistant foam system covering the tank top and bilge area under the floor plates should be arranged for machinery space category A and fuel preparation space containing methyl/ethyl alcohol.

〈N e w l y A d d e d〉

Section 12 Explosion and Area Classification

1201. Goal

The goal of this **section** is to provide for the prevention of explosions and for the limitation of effects of a fire and explosion.

1202. Functional requirements

This **Section** is related to functional requirements **1~ 6, 8, 11~17** of **202.**. The probability of explosions should be reduced to a minimum by:

1. reducing the number of sources of ignition;
2. reducing the probability of formation of ignitable mixtures; and
3. the use of certified safe type electrical equipment suitable for the hazardous zone where the use of electrical equipment in hazardous areas is unavoidable.

1203. General requirements

1. Hazardous areas on open deck and other spaces not addressed in this **section** should be analysed and classified based on a recognized standard. The electrical equipment fitted within hazardous areas should be according to the same standard.
2. All hazardous areas should be inaccessible to passengers and unauthorized crew at all times.

1204. Area classification

1. Ch 12, 401. 1 & 3 of this Rules is to be applied.
2. In order to facilitate the selection of appropriate electrical apparatus and the design of suitable electrical installations, hazardous areas are divided into zones 0, 1 and 2, according to **1205.**. In cases where the prescriptive provisions in **1205**. are deemed to be inappropriate, area classification according to **IEC 60079-10-1** should be applied with special consideration by the Society.

1205. Hazardous area zone

1. Hazardous area zone 0

This zone includes, but is not limited to, the interiors of fuel tanks, any pipework for pressure-relief or other venting systems for fuel tanks, pipes and equipment containing fuel.

2. Hazardous area zone 1

This zone includes, but is not limited to:
(1) cofferdams and other protective spaces surrounding the fuel tanks;
(2) fuel preparation spaces;
(3) areas on open deck, or semi-enclosed spaces on deck, within 3 m of any fuel tank outlet, gas or vapour outlet, bunker manifold valve, other fuel valve, fuel pipe flange, fuel preparation space ventilation outlets;
(4) areas on open deck or semi-enclosed spaces on deck in the vicinity of the fuel tank P/V outlets, within a vertical cylinder of unlimited height and 6 m radius centred upon the centre of the outlet and within a hemisphere of 6 m radius below the outlet;
(5) areas on open deck or semi-enclosed spaces on deck, within 1.5 m of fuel preparation space entrances, fuel preparation space ventilation inlets and other openings into zone 1 spaces;
(6) areas on the open deck within spillage coamings surrounding fuel bunker manifold valves and 3 m beyond these, up to a height of 2.4 m above the deck;
(7) enclosed or semi-enclosed spaces in which pipes containing fuel are located, e.g. ducts around fuel pipes, semi-enclosed bunkering stations; and
(8) a space protected by an airlock is considered as non-hazardous area during normal operation, but will require equipment to operate following loss of differential pressure between the protected space and the hazardous area to be certified as suitable for zone 1.

3. Hazardous area zone 2

This zone includes, but is not limited to:
(1) areas 4 m beyond the cylinder and 4 m beyond the sphere defined in **2.** (4);
(2) areas within 1.5 m surrounding other open or semi-enclosed spaces of zone 1 defined in **2**; and
(3) airlocks.

Section 13 Ventilation

1301. Goal

The goal of this **Section** is to provide for the ventilation required for safe working conditions for personnel and the safe operation of machinery and equipment where methyl/ethyl alcohol is used as fuel.

1302. Functional requirements

This **Section** is related to functional requirements in **1**, **2**, **4**, **6** and **11** ~ **17** of **202.** is to be applied.

1303. General requirements

1. **Ch 13, 301. ~ 303. & 305. ~ 310.** of this **Rules** is to be applied.
2. Ventilation inlets and outlets for spaces required to be fitted with mechanical ventilation should be located such that according to the International Convention on Load Lines they will not be required to have closing appliances.
3. Ventilation systems required to avoid any vapour accumulation should consist of independent fans, each of sufficient capacity, unless otherwise specified in this **Section**. The ventilation system should be of a mechanical exhaust type, with extraction inlets located such as to avoid accumulation of vapour from leaked methyl/ethyl alcohol in the space.
4. Double bottoms, cofferdams, duct keels, pipe tunnels, hold spaces and other spaces where the fuel may accumulate should be capable of being ventilated to ensure a safe environment when entry into the spaces is necessary.

