Amendments of the Rules for Classification of Steel Ships

Part 5 MACHINERY INSTALLATIONS

2024. 01.

Machinery Rule Development Team

- Main Amendments -

(1) Effective date : 1 Jul. 2024 (Date of which contracts for construction are signed)

◉ The name of diesel engine and internal combustion engine has been modified to reciprocating internal combustion engine.

◉ The requirements for corrosion allowance of pressure vessels have been clarified.

(2) Effective date : 1 Jul. 2024 (Date of the application for certification)

◉ By reflecting IACS UR M72 (Rev.3 April 2023), it has been revised so NDE of engine components can be conducted at an appropriate stage in the early stage of production.

◉ By reflecting IACS UR M73(Rev.2 May 2023), the requirements for the containment of exhaust gas turbochargers have been revised.

Present	Amendment	Reason
# CHAPTER 1 GENERAL ## Section 1 General **101. Application** **1. ~ 4. 〈omitted〉** **5.** For the purpose of determining the power of main and auxiliary internal combustion engines, the ambient reference conditions are to be such as given in **Table 5.1.1.** However, the engine manufacturers shall not be expected to provide simulated ambient reference conditions at a test bed. **6. ~ 9. 〈omitted〉** **102. Definitions** **1. ~ 8. 〈omitted〉** **9. Exhaust gas boiler** is a boiler which generates steam or hot water solely by exhaust gas from internal combustion engine and has a steam space or a hot well and has an outlet of steam or hot water. **10. Exhaust gas economizer** is the equipment without any steam space or hot well which generates steam or hot water solely by exhaust gas from internal combustion engine and supplies to other boiler. (hereafter, omitted)	# CHAPTER 1 GENERAL ## Section 1 General **101. Application** **1. ~ 4. 〈same as the present〉** **5.** For the purpose of determining the power of main and auxiliary reciprocating internal combustion engines, the ambient reference conditions are to be such as given in **Table 5.1.1.** However, the engine manufacturers shall not be expected to provide simulated ambient reference conditions at a test bed. **6. ~ 9. 〈same as the present〉** **102. Definitions** **1. ~ 8. 〈same as the present〉** **9. Exhaust gas boiler** is a boiler which generates steam or hot water solely by exhaust gas from reciprocating internal combustion engine and has a steam space or a hot well and has an outlet of steam or hot water. **10. Exhaust gas economizer** is the equipment without any steam space or hot well which generates steam or hot water solely by exhaust gas from reciprocating internal combustion engine and supplies to other boiler. (hereafter, same as the present Rules)	〈Pt 5 Rules〉 (Amendment) The name of diesel engines has been modified to reciprocating internal combustion engines. 〈application date: the date of contract for construction on or after 1 Jul. 2024〉 - As gas turbines were included in internal combustion engines, they have been modified to reciprocating internal combustion engines for more clarity.

Present	Amendment	Reason
Section 2 Plans and Documents **201. ~ 202. 〈omitted〉** **203. Plans and documents to be submitted by the licensor and licensee of internal combustion engines 【See Guidance】** **1. ~ 3. 〈omitted〉** **Table 5.1.4 Documents of internal combustion engines to be submitted for approval** **Table 5.1.5 Documents of Internal combustion engines to be submitted for information** **Table 5.1.6 Documents of internal combustion engines to be submitted for inspection** (hereafter, omitted) **Section 4 Spare Parts and Tools** **401. 〈omitted〉** **402. Description and Number of spare parts *(2017)* 【See Guidance】** Description and number of spare parts for main and essential auxiliary engines, main and essential auxiliary steam turbines, shafting and power transmission system, boilers, essential auxiliaries, various tools and instruments are to be as recommended by the Society. ⚓	**Section 2 Plans and Documents** **201. ~ 202. 〈same as the present〉** **203. Plans and documents to be submitted by the licensor and licensee of reciprocating internal combustion engines 【See Guidance】** **1. ~ 3. 〈same as the present〉** **Table 5.1.4 Documents of reciprocating internal combustion engines to be submitted for approval** **Table 5.1.5 Documents of reciprocating Internal combustion engines to be submitted for information** **Table 5.1.6 Documents of reciprocating internal combustion engines to be submitted for inspection** (hereafter, same as the present Rules) **Section 4 Spare Parts and Tools** **401. 〈same as the present〉** **402. Description and Number of spare parts *(2017)* 【See Guidance】** Description and number of spare parts for reciprocating internal combustion engines for main and essential auxiliary, main and essential auxiliary steam turbines, shafting and power transmission system, boilers, essential auxiliaries, various tools and instruments are to be as recommended by the Society. ⚓	〈Pt 5 Rules〉 - As gas turbines were included in internal combustion engines, they have been modified to reciprocating internal combustion engines for more clarity.

Present	Amendment	Reason
# CHAPTER 2 MAIN AND AUXILIARY ENGINES ## Section 1 General **101. Application** **1. ~ 2. 〈omitted〉** **3.** Internal combustion engines driving emergency generators are to comply with the requirements in **Pt 6, Ch 1, 203.** and **Pt 6, Ch 2, 204. 2.** *(2018)* **4. ~ 6. 〈omitted〉** **7. Electronic controlled diesel engines** Electronically controlled diesel engines for the main propulsion engines are to be in accordance with the separated requirements of the Society, in addition to the requirements prescribed in this Chapter. **【See Guidance】** **8. Gas fueled engines** The gas fueled engines installed on liquefied gas cargo carriers using cargo as fuel subject to **Pt 7, Ch 5** are to comply with the requirements in **Pt 7, Ch 5, Sec 5** and **Sec 16** in addition to the relevant requirements specified in this Chapter. The gas fueled engines installed on Ships using low-flashpoint fuels of below 60 °C other than ships carrying liquified gases in bulk and ships carrying CNG in bulk are to comply with the requirements in the **Rules for Ships using Low-flashpoint Fuels** in addition to the relevant requirements specified in this Chapter. In addition, Internal combustion engines supplied with low pressure gas are to comply with the requirements given in **Annex 5-7** of the Guidance. *(2018) (2021)* (hereafter, omitted)	# CHAPTER 2 MAIN AND AUXILIARY ENGINES ## Section 1 General **101. Application** **1. ~ 2. 〈same as the present〉** **3.** Reciprocating internal combustion engines driving emergency generators are to comply with the requirements in **Pt 6, Ch 1, 203.** and **Pt 6, Ch 2, 204. 2.** *(2018)* **4. ~ 6. 〈same as the present〉** **7. Electronic controlled reciprocating internal combustion engines** Electronically controlled reciprocating internal combustion engines engines for the main propulsion engines are to be in accordance with the separated requirements of the Society, in addition to the requirements prescribed in this Chapter. **【See Guidance】** **8. Gas fueled engines** The gas fueled engines installed on liquefied gas cargo carriers using cargo as fuel subject to **Pt 7, Ch 5** are to comply with the requirements in **Pt 7, Ch 5, Sec 5** and **Sec 16** in addition to the relevant requirements specified in this Chapter. The gas fueled engines installed on Ships using low-flashpoint fuels of below 60 °C other than ships carrying liquified gases in bulk and ships carrying CNG in bulk are to comply with the requirements in the **Rules for Ships using Low-flashpoint Fuels** in addition to the relevant requirements specified in this Chapter. In addition, reciprocating internal combustion engines supplied with low pressure gas are to comply with the requirements given in **Annex 5-7** of the Guidance. *(2018) (2021)* (hereafter, same as the present Rules)	〈Pt 5 Rules〉 - As gas turbines were included in internal combustion engines, they have been modified to reciprocating internal combustion engines for more clarity. - As the gas-fueled engines appeared, the name of diesel engines have a limit in representativeness, so the name of diesel engines has been modified to reciprocating internal combustion engines.

Present	Amendment	Reason
Section 2 Internal Combustion Engines **201. Materials** **1. Tests** Materials intended for the parts marked in **Table 5.2.4** are to be tested and inspected to comply with the requirements of **Pt 2, Ch 1.** **2. 〈omitted〉**	**Section 2 Reciprocating Internal Combustion Engines** **201. Materials** **1. Tests** Materials of the parts for reciprocating internal combustion engines are to be tested as specified in **Table 5.2.4** and are to comply with the requirements of **Pt 2, Ch 1.** **2. 〈same as the present〉**	〈Pt 5 Rules〉 - As gas turbines were included in internal combustion engines, they have been modified to reciprocating internal combustion engines for more clarity. - Added reciprocating internal combustion engines and corrected the text to match the Korean version.