1304. Fuel preparation spaces

1. Fuel preparation spaces should be provided with an effective mechanical forced ventilation system of extraction type. During normal operation the ventilation should be at least 30 air changes per hour.
2. The number and power of the ventilation fans should be such that the capacity is not reduced by more than 50%, if a fan with a separate circuit from the main switchboard or emergency switchboard or a group of fans with common circuit from the main switchboard or emergency switchboard, is inoperable.
3. Ventilation systems for fuel preparation spaces and other fuel handling spaces should be in operation when pumps or other fuel treatment equipment are working.

1305. Bunkering station

Ch 13, 701. of this **Rules** is to be applied.

1306. Ducts and double wall pipes

1. Ducts and double wall pipes containing fuel piping fitted with mechanical ventilation system of the extraction type should be provided with a ventilation capacity of at least 30 air changes per hour.
2. The ventilation system for double wall piping and ducts should be independent of all other ventilation systems.

3. The ventilation inlet for the double wall piping or duct should always be located in a non-hazardous area, in open air, 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

This **Section** is related to functional requirements in **1, 2, 3, 5, 8, 11, 13** and **15 ~ 17** of **202.**.

1403. General requirements

1. **Ch 14, 301., 1, 2, 5, 6** of this **Rules** and **Ch 14, 301. 1** of this **Guidance** is to be applied.
2. Where electrical equipment is installed in hazardous areas as provided in **Ch 14 301. 2** of this **Rules**, it should be selected, installed and maintained in accordance with **IEC 60092-502** or other standards at least equivalent to those acceptable.

Section 15 Control, Monitoring and Safety Systems

151. Goal

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

1502. Functional requirements

1. This **Section** is related to functional requirements in **1, 2, 3, 9, 10, 11, 13, 14** and **17** of **202.**. In particular, **Ch 15, 201. 1** and **4 ~ 6** of this **Rules** is to be applied.
2. A fuel safety system should be arranged to close down the fuel supply system automatically, upon failure in systems as described in **table 1** and upon other fault conditions which may develop too fast for manual intervention.

1503. General provisions

1. **Ch 15, 301. 1** & **3** of this **Rules** is to be applied.
2. Liquid leakage detection should be installed in the protective cofferdams surrounding the fuel tanks, in all ducts around fuel pipes, in fuel preparation spaces, and in other enclosed spaces containing single-walled fuel piping or other fuel equipment.
3. The annular space in a double-walled piping system should be monitored for leakages and the monitoring system should be connected to an alarm system. Any leakage detected should lead to shutdown of the affected fuel supply line in accordance with **table 1**.
4. At least one bilge well with a level indicator should be provided for each enclosed space, where an independent storage tank without a protective cofferdam is located. A high-level bilge alarm should be provided. The leakage detection system should trigger an alarm and the safety functions in accordance with **table 1**.

〈Newly Added〉

1504. Bunkering and fuel tank monitoring

1. Level indicators for fuel tanks

Each fuel tank should be fitted with closed level gauging devices, arranged to ensure a level reading is always obtainable and unless any necessary maintenance can be carried out while the fuel tank is in service, two devices should be installed.

2. Overflow control

(1) Each fuel tank should be fitted with a visual and audible high-level alarm. This should be able to be function tested from the outside of the tank and can be common with the level gauging system (configured as an alarm on the gauging transmitter), but should be independent of the high-high level alarm.
(2) An additional sensor (high-high level) operating independently of the high liquid level alarm should automatically actuate a shut-off valve to avoid excessive liquid pressure in the bunkering line and prevent the tank from becoming liquid full.
(3) The high and high-high level alarm for the fuel tanks should be visual and audible at the location at which gas-freeing by water filling of the fuel tanks is controlled, given that water filling is the preferred method for gas-freeing.

1505. Bunkering control

1. Bunkering control should be from a safe remote location. At this safe remote location:
(1) tank level should be capable of being monitored;
(2) the remote-control valves required by **Ch 8, 501. 7** of this **Rules** should be capable of being operated from this location; closing of the bunkering shutdown valve should be possible from the control location for bunkering and from another safe location; and
(3) overfill alarms and automatic shutdown should also be indicated at this location.