Present	Amendment	Reason
202. Construction and installation **1. ~ 2. 〈omitted〉** **3. Exhaust gas turbocharger** (1) ~ (3) 〈omitted〉 (4) Turbochargers shall fulfil containment in the event of a rotor burst. This means that at a rotor burst no part may penetrate the casing of the turbocharger or escape through the air intake. For documentation purposes (test/calculation), it shall be assumed that the discs disintegrate in the worst possible way. For category B and C, containment shall be documented by testing. Fulfilment of this requirement can be awarded to a generic range of turbochargers based on testing of one specific unit. Testing of a large unit is preferred as this is considered conservative for all smaller units in the generic range. In any case, it must be documented (e.g. by calculation) that the selected test unit really is representative for the whole generic range. (A) The minimum test speeds, relative to the maximum permissible operating speed, are 120 % for the compressor, 140 % or the natural burst speed for the turbine, whichever is lower. Containment tests shall be performed at working temperature.	**202. Construction and installation** **1. ~ 2. 〈same as the present〉** **3. Exhaust gas turbocharger** (1) ~ (3) 〈same as the present〉 (4) Containment (A) Turbochargers are to fulfil containment in the event of a rotor burst. This means that at a rotor burst no part may penetrate the casing of the turbocharger or escape through the air intake. For documentation purposes (test/calculation), it is to be assumed that the discs disintegrate in the worst possible way. (B) For category B and C, containment is to be documented by testing. Fulfilment of this requirement can be awarded to a generic range of turbochargers based on testing of one specific unit. Testing of a large unit is preferred as this is considered conservative for all smaller units in the generic range. In any case, it must be documented (e.g. by calculation) that the selected test unit really is representative for the whole generic range. A generic range means a series of turbocharger which are of the same design, but scaled to each other. (C) The minimum test speeds, relative to the maximum permissible operating speed, are 120 % for the compressor, 140 % or the natural burst speed for the turbine, whichever is lower. (D) Containment tests are to be performed at a temperature which is not lower than the maximum allowable temperature of the turbocharger to be specified by the manufacturer. (E) Manufacturers are to determine whether cases more critical than those defined in (C) and (D) exist with respect to containment safety. Where such a case is identified, evidence of containment safety is also to be provided for that case.	〈Pt 5 Rules〉 (Amendment) Reflecting IACS UR M73(Rev.2 May 2023) 〈application date: the date of application for certification on or after 1 Jul. 2024〉 - Re-arranged for easy viewing with the title "Containment" in line with the UR. - Reflecting 3.2.4 - Reflecting 3.2.5

Present	Amendment	Reason
(B) Where deemed as appropriate by the Society, a numerical analysis (simulation) of sufficient containment integrity of the casing based on calculations by means of a simulation model may be accepted in lieu of the practical containment test. **【See Guidance】**	(F) A numerical analysis simulation such as Finite Element Method (FEM) of sufficient containment integrity of the casing based on calculations by means of a simulation model may be accepted in lieu of the practical containment test, provided that: (a) The numerical simulation model has been tested and its suitability/accuracy has been proven by direct comparison between calculation results and the practical containment test for a reference application (reference containment test). This test is to be performed at least once by the manufacturer for acceptance of the numerical simulation method in lieu of tests. (b) The corresponding numerical simulation for the containment is performed for the same speeds as specified for the containment test. (c) Material properties for high-speed deformations are to be applied in the numeric simulation. The correlation between normal properties and the properties at the pertinent deformation speed are to be substantiated. (d) The design of the turbocharger regarding geometry and kinematics is to be similar to the turbocharger that was used for the reference containment test.	〈Pt 5 Rules〉 - Reflecting 3.2.6 - The requirements (a) ~ (d) that were reflected in the Guidance have been moved to the Rules to enhance intuitiveness.
	(G) In cases where a totally new design is adopted for a turbocharger for which an application for type approval certification has been requested, new reference containment tests are to be performed. Totally new design means the principal differences between a new turbocharger and previous ones are related to geometry and kinematics. The turbochargers are to be regarded as having a totally new design if the structure and/or material of the turbocharger casings are changed, or any of, but not limited to, the following items is changed from the previous design. (a) Maximum permissible exhaust gas temperature (b) Number of bearings (c) Number of turbine blades (d) Number of turbine wheels and/or compressor wheels (e) Direction of inlet air and/or exhaust gas (e.g., axial flow orientation, radial flow orientation) (f) Type of the turbocharger drive (e.g., axial turbine type, radial turbine type, mixed flow turbine type)	- Reflecting 3.2.7, added the definition of "totally new design"
(hereafter, omitted)	(hereafter, same as the present Rules)	

Present	Amendment	Reason
		〈Pt 5 Rules〉
203. Safety devices	**203. Safety devices**	
1. Governors	**1. Governors**	
(1) ~ (2) 〈omitted〉 (3) When electronic speed governors fitted to main internal combustion engines and form part of a remote control system, they are to comply with **Pt 9, Ch 3, 305. 2** (3) and with the following conditions. *(2020)* (A) ~ (C) 〈omitted〉	(1) ~ (2) 〈same as the present〉 (3) When electronic speed governors fitted to main engines and form part of a remote control system, they are to comply with **Pt 9, Ch 3, 305. 2** (3) and with the following conditions. *(2020)* (A) ~ (C) 〈same as the present〉	- Modified as per Ch 1, 102. 1
2. ~ 3. 〈omitted〉	**2. ~ 3. 〈same as the present〉**	
4. Relief valve of crankcase 【See Guidance】	**4. Relief valve of crankcase 【See Guidance】**	
(1) Internal combustion engines having a cylinder bore of 200 mm and above or a crankcase volume of 0.6 m^3 and above shall be provided with relief valves of an approved type, for the purpose of relieving the excess pressure in the event of an internal explosion. (2) ~ (8) 〈omitted〉	(1) Reciprocating internal combustion engines having a cylinder bore of 200 mm and above or a crankcase volume of 0.6 m^3 and above shall be provided with relief valves of an approved type, for the purpose of relieving the excess pressure in the event of an internal explosion. (2) ~ (8) 〈same as the present〉	- As gas turbines were included in internal combustion engines, they have been modified to reciprocating internal combustion engines for more clarity.
5. ~ 9. 〈omitted〉	**5. ~ 9. 〈same as the present〉**	

Present	Amendment	Reason
10. Oil mist detection arrangements of crankcase (1) 〈omitted〉 (A) Low speed diesel engines of 2,250 kW and above or having cylinders of more than 300 mm bore : alarm and slow down purposes. (B) Medium and high speed diesel engines of 2,250 kW and above or having cylinders of more than 300 mm bore : alarm and automatic shutoff purposes. The definition of low, medium and high speed engines is given in **Table 5.2.1**. **Table 5.2.1 The definition of diesel engines according to rated speed** Description / Rated Speed R (rpm) Low speed / R 〈 300 Medium speed / 300 ≤ R 〈 1400 High speed / 1400 ≤ R (hereafter, omitted) **204. Crankshafts** **1. Application** The following requirements are to be applied to the crankshafts of diesel engines. For the crank shafts of internal combustion engines other than diesel engines, special consideration will be given. (hereafter, omitted)	**10. Oil mist detection arrangements of crankcase** (1) 〈omitted〉 (A) Low speed reciprocating internal combustion engines of 2,250 kW and above or having cylinders of more than 300 mm bore : alarm and slow down purposes. (B) Medium and high speed reciprocating internal combustion engines of 2,250 kW and above or having cylinders of more than 300 mm bore : alarm and automatic shutoff purposes. The definition of low, medium and high speed engines is given in **Table 5.2.1**. **Table 5.2.1 The definition of reciprocating internal combustion engines according to rated speed** Description / Rated Speed R (rpm) Low speed / R 〈 300 Medium speed / 300 ≤ R 〈 1400 High speed / 1400 ≤ R (hereafter, same as the present Rules) **204. Crankshafts** **1. Application** The following requirements are to be applied to the crankshafts of reciprocating internal combustion engines ~~For the crank shafts of reciprocating internal combustion engines other than diesel engines, special consideration will be given.~~ (hereafter, same as the present Rules)	〈Pt 5 Rules〉 - As the gas-fueled engines appeared, the name of diesel engines have a limit in representativeness, so the name of diesel engines has been modified to reciprocating internal combustion engines. - Modified to match the Korean version.

<table>
<tr><th>Present</th><th>Amendment</th><th>Reason</th></tr>
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211. Tests and Inspections

1. ~ 2. 〈omitted〉

Table 5.2.4 Test and inspection of engine components (continued)

Component	Material properties(1)	Non-destructive examination(2)	〈omitted〉	Component certificate
〈omitted〉				

NOTES:
C : Chemical composition
〈omitted〉
X : Visual examination of accessible surfaces by the Surveyor

(1) Material properties include chemical composition and mechanical properties, and also surface treatment such as surface hardening (hardness, depth and extent), peening and rolling (extent and applied force).
(2) Non-destructive examination means e.g. ultrasonic testing, crack detection by magnetic particle tests or liquid penetrant tests.
(3) ~ (7) 〈omitted〉

3. Type approval of engine

For diesel engines with novel design features or those with no service records, in case where deemed necessary by the Society, they are to be type approved in accordance with the procedure as deemed appropriate by the Society. **【See Guidance】**

(hereafter, omitted)

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211. Tests and Inspections

1. ~ 2. 〈same as the present〉

Table 5.2.4 Test and inspection of engine components (continued)

Component	Material properties(1)	Non-destructive examination(2)	〈omitted〉	Component certificate
〈omitted〉				

NOTES:
C : Chemical composition
〈omitted〉
X : Visual examination of accessible surfaces by the Surveyor

(1) Material properties include chemical composition and mechanical properties, and also surface treatment such as surface hardening (hardness, depth and extent), peening and rolling (extent and applied force).
(2) Non-destructive examination means e.g. ultrasonic testing, crack detection by magnetic particle tests or liquid penetrant tests. When certain NDE method on the finished component is impractical (for example UT for cylinder head GS/forged cylinder head), the NDE method can be performed at earlier appropriate stages in the production of the component.
(3) ~ (7) 〈same as the present〉

3. Type approval of engine

For reciprocating internal combustion engines with novel design features or those with no service records, in case where deemed necessary by the Society, they are to be type approved in accordance with the procedure as deemed appropriate by the Society. **【See Guidance】**

(hereafter, same as the present Rules)

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〈Pt 5 Rules〉
(Amendment) Reflecting IACS UR M72 (Rev.3 April 2023) 〈application date: the date of application for certification on or after 1 Jul. 2024〉

- In the case of a cylinder head, it is difficult to perform UT due to the addition of complicated shapes after machining. In this case, it has been revised so that NDE can be conducted at an appropriate stage in the early stage of production.
- Modified to match the Korean version.

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Present	Amendment	Reason
# CHAPTER 3 PROPULSION SHAFTING AND POWER TRANSMISSION SYSTEMS ## Section 2 Shaftings **201. Application** **1.** The requirements of this Section apply to the shaftings of ships having diesel engines, steam turbines and gas turbines as their main engines and of ships of electric propulsion. **2. 〈omitted〉** **202. 〈omitted〉** **203. Intermediate shaft and thrust shaft** The diameters of intermediate shaft and thrust shaft are not to be less than those obtained by the following formula: **【See Guidance】** $d_0 = F \cdot K_1 \sqrt[3]{\frac{P}{n} \times \frac{560}{(T+160)}}$ (mm) where: P = Shaft output of engine at maximum continuous output (kW) n = Number of shaft revolution at maximum continuous output (rpm) F = Factor for the type of propulsion installations · 95 for intermediate shafts in turbine installation, diesel installations with hydraulic(slip type) couplings, electric propulsion installations · 100 for all other diesel installations and all propeller shafts (hereafter, omitted)	# CHAPTER 3 PROPULSION SHAFTING AND POWER TRANSMISSION SYSTEMS ## Section 2 Shaftings **201. Application** **1.** The requirements of this Section apply to the shaftings of ships having reciprocating internal combustion engines, steam turbines and gas turbines as their main engines and of ships of electric propulsion. **2. 〈same as the present〉** **202. 〈same as the present〉** **203. Intermediate shaft and thrust shaft** The diameters of intermediate shaft and thrust shaft are not to be less than those obtained by the following formula: **【See Guidance】** $d_0 = F \cdot K_1 \sqrt[3]{\frac{P}{n} \times \frac{560}{(T+160)}}$ (mm) where: P = Shaft output of engine at maximum continuous output (kW) n = Number of shaft revolution at maximum continuous output (rpm) F = Factor for the type of propulsion installations · 95 for intermediate shafts in turbine installation, reciprocating internal combustion engines with hydraulic(slip type) couplings, electric propulsion installations · 100 for all other reciprocating internal combustion engines ~~and all propeller shafts~~ (hereafter, same as the present Rules)	〈Pt 5 Rules〉 - As the gas-fueled engines appeared, the name of diesel engines have a limit in representativeness, so the name of diesel engines has been modified to reciprocating internal combustion engines. - Modified to match the Korean version.

Present

Section 4 Power Transmission Systems

401. ~ 402. 〈omitted〉

403. Allowable tangential load for gears

Table 5.3.4 Values of K_1

Driving engine	Construction or method of connection	K_1 (3)	
		Gear for propulsion	Gear for auxiliaries
〈omitted〉			
Internal combustion engine	Hydro-dynamic or electro-magnetic coupling	1.00	1.15
	High elastic coupling	0.90	1.05
	Elastic coupling	0.80	0.95
	Rigid coupling	0.50	0.60
NOTES: (1) ~ (3) 〈omitted〉			

(hereafter, omitted)

Amendment

Section 4 Power Transmission Systems

401. ~ 402. 〈same as the present〉

403. Allowable tangential load for gears

Table 5.3.4 Values of K_1

Driving engine	Construction or method of connection	K_1 (3)	
		Gear for propulsion	Gear for auxiliaries
〈same as the present〉			
Reciprocating internal combustion engine	Hydro-dynamic or electro-magnetic coupling	1.00	1.15
	High elastic coupling	0.90	1.05
	Elastic coupling	0.80	0.95
	Rigid coupling	0.50	0.60
NOTES: (1) ~ (3) 〈same as the present〉			

(hereafter, same as the present Rules)

Reason

〈Pt 5 Rules〉

- As gas turbines were included in internal combustion engines, they have been modified to reciprocating internal combustion engines for more clarity.

Present	Amendment	Reason
407. Tests and inspections **1. ~ 3. 〈omitted〉** **4. Flexible couplings *(2019)*** (1) 〈omitted〉 (2) For non-metallic type (rubber, silicone, etc.) flexible couplings are to be subjected to a torque test. The test is to be carried out by twisting the flexible coupling or by subjecting the elastomer to a load which is equivalent to the coupling twist. The test torque is to be not less than 1.5 times the permissible nominal torque T_{KN}. The deflection from test results is to be within the tolerance specified by manufacturer. Flexible couplings not used with internal combustion engines may adjust the scope of the torque test at the discretion of the Surveyor. (3) 〈omitted〉	**407. Tests and inspections** **1. ~ 3. 〈same as the present〉** **4. Flexible couplings *(2019)*** (1) 〈same as the present〉 (2) For non-metallic type (rubber, silicone, etc.) flexible couplings are to be subjected to a torque test. The test is to be carried out by twisting the flexible coupling or by subjecting the elastomer to a load which is equivalent to the coupling twist. The test torque is to be not less than 1.5 times the permissible nominal torque T_{KN}. The deflection from test results is to be within the tolerance specified by manufacturer. Flexible couplings not used with reciprocating internal combustion engines may adjust the scope of the torque test at the discretion of the Surveyor. (3) 〈same as the present〉	〈Pt 5 Rules〉 - As gas turbines were included in internal combustion engines, they have been modified to reciprocating internal combustion engines for more clarity.
Section 5 Water-jet propulsion systems *(2023)* **501. General** **1. 〈omitted〉** **2. Definitions** The terms used in this Section are defined as follows: (1) ~ (7) 〈omitted〉 (8) **High speed engine** is the high-rotating-speed internal combustion engine specified in **Pt 1, Ch 2, 303. 3** of the Guidance or gas turbine. (hereafter, omitted)	**Section 5 Water-jet propulsion systems *(2023)*** **501. General** **1. 〈same as the present〉** **2. Definitions** The terms used in this Section are defined as follows: (1) ~ (7) 〈same as the present〉 (8) **High speed engine** is the high-rotating-speed reciprocating internal combustion engine specified in **Pt 1, Ch 2, 303. 3** of the Guidance or gas turbine. (hereafter, same as the present Rules)	

Present	Amendment	Reason
# CHAPTER 4 TORSIONAL VIBRATION OF SHAFTINGS ## Section 2 Allowable Limit of Vibration Stresses **201. Crankshafts** The torsional vibration stresses on the crankshafts of main propulsion diesel engines are to be in accordance with the following requirements. However, where the strength calculation for crankshafts is carried out according to the special requirements given by the Society, these stresses are to comply with this special requirements. **【See Guidance】** **1. 〈omitted〉** (1) For 4 cycle in-line diesel engines and 4 cycle vee type diesel engines with firing intervals of 45° or 60°, the value of τ_1 is given by the following formula: 〈omitted〉 (2) For 2 cycle diesel engines and 4 cycle vee type diesel engines other than shown in (1) above, the value of τ_1 is given by the following formula: 〈omitted〉 **2. 〈omitted〉** **3. 〈omitted〉** (1) For 4 cycle in-line diesel engines and 4 cycle vee type diesel engines with firing intervals of 45° or 60°, the value of τ_3 is given by the following formula: 〈omitted〉 (2) For 2 cycle diesel engines and 4 cycle vee type diesel engines other than shown in (1) above, the value of τ_3 is given by the following formula: (hereafter, omitted)	# CHAPTER 4 TORSIONAL VIBRATION OF SHAFTINGS ## Section 2 Allowable Limit of Vibration Stresses **201. Crankshafts** The torsional vibration stresses on the crankshafts of reciprocating internal combustion engines used as main engines are to be in accordance with the following requirements. However, where the strength calculation for crankshafts is carried out according to the special requirements given by the Society, these stresses are to comply with this special requirements. **【See Guidance】** **1. 〈same as the present〉** (1) For 4 cycle in-line ~~diesel~~ engines and 4 cycle vee type ~~diesel~~ engines with firing intervals of 45° or 60°, the value of τ_1 is given by the following formula: 〈same as the present〉 (2) For 2 cycle ~~diesel~~ engines and 4 cycle vee type ~~diesel~~ engines other than shown in (1) above, the value of τ_1 is given by the following formula: 〈same as the present〉 **2. 〈same as the present〉** **3. 〈same as the present〉** (1) For 4 cycle in-line ~~diesel~~ engines and 4 cycle vee type ~~diesel~~ engines with firing intervals of 45° or 60°, the value of τ_3 is given by the following formula: 〈same as the present〉 (2) For 2 cycle ~~diesel~~ engines and 4 cycle vee type ~~diesel~~ engines other than shown in (1) above, the value of τ_3 is given by the following formula: (hereafter, same as the present Rules)	〈Pt 5 Rules〉 - As the gas-fueled engines appeared, the name of diesel engines have a limit in representativeness, so the name of diesel engines has been modified to reciprocating internal combustion engines. - Removed 'diesel' to apply also to gas-fueled engines.