2. If the ventilation in the ducting enclosure or annular spaces of the double walled bunkering lines stops, an audible and visual alarm should be activated at the bunkering control location.

3. If fuel leakage is detected in ducting enclosure or the annular spaces of the double walled bunkering lines, an audible and visual alarm and emergency shutdown of the bunkering valve should automatically be activated.

1506. Engine monitoring

Ch 15, 701. of this **Rules** is to be applied.

1507. Vapour detection

1. Permanently installed vapour detectors should be fitted in:
(1) all ventilated annular spaces of the double walled fuel pipes;
(2) machinery spaces containing fuel equipment or consumers;
(3) fuel preparation spaces;
(4) other enclosed spaces containing fuel piping or other fuel equipment without ducting;
(5) other enclosed or semi-enclosed spaces where fuel vapours may accumulate;
(6) cofferdams and fuel storage hold spaces surrounding fuel tanks;
(7) airlocks; and
(8) ventilation inlets to accommodation and machinery spaces if required based on the risk assessment required in **302.**.

2. The number and placement of detectors in each space should be considered taking into account the size, layout and ventilation of the space. Gas dispersal analysis or a physical smoke test should be used to find the best arrangement.

3. Ch 15, 801. 5 of this **Rules and Guidance** is to be applied.

4. An audible and visible alarm should be activated at a fuel vapour concentration of 20% of the lower explosion limit (LEL). The safety system should be activated at 40% of LEL at two detectors. Special consideration should be given to toxicity in the design process of the detection system.

5. For ventilated ducts and annular spaces around fuel pipes in the machinery spaces containing methyl/ethyl alcohol-fuelled engines, the alarm limit should be set to 20% LEL. The safety system should be activated at 40% of LEL at two detectors.

6. **Ch 15, 801. 8** & **9** of this **Rules** is to be applied.

1508. Fire detection

Fire detection in machinery space containing fuel engines and fuel storage hold spaces should give audible and visual alarms on the navigation bridge and in a continuously manned central control station or safety centre as well as locally.

1509. Ventilation

Any loss of the required ventilating capacity should give an audible and visual alarm on the navigation bridge and in a continuously manned central control station or safety centre as well as locally.

1510. Safety functions of fuel supply systems

1. **Ch 15, 1101.** of this **Rules** is to be applied, except **Ch 15, 1101. 4**.

〈Newly Added〉

Table 1 Monitoring of gas supply system to engines

Parameter	Alarm	Automatic shutdown of tank valve (valve(s) referred to in Ch 9 501. 2)	Automatic shutdown of master fuel valve (valve(s) referred to in Ch 9 501. 3)	Automatic shutdown of bunkering valve
High-level fuel tank	X			X
High, high-level fuel tank	X			X
Loss of ventilation in the annular space in the bunkering line	X			X
Vapour detection in the annular space in the bunkering line	X			X
Loss of ventilation in ventilated areas	X			
Manual shutdown	X			X
Liquid methyl/ethyl alcohol detection in the annular space of the double walled bunkering line	X			X
Vapour detection in ducts around fuel pipes	X			
Vapour detection in cofferdams surrounding fuel tanks. One detector giving 20% of LEL	X			
Vapour detection in airlocks	X			
Vapour detection in cofferdams surrounding fuel tanks. Two detectors giving 40% of LEL	X	X		X
Vapour detection in ducts around double walled pipes, 20% LEL	X			
Vapour detection in ducts around double walled pipes, 40% of LEL	X	X	X	
Liquid leak detection in annular space of double-walled pipes	X	X	X	
Liquid leak detection in engine-room	X	X		
Liquid leak detection in fuel preparation space	X	X		
Liquid leakage detection in protective cofferdams surrounding fuel tanks	X			

〈Newly Added〉

Section 16 Training, Drills and Emergency Exercises

1601. Goal

The goal of this **Section** is to ensure that seafarers on board ships to which this **Annex** apply, are adequately qualified, trained and experienced.