Present	Amendment	Reason
		〈Pt 5 Rules〉
202. Intermediate shafts, thrust shafts, propeller shafts and stern tube shafts **1.** For ships equipped with main propulsion diesel engine, the torsional vibration stresses on the intermediate shafts, thrust shafts, propeller shafts and stern tube shafts are to be in accordance with the following requirements (1) and (2). (1) ~ (2) 〈omitted〉 **2.** For main propulsion system formed by steam turbines, gas turbines, diesel engines having slide couplings such as electro-magnetic coupling or fluid couplings, or electric propulsion systems, allowable limits of the torsional vibration stress on the intermediate shafts, thrust shafts, propeller shaft and stern tube shafts are to be as deemed appropriate by the Society. **【See Guidance】**	**202. Intermediate shafts, thrust shafts, propeller shafts and stern tube shafts** **1.** For ships equipped with reciprocating internal combustion engines used as main engines, the torsional vibration stresses on the intermediate shafts, thrust shafts, propeller shafts and stern tube shafts are to be in accordance with the following requirements (1) and (2). (1) ~ (2) 〈same as the present〉 **2.** For main propulsion system formed by steam turbines, gas turbines, reciprocating internal combustion engines having slide couplings such as electro-magnetic coupling or fluid couplings, or electric propulsion systems, allowable limits of the torsional vibration stress on the intermediate shafts, thrust shafts, propeller shaft and stern tube shafts are to be as deemed appropriate by the Society. **【See Guidance】**	- As the gas-fueled engines appeared, the name of diesel engines have a limit in representativeness, so the name of diesel engines has been modified to reciprocating internal combustion engines.
203. Shafting system of generators **1.** Torsional vibration stresses on the crankshafts of diesel engines to drive generators are to be in accordance with the following requirements (1) and (2). However, where the strength calculation for crankshafts is carried out according to the special requirements given by the Society, these stresses are to comply with the special requirements. **【See Guidance】** (1) 〈omitted〉 (A) For 4 cycle in-line diesel engines and 4 cycle vee type diesel engines with firing intervals of 45° or 60°, the value of τ_1 is given by the following formula: $\tau_1 = 21 \ \mathrm{N/mm^2}$ (B) For 2 cycle diesel engines and 4 cycle vee type diesel engines other than shown in (A), the value of τ_1 is given by the following formula: $\tau_1 = 16 \ \mathrm{N/mm^2}$ (2) 〈omitted〉	**203. Shafting system of generators** **1.** Torsional vibration stresses on the crankshafts of reciprocating internal combustion engines to drive generators are to be in accordance with the following requirements (1) and (2). However, where the strength calculation for crankshafts is carried out according to the special requirements given by the Society, these stresses are to comply with the special requirements. **【See Guidance】** (1) 〈same as the present〉 (A) For 4 cycle in-line ~~diesel~~ engines and 4 cycle vee type ~~diesel~~ engines with firing intervals of 45° or 60°, the value of τ_1 is given by the following formula: $\tau_1 = 21 \ \mathrm{N/mm^2}$ (B) For 2 cycle ~~diesel~~ engines and 4 cycle vee type ~~diesel~~ engines other than shown in (A), the value of τ_1 is given by the following formula: $\tau_1 = 16 \ \mathrm{N/mm^2}$ (2) 〈same as the present〉	- Removed 'diesel' to apply also to gas-fueled engines.

Present	Amendment	Reason
2. The torsional vibration stresses on the generator shafts driven by diesel engines are to be in accordance with the following requirements (1) and (2). (1) ~ (2) 〈omitted〉 **3. 〈omitted〉** **204. Avoidance of major criticals** The major criticals of one node vibration in in-line diesel engine, e.g. the n th and n/2th order for 4 cycle and the nth order for 2 cycle (n denotes the number of cylinders), are not to exist within the following speed range except when an approval is specifically obtained by the Society: (hereafter, omitted)	**2.** The torsional vibration stresses on the generator shafts driven by reciprocating internal combustion engines are to be in accordance with the following requirements (1) and (2). (1) ~ (2) 〈same as the present〉 **3. 〈same as the present〉** **204. Avoidance of major criticals** The major criticals of one node vibration in in-line reciprocating internal combustion engine, e.g. the n th and n/2th order for 4 cycle and the nth order for 2 cycle (n denotes the number of cylinders), are not to exist within the following speed range except when an approval is specifically obtained by the Society: (hereafter, same as the present Rules)	〈Pt 5 Rules〉 - As the gas-fueled engines appeared, the name of diesel engines have a limit in representativeness, so the name of diesel engines has been modified to reciprocating internal combustion engines.

<table>
<tr><th>Present</th><th>Amendment</th><th>Reason</th></tr>
<tr>
<td>

CHAPTER 5 BOILERS AND PRESSURE VESSELS

Section 3 Pressure Vessels

301. ~ 308. 〈omitted〉

309. Tests and Inspections

Table 5.5.15 The Thickness of Shell Plates and End Plates

<table>
<tr><td colspan="2">Shell plates and end plates</td><td>The required thickness (mm)</td></tr>
<tr><td rowspan="2">Shell plates</td><td>Cylindrical</td><td>$T=\frac{PD_1}{2fJ-1.2P}+c$</td></tr>
<tr><td>Spherical</td><td>$T=\frac{PR_1}{2fJ-0.2P}+c$</td></tr>
<tr><td>End plates</td><td colspan="2">〈omitted〉</td></tr>
<tr><td colspan="3">P = Design pressure (MPa)
〈omitted〉
c = Corrosion allowance(3) (mm)</td></tr>
<tr><td colspan="3">NOTES :
(1) ~ (2) 〈omitted〉
(3) The corrosion allowance is to be 1/6 of the required thickness or 1 mm, whichever is less. However, pressure vessels containing corrosive liquids or gases may increase the corrosion allowance, and pressure vessels containing non-corrosive liquids or gases or pressure vessels using corrosion resistant materials may reduce the corrosion allowance. (2021)</td></tr>
</table>

(hereafter, omitted)

</td>
<td>

CHAPTER 5 BOILERS AND PRESSURE VESSELS

Section 3 Pressure Vessels

301. ~ 308. 〈same as the present〉

309. Tests and Inspections

Table 5.5.15 The Thickness of Shell Plates and End Plates

<table>
<tr><td colspan="2">Shell plates and end plates</td><td>The required thickness (mm)</td></tr>
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<tr><td>Spherical</td><td>$T=\frac{PR_1}{2fJ-0.2P}+c$</td></tr>
<tr><td>End plates</td><td colspan="2">〈same as the present〉</td></tr>
<tr><td colspan="3">P = Design pressure (MPa)
〈omitted〉
c = Corrosion allowance(3) (mm)</td></tr>
<tr><td colspan="3">NOTES :
(1) ~ (2) 〈same as the present〉
(3) The corrosion allowance is to be 1/6 of the required thickness <u>(excluding the corrosion allowance)</u> or 1 mm, whichever is less. However, pressure vessels containing corrosive liquids or gases may increase the corrosion allowance, and pressure vessels containing non-corrosive liquids or gases or pressure vessels using corrosion resistant materials may reduce the corrosion allowance. (2021) <u>(2024)</u></td></tr>
</table>

(hereafter, same as the present Rules)

</td>
<td>

〈Pt 5 Rules〉

(Amendment) Clarification of the requirement for corrosion allowance of pressure vessels. 〈application date: the date of contract for construction on or after 1 Jul. 2024〉

- Since the required thickness formula includes the corrosion allowance, it has been clarified that when multiplying by 1/6, the corrosion allowance is to be excluded and the net strength required thickness is to be multiplied by 1/6.

</td>
</tr>
</table>

Amendments of Guidance Relating to Rules for Classification of Steel Ships

Part 5 Machinery Installations

2024. 01.

Machinery Rule Development Team

- Main Amendments -

(1) Effective date : 1 Jul. 2024 (Date of contracts for construction)

◉ The name of diesel engine and internal combustion engine has been modified to reciprocating internal combustion engine.

(2) Effective date : 1 Jul. 2024 (Date of application for approval)

◉ By reflecting IACS UR M73 (Rev.2 May 2023), the requirements for the containment of exhaust gas turbochargers have been revised.