1. Methyl/ethyl alcohol fuel-related drills and exercises should be incorporated into schedule for periodical drills.
2. **Ch 16, 101. 2** of this **Rules** is to be applied.
3. The response and safety system for hazards and accident control should be reviewed and tested.
4. The company should ensure that seafarers on board ships using fuels should have completed training to attain the abilities that are appropriate to the capacity to be filled and duties and responsibilities to be taken up.
5. The master, officers, ratings and other personnel on ships using fuels should be trained and qualified in accordance to the regulation V/3 of the STCW Convention and section A-V/3 of the STCW Code, taking into account the specific hazards of the methyl/ethyl alcohol used as fuel.

Section 17 Operation

1701. Goal

Ch 18, 101. of this **Rules** is to be applied.

1702. Functional requirements

Ch 18, 201. of this **Rules** is to be applied.

1703. Maintenance

1. Maintenance and repair procedures should include considerations with respect to the fuel containment system and adjacent spaces. Special consideration should be given to the toxicity of fuel.
2. **Ch 18, 301. 1** of this **Rules** is to be applied.

1704. Responsibilities for Bunkering operation

1. **Responsibilities**
   (1) Before any bunkering operation commences, the master of the receiving ship or their representative and the representative of the bunkering source (persons in charge, PIC) should:
      (A) agree in writing the transfer procedure including the maximum transfer rate at all stages and volume to be transferred;
      (B) agree in writing action to be taken in an emergency; and
      (C) complete and sign the bunker safety checklist.
   (2) Upon completion of bunkering operations, the ship PIC should receive and sign documentation containing a description of the product and the quantity delivered.
2. **Control, automation and safety systems**
   (1) The fuel handling manual required by **1702.** should include the requirements of **Ch 18, 402. 1** (1) and (4) ~ (9) of this **Rules** but not be limited to.
   (2) **Ch 18, 402. 2** of this **Rules** is to be applied.
3. **Pre-bunkering verification**
   (1) Prior to conducting bunkering operations, pre-bunkering verification including, but not limited to **Ch 18, 403. 1** (1), (3) ~ (5) of this **Rules** and the following, should be carried out and documented in the bunker safety checklist:
      (A) operation of fixed fire detection equipment;

(B) readiness of fixed and portable fire-fighting systems and appliances.

(2) **Ch 18, 403. 2** of this **Rules** is to be applied.

4. Ship bunkering source communications

Ch 18, 404. of this **Rules** is to be applied.

5. Electrical bonding

Consideration should be given to the electrical insulation between ship and shore. ⚓

AMENDMENTS OF GUIDANCES FOR THE CLASSIFICATION OF LOW FLASHPOINT FUEL SHIPS

(External Opinion Inquiry)

2022. 01.

Hull Rule Development Team

- Main Amendments -

(1) Effective Date : 1 July 2022

◉ Amendment of requirement for inspection of vacuum insulation system for vacuum insulated tank

Present	Amendment	Remark
Annex 1 Requirements for Equipment Used for Low-flashpoint Fuel Supply Systems	**Annex 1 Requirements for Equipment Used for Low-flashpoint Fuel Supply Systems**	
Section 10 Vacuum Insulation System for Vacuum Insulated Tanks *(2020)*	**Section 10 Vacuum Insulation System for Vacuum Insulated Tanks *(2020)***	
1001. <omitted>	**1001. <same as the present>**	
1002. <omitted>	**1002. <same as the present>**	
1003. Materials and welding	**1003. Materials and welding**	
1. ~ 2. **<omitted>**	1. ~ 2. **<omitted>**	
3. Elements of insulation systems which do not contribute to vacuums (such as supporting structures installed between inner vessels and other shells, and layered insulation installed on inner vessels as countermeasure for heat radiation) are to be type approved in accordance with **Guidance for the Approval of Manufacturing Process and Type Approval, Etc.**	3. Elements of insulation systems which do not contribute to vacuums (such as supporting structures installed between inner vessels and other shells, and layered insulation installed on inner vessels as countermeasure for heat radiation) are to be verified through testing that they are suitable for the function and environment.	
1004. <omitted>	**1004. <same as the present>**	
1005. Tests and Inspections	**1005. Tests and Inspections**	
1. The following tests are to be conducted. (1) Non-destructive testing for all welded joints of outer shell. (2) ~ (3) <omitted>	1. The following tests are to be conducted. (1) Surface inspection for all welded joints of outer shell. (2) ~ (3) <same as the present>	

GUIDANCE RELATING TO RULES FOR CLASSIFICATION OF SHIPS USING LOW-FLASHPOINT FUELS

(Development Review : External Opinion Inquiry)

2022. 01.