Present	Amendment	Reason
# CHAPTER 1 GENERAL ## Section 2 Plans and Documents **203. Plans and documents to be submitted by the licensor and licensee of internal combustion engines *(2018)* 【See Rule】** **208. Plans and documents to be submitted by the manufacturers of boilers, Class 1 and 2 pressure vessels 【See Rule】** **1.** The submission of plans and documents for approval of air inter-cooler of internal combustion engines may be waived. (hereafter, omitted) ## Section 4 Spare Parts and Tools **402. Description and Number of spare parts *(2017)* 【See Rule】** **1. Internal combustion engine** Description and number of spare parts for main and essential auxiliary engines are to be as given in **Table 5.1.1** of the Guidance. At the request of the Owners, the spare parts of camshaft driving gears, chains and bearings may be omitted according to the discretion of the Society. **2. ~ 6. 〈omitted〉** **Table 5.1.1 Spare Parts for Internal Combustion Engines** (hereafter, omitted)	# CHAPTER 1 GENERAL ## Section 2 Plans and Documents **203. Plans and documents to be submitted by the licensor and licensee of reciprocating internal combustion engines *(2018)* 【See Rule】** **208. Plans and documents to be submitted by the manufacturers of boilers, Class 1 and 2 pressure vessels 【See Rule】** **1.** The submission of plans and documents for approval of air inter-cooler of reciprocating internal combustion engines may be waived. (hereafter, same as the present) ## Section 4 Spare Parts and Tools **402. Description and Number of spare parts *(2017)* 【See Rule】** **1. Reciprocating internal combustion engine** Description and number of spare parts for main and essential auxiliary engines are to be as given in **Table 5.1.1** of the Guidance. At the request of the Owners, the spare parts of camshaft driving gears, chains and bearings may be omitted according to the discretion of the Society. **2. ~ 6. 〈same as the present〉** **Table 5.1.1 Spare Parts for Reciprocating Internal Combustion Engines** (hereafter, same as the present)	〈Pt 5 Guidance〉 (Amendment) The name of diesel engines has been modified to reciprocating internal combustion engines. 〈application date: the date of contract for construction on or after 1 Jul. 2024〉 - As gas turbines were included in internal combustion engines, they have been modified to reciprocating internal combustion engines for more clarity.

Present	Amendment	Reason
CHAPTER 2 MAIN AND AUXILIARY ENGINES	**CHAPTER 2 MAIN AND AUXILIARY ENGINES**	〈Pt 5 Guidance〉 (Amendment) Reflecting IACS UR M73 (Rev.2 May 2023) 〈application date: the date of application for certification on or after 1 Jul. 2024〉
Section 1 General	**Section 1 General**	
101. Application	**101. Application**	
1. ~ 2. 〈omitted〉	**1. ~ 2. 〈same as the present〉**	
3. Electronically controlled diesel engines In application to **101. 7** of the Rules, the additional requirements specified otherwise by the Society are to be in accordance with **Annex 5-8**. **【See Rule】**	**3. Electronically controlled reciprocating internal combustion engines** In application to **101. 7** of the Rules, the additional requirements specified otherwise by the Society are to be in accordance with **Annex 5-8**. **【See Rule】**	- As the gas-fueled engines appeared, the name of diesel engines have a limit in representativeness, so the name of diesel engines has been modified to reciprocating internal combustion engines. - moved to the Rules
Section 2 Internal Combustion Engines	**Section 2 Reciprocating Internal Combustion Engines**	
202. Construction and installation	**202. Construction and installation**	
1. 〈omitted〉	**1. 〈same as present〉**	
2. In application to **202. 3** (4) (B) of the Rules, where deemed as appropriate by the society means to be satisfied with followings. **【See Rule】** (1) The numerical simulation model has been tested and its suitability/accuracy has been proven by direct comparison between calculation results and the practical containment test for a reference application (reference containment test). This test shall be performed at least once by the manufacturer for acceptance of the numerical simulation method in lieu of tests. (2) The corresponding numerical simulation for the containment is performed for the same speeds as specified for the containment test. (3) Material properties for high-speed deformations are to be applied in the numeric simulation. The correlation between normal properties and the properties at the pertinent deformation speed are to be substantiated.	~~**2.** In application to **202. 3** (4) (B) of the Rules, where deemed as appropriate by the society means to be satisfied with followings. **【See Rule】**~~ ~~(1) The numerical simulation model has been tested and its suitability/accuracy has been proven by direct comparison between calculation results and the practical containment test for a reference application (reference containment test). This test shall be performed at least once by the manufacturer for acceptance of the numerical simulation method in lieu of tests.~~ ~~(2) The corresponding numerical simulation for the containment is performed for the same speeds as specified for the containment test.~~ ~~(3) Material properties for high-speed deformations are to be applied in the numeric simulation. The correlation between normal properties and the properties at the pertinent deformation speed are to be substantiated.~~	

Present	Amendment	Reason
(4) The design of the turbocharger regarding geometry and kinematics is similar to the turbocharger that was used for the reference containment test. In general, totally new designs will call for a new reference containment test.	~~(4) The design of the turbocharger regarding geometry and kinematics is similar to the turbocharger that was used for the reference containment test. In general, totally new designs will call for a new reference containment test.~~	〈Pt 5 Guidance〉
3. In application to **202. 5** (5) of the Rules, it is acceptable to charge the starting batteries through a charging generator attached to the engine. However, starting devices for emergency generating sets are to comply with the requirements in **Pt 6, Ch 1, 203. 6** of the Rules. *(2019)* **【See Rule】**	2. In application to **202. 5** (5) of the Rules, it is acceptable to charge the starting batteries through a charging generator attached to the engine. However, starting devices for emergency generating sets are to comply with the requirements in **Pt 6, Ch 1, 203. 6** of the Rules. *(2019)* **【See Rule】**	
203. Safety devices	**203. Safety devices**	
1. ~ 2. 〈omitted〉	**1. ~ 2. 〈same as the present〉**	
3. In application to **203. 10** (1) of the Rules, bearing temperature monitors or equivalent devices are to be in accordance with the following. **【See Rule】** (1) Bearing temperature monitors of low speed diesel engines are to be capable of monitoring temperature(or oil outlet temp.) of main bearing, crank bearing and crosshead bearing. (2) Bearing temperature monitors of medium and high speed diesel engines are to be capable of monitoring temperature(or oil outlet temp.) of main bearing and crank bearing. (3) An equivalent device could be interpreted as measures applied to high speed engines where specific design features to preclude the risk of crankcase explosions are incorporated.	**3.** In application to **203. 10** (1) of the Rules, bearing temperature monitors or equivalent devices are to be in accordance with the following. **【See Rule】** (1) Bearing temperature monitors of low speed reciprocating internal combustion engines are to be capable of monitoring temperature(or oil outlet temp.) of main bearing, crank bearing and crosshead bearing. (2) Bearing temperature monitors of medium and high speed reciprocating internal combustion engines are to be capable of monitoring temperature(or oil outlet temp.) of main bearing and crank bearing. (3) An equivalent device could be interpreted as measures applied to high speed engines where specific design features to preclude the risk of crankcase explosions are incorporated.	- As the gas-fueled engines appeared, the name of diesel engines have a limit in representativeness, so the name of diesel engines has been modified to reciprocating internal combustion engines.
(hereafter, omitted)	(hereafter, same as the present)	

Present	Amendment	Reason
211. Tests and inspections **1. ~ 3. 〈omitted〉** **4. 〈omitted〉** (1) The programme shown in **Table 5.2.2** of the Guidance is to be used as a standard for shop trial of diesel engines. Alternatives to the detailed tests may be agreed between the manufacturer and the Society when the overall scope of tests is found to be equivalent. Additional test items may be requested according to the discretion of the Society. *(2023)* (2) ~ (4) 〈omitted〉 **5. 〈omitted〉** (1) The **Table 5.2.3** of the Guidance is to be used as a standard for the details of on-board test programme or sea trial programme for diesel engines. Additional tests may be carried out according to *KS V* 0811 (Sea Trials Code for Machinery Department) where considered necessary by the Society. The details of the programme are referred to *KS V* 0811 or standards considered as equivalent thereto, and the overhaul inspection for cylinder assembly may be carried out where considered necessary by the Society. (hereafter, omitted)	**211. Tests and inspections** **1. ~ 3. 〈same as the present〉** **4. 〈same as the present〉** (1) The programme shown in **Table 5.2.2** of the Guidance is to be used as a standard for shop trial of reciprocating internal combustion engines. Alternatives to the detailed tests may be agreed between the manufacturer and the Society when the overall scope of tests is found to be equivalent. Additional test items may be requested according to the discretion of the Society. *(2023)* (2) ~ (4) 〈same as the present〉 **5. 〈same as the present〉** (1) The **Table 5.2.3** of the Guidance is to be used as a standard for the details of on-board test programme or sea trial programme for reciprocating internal combustion engines. Additional tests may be carried out according to *KS V* 0811 (Sea Trials Code for Machinery Department) where considered necessary by the Society. The details of the programme are referred to *KS V* 0811 or standards considered as equivalent thereto, and the overhaul inspection for cylinder assembly may be carried out where considered necessary by the Society. (hereafter, same as the present)	〈Pt 5 Guidance〉 - As the gas-fueled engines appeared, the name of diesel engines have a limit in representativeness, so the name of diesel engines has been modified to reciprocating internal combustion engines.

Present	Amendment	Reason
Table 5.2.2 Programme for Shop Trials of Internal Combustion Engine	**Table 5.2.2 Programme for Shop Trials of Reciprocating Internal Combustion Engine**	〈Pt 5 Guidance〉 - As gas turbines were included in internal combustion engines, they have been modified to reciprocating internal combustion engines for more clarity.
Use of engines / Test items: Propulsion engines driving propeller or impeller only(2); Engines driving generators for electric propulsion and main power supply(3); Propulsion engines also driving power take off (PTO) generator(4); Engines driving essential auxiliaries(2)	Use of engines / Test items: Propulsion engines driving propeller or impeller only(2); Engines driving generators for electric propulsion and main power supply(3); Propulsion engines also driving power take off (PTO) generator(4); Engines driving essential auxiliaries(2)	
〈omitted〉	〈same as the present〉	
NOTES : 1. For electronically controlled diesel engines, integration tests are to be carried out in accordance with **211. 5** (4) of the Guidance. 2. 〈omitted〉	NOTES : 1. For electronically controlled reciprocating internal combustion engines, integration tests are to be carried out in accordance with **211. 5** (4) of the Guidance. 2. 〈same as the present〉	
Table 5.2.3 Programme for Sea Trials (on-board tests) of Internal Combustion Engine	**Table 5.2.3 Programme for Sea Trials (on-board tests) of Reciprocating Internal Combustion Engine**	
〈table omitted〉	〈table omitted〉	
(hereafter, omitted)	(hereafter, same as the present)	

Present	Amendment	Reason
# CHAPTER 3 PROPULSION SHAFTING AND POWER TRANSMISSION SYSTEMS ## Section 3 Propellers **305. Fitting of propeller** **1. 〈omitted〉** **2.** In application **305. 2** of the Rules, keyless forced fitting propellers are to satisfy the following. **【See Rule】** (A) ~ (B) 〈omitted〉 (C) Calculations for pull-up length and pull-up load (a) The formulae are applicable for solid shafts only. (b) Pull-up length (i) ~ (ii) 〈omitted〉 (iii) Corresponding maximum permissible pull-up length at 0 °C (mm) (omitted) F_V : Shear force at interface (N) $$F_V = \frac{2cQ}{D_s}$$ c : Constant, 1 : for turbines, geared diesel drives, electric drives and for direct diesel drives with a hydraulic or an electromagnetic or high elasticity coupling 1.2 : for a direct diesel drive (hereafter, omitted)	# CHAPTER 3 PROPULSION SHAFTING AND POWER TRANSMISSION SYSTEMS ## Section 3 Propellers **305. Fitting of propeller** **1. 〈same as the present〉** **2.** In application **305. 2** of the Rules, keyless forced fitting propellers are to satisfy the following. **【See Rule】** (A) ~ (B) 〈same as the present〉 (C) Calculations for pull-up length and pull-up load (a) The formulae are applicable for solid shafts only. (b) Pull-up length (i) ~ (ii) 〈same as the present〉 (iii) Corresponding maximum permissible pull-up length at 0 °C (mm) (omitted) F_V : Shear force at interface (N) $$F_V = \frac{2cQ}{D_s}$$ c : Constant, 1 : for turbines, geared reciprocating internal combustion engines, electric drives and for direct diesel drives with a hydraulic or an electromagnetic or high elasticity coupling 1.2 : for a direct reciprocating internal combustion engine (hereafter, same as the present)	〈Pt 5 Guidance〉 - As the gas-fueled engines appeared, the name of diesel engines have a limit in representativeness, so the name of diesel engines has been modified to reciprocating internal combustion engines.

Present	Amendment	Reason
## Section 4 Power Transmission Systems **403. Allowable tangential load for gears** **1.** In application to **403. 1** of the Rules, the term "which the Society deems appropriate" is to comply with AGMA, ISO or equivalent. **【See Rule】** **2.** In gearing for main propulsion internal combustion engines having maximum continuos output not more than 257 kW and maximum continuos revolution not less than 1,300 rpm, where the coupling complied with the following (1) or (2) is provided between engines and gearing, and the gearing and coupling are of type having actual examples used on ships, the value of K_1 given in **403. 2** of the Rules may be taken as 1.0. **【See Rule】** (hereafter, omitted)	## Section 4 Power Transmission Systems **403. Allowable tangential load for gears** **1.** In application to **403. 1** of the Rules, the term "which the Society deems appropriate" is to comply with AGMA, ISO or equivalent. **【See Rule】** **2.** In gearing for main propulsion reciprocating internal combustion engines having maximum continuos output not more than 257 kW and maximum continuos revolution not less than 1,300 rpm, where the coupling complied with the following (1) or (2) is provided between engines and gearing, and the gearing and coupling are of type having actual examples used on ships, the value of K_1 given in **403. 2** of the Rules may be taken as 1.0. **【See Rule】** (hereafter, same as the present)	〈Pt 5 Guidance〉 - As gas turbines were included in internal combustion engines, they have been modified to reciprocating internal combustion engines for more clarity.
# CHAPTER 5 BOILERS AND PRESSURE VESSELS ## Section 2 Thermal Oil Heaters **203. Safety devices for thermal oil heaters directly heated by the exhaust gas of engines 【See Rule】** In application to **203. 7** of the Rules, "Fixed fire extinguishing and cooling system as deemed appropriate by the Society" means the combination of fixed gas fire-extinguishing systems and the systems for cooling the heating coil, header, casing, etc., and the heater itself such as water-spray. The fixed fire extinguishing cooling system can be a water-drenching system able to discharge copious amounts of water. In this case, the suitable means for collection and drainage, to prevent the water from flowing into the diesel engines, are to be provided on exhaust ducting below the heater, and the drainage is to be led to suitable places. (hereafter, omitted)	# CHAPTER 5 BOILERS AND PRESSURE VESSELS ## Section 2 Thermal Oil Heaters **203. Safety devices for thermal oil heaters directly heated by the exhaust gas of engines 【See Rule】** In application to **203. 7** of the Rules, "Fixed fire extinguishing and cooling system as deemed appropriate by the Society" means the combination of fixed gas fire-extinguishing systems and the systems for cooling the heating coil, header, casing, etc., and the heater itself such as water-spray. The fixed fire extinguishing cooling system can be a water-drenching system able to discharge copious amounts of water. In this case, the suitable means for collection and drainage, to prevent the water from flowing into the reciprocating internal combustion engines, are to be provided on exhaust ducting below the heater, and the drainage is to be led to suitable places. (hereafter, same as the present)	- As the gas-fueled engines appeared, the name of diesel engines have a limit in representativeness, so the name of diesel engines has been modified to reciprocating internal combustion engines.

Present

Annex 5-4 Strength Calculation for Gears of Power Transmission Systems

〈omitted〉

Table 1 Application Factor, K_A

Driving engine	Construction or method of connection	K_A
Main propulsion	Diesel engine with hydraulic or electromagnetic slip coupling	1.00
	Diesel engine with high elasticity coupling	1.30
	Diesel engine with other couplings	1.50
Auxiliary	Electric motor, diesel engine with hydraulic or electromagnetic slip coupling	1.00
	Diesel engine with high elasticity coupling	1.20
	Diesel engine with other couplings	1.40

(hereafter, omitted)

Annex 5-7 Internal Combustion Engines Supplied with Low Pressure Gas *(2019)*

1. General

(1) Scope

(A) This Annex addresses the requirements for trunk piston internal combustion engines supplied with low pressure natural gas as fuel. This Annex is to be applied in association with other relevant requirements for internal combustion engine of **Pt 5** of the Rules, as far as found applicable to the specific natural gas burning engine design.

(hereafter, omitted)

Amendment

Annex 5-4 Strength Calculation for Gears of Power Transmission Systems

〈same as the present〉

Table 1 Application Factor, K_A

Driving engine	Construction or method of connection	K_A
Main propulsion	Reciprocating internal combustion engine with hydraulic or electromagnetic slip coupling	1.00
	Reciprocating internal combustion engine with high elasticity coupling	1.30
	Reciprocating internal combustion engine with other couplings	1.50
Auxiliary	Electric motor, reciprocating internal combustion engine with hydraulic or electromagnetic slip coupling	1.00
	Reciprocating internal combustion engine with high elasticity coupling	1.20
	Reciprocating internal combustion engine with other couplings	1.40

(hereafter, same as the present)

Annex 5-7 Reciprocating Internal Combustion Engines Supplied with Low Pressure Gas *(2019)*

1. General

(1) Scope

(A) This Annex addresses the requirements for trunk piston reciprocating internal combustion engines supplied with low pressure natural gas as fuel. This Annex is to be applied in association with other relevant requirements for reciprocating internal combustion engine of **Pt 5** of the Rules, as far as found applicable to the specific natural gas burning engine design.

(hereafter, same as the present)

Reason

〈Pt 5 Guidance〉

- As the gas-fueled engines appeared, the name of diesel engines have a limit in representativeness, so the name of diesel engines has been modified to reciprocating internal combustion engines.

- As gas turbines were included in internal combustion engines, they have been modified to reciprocating internal combustion engines for more clarity.