Machinery Rule Development Team

- Main Amendments -

(1) Reflecting Request for Revision of Classification Technical Rules <ships contracted for construction on or after 2022/07/01>

◉ MET4600-281-2021 : Material of equipment used for low flash point fuel supply systems

◉ EAT4800-2119-2021 : Hazardous zone classification regarding low flash point fuel

Present	Amendment	Reason
CHAPTER 12 EXPLOSION PREVENTION **Section 3 General Requirements** <omitted> **Section 4 Area Classification** <omitted> **Section 5 Hazardous Area Zones** **502. Zone "1"** 【See Rules】 **1. to 3.** <omitted> **4.** In addition to the zones defined in **502.** of this Rules, examples of hazardous area zone 1 include, but are not limited to, the following: *(2019)* (1) enclosures or compartments containing gas regulating and/or block and bleed valves; (2) areas on open deck or semi-enclosed spaces on deck, with 3 m of ventilation outlets of spaces: (A) tank connection spaces (B) fuel storage hold spaces (C) interbarrier spaces (D) enclosed or semi-enclosed spaces in which pipes containing fuel are located (E) enclosures or compartments defined in (1) <hereafter omitted>	**CHAPTER 12 EXPLOSION PREVENTION** **Section 3 General Requirements** <same as the presnet Guidance> **Section 4 Area Classification** <same as the presnet Guidance> **Section 5 Hazardous Area Zones** **502. Zone "1"** 【See Rules】 **1. to 3.** <same as the present Guidance> **4.** In addition to the zones defined in **502.** of this Rules, examples of hazardous area zone 1 include, but are not limited to, the following: *(2019)* (1) enclosures or compartments containing gas regulating and/or block and bleed valves; (2) areas on open deck or semi-enclosed spaces on deck, with 3 m of ventilation outlets of spaces: *(2022)* (A) tank connection spaces ~~(B) fuel storage hold spaces~~ ~~(C) interbarrier spaces~~ (B) enclosed or semi-enclosed spaces in which pipes containing fuel are located (C) enclosures or compartments defined in (1) <hereafter same as the present Guidance>	- to be harmonized with IEC

Present	Amendment	Reason
Annex 1 Requirements for Equipment Used for Low-flashpoint Fuel Supply Systems	**Annex 1 Requirements for Equipment Used for Low-flashpoint Fuel Supply Systems**	
Section 1 General <omitted>	**Section 1 General** <same as the presnet Guidance>	
Section 2 Centrifugal Gas Compressors	**Section 2 Centrifugal Gas Compressors**	
201. to 202. <omitted>	**201. to 202. <same as the presnet Guidance>**	
203. Material 1. Materials used for main structural parts are to be suitable for their respective working conditions, such as service temperatures, pressures, etc. In addition, materials to be used for power transmission shafts of prime mover having output of 100 kW are to be in accordance with relevant requirements in **Pt 2, Ch 1** of **Rules for the Classification of Steel Ships**. The materials used for essential parts are to be manufactured by the manufacturer approved by the Society and complied with Korean Industrial Standards or equivalent, unless the Society specially considers necessary. *(2021)* 2. to 4. <omitted>	**203. Material** *(2022)* 1. Materials used for essential parts are to be suitable for their respective working conditions, such as service temperatures, pressures, etc. In addition, materials to be used for power transmission shafts of prime mover having output of 100 kW are to be in accordance with relevant requirements in **Pt 2, Ch 1** of **Rules for the Classification of Steel Ships**. The materials used for essential parts are to be manufactured by the manufacturer approved by the Society and complied with Korean Industrial Standards or equivalent, unless the Society specially considers necessary. *(2022)* 2. to 4. <same as the present Guidance>	- to be harmonized with Pt 5 Ch 6 of Rules
	<amended as same for Ch 3, Ch 4, Ch 5, Ch 6>	