Present	Amendment	Reason
Annex 5-8 The Additional Requirements on Electronically-Controlled Diesel Engines **1. Application** The requirements in this Guidance apply to electronically-controlled diesel engines in addition to the requirements prescribed in **Pt 5, Ch 2** of the Rules. **2. ~ 5. 〈omitted〉** **6. Others** (1) 〈omitted〉 (2) Spare parts The spare parts for the electronically-controlled diesel engine are to be in accordance with **Table 1**. **Annex 5-11 Documents for the Approval of Diesel Engines** **1. General** (1) 〈omitted〉 (2) Engine certificate Each diesel engine manufactured for a shipboard application is to have an engine certificate. The certification process details for obtaining followings. (hereafter, omitted)	**Annex 5-8 The Additional Requirements on Electronically-Controlled Reciprocating Internal Combustion Engines** **1. Application** The requirements in this Guidance apply to electronically-controlled reciprocating internal combustion engines in addition to the requirements prescribed in **Pt 5, Ch 2** of the Rules. **2. ~ 5. 〈same as the present〉** **6. Others** (1) 〈same as the present〉 (2) Spare parts The spare parts for the electronically-controlled reciprocating internal combustion engine are to be in accordance with **Table 1**. **Annex 5-11 Documents for the Approval of Reciprocating Internal Combustion Engines** **1. General** (1) 〈same as the present〉 (2) Engine certificate Each ~~diesel~~ engine manufactured for a shipboard application is to have an engine certificate. The certification process details for obtaining followings. (hereafter, same as the present)	〈Pt 5 Guidance〉 - As the gas-fueled engines appeared, the name of diesel engines have a limit in representativeness, so the name of diesel engines has been modified to reciprocating internal combustion engines. - Removed 'diesel' to apply also to gas-fueled engines.

- Main Amendments -

(1) Effective date : 1 Jul. 2024 (Date of contracts for construction)

◉ The application of the requirements for deadship recovery has been clarified.

◉ The requirements for shop trials and sea trials for reciprocating internal combustion engines for main propulsion with PTO generators have been revised.

◉ The requirements for non-destructive testing for welds of pressure vessels are newly added.

(2) Effective date : 1 Jul. 2024 (Date of application for approval)

◉ Reflecting IACS UR M53 (Rev.5 May 2023), use of results and crankshaft acceptability in guidance for calculation of crankshaft stress has been revised.

◉ Reflecting IACS UR M56 (Rev.4 Corr.2 Mar 2023), reference to ISO standards has been corrected.

Present	Amendment	Note
# CHAPTER 1 GENERAL ## Section 1 General **103. Construction, materials and installation 【See Rule】** In application to **103. 7** of the Rules, where insulation for surfaces of machinery installations e.g. turbo blowers, etc, is difficult, consideration will be given to the discretion of the Society. (hereafter, omitted)	# CHAPTER 1 GENERAL ## Section 1 General **103. Construction, materials and installation 【See Rule】** **1.** In case of ships complied with the following, the requirements of **103. 3** of the Rules may not be applied. *(2024)* **【See Rule】** (1) Cargo ships with a gross tonnage less than 500 tons, or (2) Ships not engaged in international voyage **2.** In application to **103. 7** of the Rules, where insulation for surfaces of machinery installations e.g. turbo blowers, etc, is difficult, consideration will be given to the discretion of the Society. (hereafter, same as the present)	〈Pt 5 Guidance〉 (Amendment) Clarified the application of the requirements for deadship recovery 〈application date: the date of contract for construction on or after 1 July. 2024〉 - In line with the application of SOLAS, deadship recovery requirements have been amended so that cargo ships with a gross tonnage of less than 500 tons or ships not engaged in international voyages may not be subject to deadship recovery requirements.

Present	Amendment	Reason
# CHAPTER 2 MAIN AND AUXILIARY ENGINES ## Section 2 Internal Combustion Engines **211. Tests and inspections** **Table 5.2.2 Programme for Shop Trials of Internal Combustion Engine**	# CHAPTER 2 MAIN AND AUXILIARY ENGINES ## Section 2 Reciprocating Internal Combustion Engines **211. Tests and inspections** **Table 5.2.2 Programme for Shop Trials of Reciprocating Internal Combustion Engine**	〈Pt 5 Guidance〉 (Amendment) The requirements for sea trials of reciprocating internal combustion engine have been revised. 〈application date: the date of contract for construction on or after 1 Jul. 2024〉

Use of engines / Test items	Propulsion engines driving propeller or impeller only[2]	Engines driving generators for electric propulsion and main power supply[3]	Propulsion engines also driving power take off (PTO) generator[4]	Engines driving essential auxiliaries[2]
〈omitted〉				
Reverse maneuvering test[7]	○	-	-	-
Governor characteristics test	○	○	○	○
Performance test of alarm and safety devices	○	○	○	○
Overhaul inspection[8]	○	○	○	○
〈omitted〉				

(hereafter, omitted)

Use of engines / Test items	Propulsion engines driving propeller or impeller only[2]	Engines driving generators for electric propulsion and main power supply[3]	Propulsion engines also driving power take off (PTO) generator[4]	Engines driving essential auxiliaries[2]
〈same as the present〉				
Reverse maneuvering test[7]	○	-	○	-
Governor characteristics test	○	○	○	○
Performance test of alarm and safety devices	○	○	○	○
Overhaul inspection[8]	○	○	○	○
〈same as the present〉				

(hereafter, same as the present)

- It is clarified that reverse maneuvering test are to be carried out because propulsion engines also driving power take off (PTO) generator also serves as the main engine.

Present

Table 5.2.3 Programme for Sea Trials (on-board tests) of Internal Combustion Engine

Use of engines / Test items	Propulsion engines driving propeller or impeller only[1]	Engines driving generators for electric propulsion and main power supply[2]	Propulsion engines also driving power take off (PTO) generator	Engines driving essential auxiliaries
110 % power run[3]	30 *minutes* at the speed of 1.032 times of the rated engine speed	10 *minutes* at the 110 % rated electrical power of generator	-	-
Approved intermittent overload (if applicable)	testing for duration as agreed with the manufacturer	-	-	testing for duration as agreed with the manufacturer
100 % power run	4 *hours* at the rated engine speed	1 *hour* at the 100 % rated electrical power of generator	4 *hours* at the rated engine speed [4]	30 *minutes* at the rated engine speed
Minimum engine speed test	○	-	-	-
Starting maneuvering test[5]	○	○	○	○
Reverse maneuvering test[6]	○	-	-	-

〈omitted〉

(hereafter, omitted)

Amendment

Table 5.2.3 Programme for Sea Trials (on-board tests) of Reciprocating Internal Combustion Engine

Use of engines / Test items	Propulsion engines driving propeller or impeller only[1]	Engines driving generators for electric propulsion and main power supply[2]	Propulsion engines also driving power take off (PTO) generator	Engines driving essential auxiliaries
110 % power run[3]	30 *minutes* at the speed of 1.032 times of the rated engine speed	10 *minutes* at the 110 % rated electrical power of generator	30 *minutes* at the speed of 1.032 times of the rated engine speed	-
Approved intermittent overload (if applicable)	testing for duration as agreed with the manufacturer	-	testing for duration as agreed with the manufacturer	testing for duration as agreed with the manufacturer
100 % power run	4 *hours* at the rated engine speed	1 *hour* at the 100 % rated electrical power of generator	4 *hours* at the rated engine speed [4]	30 *minutes* at the rated engine speed
Minimum engine speed test	○	-	○	-
Starting maneuvering test[5]	○	○	○	○
Reverse maneuvering test[6]	○	-	○	-

〈same as the present〉

(hereafter, same as the present)

Reason

〈Pt 5 Guidance〉

- It is clarified that minimum engine speed test and reverse maneuvering test are to be carried out because propulsion engines also driving power take off (PTO) generator also serves as the main engine.

<table>
<tr>
<th>Present</th>
<th>Amendment</th>
<th>Note</th>
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<td>

CHAPTER 5 BOILERS AND PRESSURE VESSELS

Section 4 Welding for Boilers and Pressure Vessels

404. Radiographic examination 【See Rule】

1. In application to **404.** of the Rules, ultrasonic examination may be substituted for radiographic examination subject to the approval by the Society.

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CHAPTER 5 BOILERS AND PRESSURE VESSELS

Section 4 Welding for Boilers and Pressure Vessels

404. Radiographic examination 【See Rule】

1. In application to **404.** of the Rules, ultrasonic examination may be substituted for radiographic examination subject to the approval by the Society.

2. The acceptance levels and required quality levels for radiographic testing are provided in table below. *(2024)*

The acceptance levels and required quality levels for Radiographic Testing

Quality Levels (ISO 5817:2014 applies)(1)	Testing Techniques/ levels (ISO 17636-1:2022 applies)(1)	Acceptance levels (ISO 10675-1:2021 applies)(1)
B	B(class)	1

Note:
(1) Or any recognized standard agreed with the Society and demonstrated to be acceptable

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〈Pt 5 Guidance〉

(Amendment) Reflects GCH4800-51-2023, a request for revision for the non-destructive testing requirements of pressure vessels 〈application date: the date of contract for construction on or after 1 July. 2024〉

- Newly added non-destructive testing requirements for welds of pressure vessels.

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</table>

<table>
<tr><th>Present</th><th>Amendment</th><th>Note</th></tr>
<tr><td>(hereafter, omitted)</td><td>3. The acceptance levels and required quality levels for ultrasonic testing are provided in table below. (2024)

The acceptance levels and required quality levels for Ultrasonic Testing
<table><tr><th>Quality Levels (ISO 5817:2014 applies)(1)</th><th>Testing Techniques/Levels (ISO 17640:2018 applies)(1)</th><th>Acceptance Levels (ISO 11666:2018 applies)(1)</th></tr><tr><td>B</td><td>at least B</td><td>2</td></tr><tr><td colspan="3">Note:
(1) Or any recognized standard agreed with the Society and demonstrated to be acceptable</td></tr></table>
(hereafter, same as the present)</td><td>〈Pt 5 Guidance〉</td></tr>
</table>

Present	Amendment	Reason
Annex 5-3 Guidance for Calculation of Crankshaft Stress (2) **〈Appendix IV Evaluation of Fatigue Tests〉** ***(2018)*** **1. ~ 3. 〈omitted〉** **4. Full size testing** (1) ~ (2) 〈omitted〉 (3) Use of results and crankshaft acceptability (A) In order to combine tested bending and torsion fatigue strength results in calculation of crankshaft acceptability (see **Annex 5-3**, **7**), the Gough-Pollard approach and the maximum principal equivalent stress formulation can be applied for the following cases: ***(2021)*** Related to the crankpin diameter: $Q=\left(\sqrt{\left(\frac{\sigma_{BH}}{\sigma_{DWCT}}\right)^2+\left(\frac{\tau_{BH}}{\tau_{DWCT}}\right)^2}\right)^{-1}$ where: σ_{DWCT} : fatigue strength by bending testing τ_{DWCT} : fatigue strength by torsion testing Related to crankpin oil bore: $Q=\frac{\sigma_{DWOT}}{\sigma_v}$; $\sigma_v=\frac{1}{3}\sigma_{BO}\bullet\left(1+2\sqrt{1+\frac{9}{4}\left(\frac{\sigma_{TO}}{\sigma_{BO}}\right)^2}\right)$ where: σ_{DWOT} : fatigue strength by means of largest principal stress from torsion testing	**Annex 5-3 Guidance for Calculation of Crankshaft Stress (2)** **〈Appendix IV Evaluation of Fatigue Tests〉** ***(2018)*** **1. ~ 3. 〈same as the present〉** **4. Full size testing** (1) ~ (2) 〈same as the present〉 (3) Use of results and crankshaft acceptability (A) In order to combine tested bending and torsion fatigue strength results in calculation of crankshaft acceptability (see **Annex 5-3**, **7**), the Gough-Pollard approach and the maximum principal equivalent stress formulation can be applied for the following cases: ***(2021)*** ***(2024)*** At the crankpin fillet: $Q=\left(\sqrt{\left(\frac{\sigma_{BH}+\sigma_{add}}{\sigma_{DWCT}}\right)^2+\left(\frac{\tau_H}{\tau_{DWCT}}\right)^2}\right)^{-1}$ where: σ_{DWCT} : fatigue strength by bending testing τ_{DWCT} : fatigue strength by torsion testing for other parameters see **2**. (1) (C), **2**. (2) (B) and **4**. Related to crankpin oil bore: $Q=\frac{\sigma_{DWOT}}{\sigma_v}$; $\sigma_v=\frac{1}{3}\sigma_{BO}\bullet\left(1+2\sqrt{1+\frac{9}{4}\left(\frac{\sigma_{TO}}{\sigma_{BO}}\right)^2}\right)$ where: σ_{DWOT} : fatigue strength by means of largest principal stress from torsion testing	〈Pt 5 Guidance〉 (Amendment) Reflecting IACS UR M53 (Rev.5 May 2023), guidance for calculation of crankshaft stress has been revised. 〈application date: the date of application for approval on or after 1 Jul. 2024〉 - The equations for stress at the crankpin needed to be updated to clarify that they are done at the fillet. - It was revised to consider further bending stresses due to misalignment and bedplate deformation as well as due to axial and bending vibrations. Corrected typos. $\tau_{BH} \rightarrow \tau_H$ - Added quotation phrases to refer to descriptions of other parameters.

Present	Amendment	Reason
Related to the journal diameter: $Q=\left(\sqrt{\left(\frac{\sigma_{BG}}{\sigma_{DWJT}}\right)^2+\left(\frac{\tau_G}{\tau_{DWJT}}\right)^2}\right)^{-1}$ where: σ_{DWJT} : fatigue strength by bending testing τ_{DWJT} : fatigue strength by torsion testing (hereafter, omitted)	At the journal fillet: $Q=\left(\sqrt{\left(\frac{\sigma_{BG}+\sigma_{add}}{\sigma_{DWJT}}\right)^2+\left(\frac{\tau_G}{\tau_{DWJT}}\right)^2}\right)^{-1}$ where: σ_{DWJT} : fatigue strength by bending testing τ_{DWJT} : fatigue strength by torsion testing for other parameters see **2**, (1) (C), **2**. (2) (B) and **4**. (hereafter, same as the present)	〈Pt 5 Guidance〉 - The equations for stress at the journal needed to be updated to clarify that they are done at the fillet. - It was revised to consider further bending stresses due to misalignment and bedplate deformation as well as due to axial and bending vibrations. - Added quotation phrases to refer to descriptions of other parameters.

Present

Annex 5-4 Strength Calculation for Gears of Power Transmission Systems

1. ~ 4. 〈omitted〉

5. General influence factors

Table 3 Values of K_1

Kind of gear	K_1 (ISO grades of accuracy*)					
	3	4	5	6	7	8
Spur gear	2.1	3.9	7.5	14.9	26.8	39.1
Helical gear	1.9	3.5	6.7	13.3	23.9	34.8

NOTE
* ISO grades of accuracy according to ISO 1328-2:2020. In case of mating gears with different grades of accuracy the grade corresponding to the lower accuracy is to be used.

(hereafter, omitted)

Amendment

Annex 5-4 Strength Calculation for Gears of Power Transmission Systems

1. ~ 4. 〈same as the present〉

5. General influence factors

Table 3 Values of K_1

Kind of gear	K_1 (ISO grades of accuracy*)					
	3	4	5	6	7	8
Spur gear	2.1	3.9	7.5	14.9	26.8	39.1
Helical gear	1.9	3.5	6.7	13.3	23.9	34.8

NOTE
* ISO grades of accuracy according to ISO 1328-1:2013. In case of mating gears with different grades of accuracy the grade corresponding to the lower accuracy is to be used.

(hereafter, same as the present)

Reason

〈Pt 5 Guidance〉

(Amendment) Reflecting IACS UR M56 (Rev.4 Corr.2), reference to ISO standards has been corrected. 〈application date: the date of application for approval on or after 1 July 2024〉

- Reflecting IACS UR M56 (Rev.4 Corr.2), reference to ISO standards has been corrected.

Amendments of the Rules for Classification of Steel Ships

Pt. 5 Machinery Installations – Chapter 6

(For External opinion inquiry)

2022.8.

Machinery Rule Development Team

- Main Amendments -

(1) Effective date : 1 July 2024 (based on contract date for construction)

◉ Service limitations for cast iron valves and pipe fittings (ENP4500-1664-2023)

- Service limitation for cast iron valves amended to include lubricating oil and other flammable oils

◉ Clarification of the expression of fuel oil heating

- Omitted expression “and/or” is included according to UR F35 Rev.8

Present	Amendment	Note
# CHAPTER 6 AUXILIARIES AND PIPING ARRANGEMENT ## Section 1 General 〈Omitted〉 **103. Valves and fitting 【See Guidance】** 〈Omitted〉 **4. Service limitations for cast iron for valves and pipe fittings** (1) Valves and pipe fittings made of cast iron with an elongation of 12 % or above can be used for valves and pipe fittings in the piping system with a design temperature of 350 °C or less. *(2021)* (2) Valves and pipe fittings made of cast iron with an elongation of less than 12 % are not to be used for the following piping system. (A) Ship-side valves and fittings. (B) Valves fitted on the collision bulkhead. (C) Valves fitted on the external wall of fuel tanks and subjected to the static head of internal fluid. (D) Valves and pipe fittings for boiler blow-off piping. (E) Valves fitted on shore connection for cargo pipings of inflammable liquid. (F) Valves and pipe fittings for piping liable to be subjected to water hammer, excessive strain or vibration. (G) Valves and pipe fittings whose design temperature exceeds 220 °C. (H) Valves and pipe fittings used for pipes of Class II. (I) Valves and pipe fittings for clean ballast piping systems which penetrate cargo oil tanks and reach the forepeak tank. (J) Valves and pipe fittings used for cargo oil pipelines exceeding design pressure of 1.6 MPa. (3) Cast iron products are not to be used for valves and pipe fittings in the piping system belonging to Class I, unless specially approved by the Society. 〈Omitted〉	# CHAPTER 6 AUXILIARIES AND PIPING ARRANGEMENT ## Section 1 General 〈Omitted〉 **103. Valves and fitting 【See Guidance】** 〈Omitted〉 **4. Service limitations for cast iron for valves and pipe fittings** (1) Valves and pipe fittings made of cast iron with an elongation of 12 % or above can be used for valves and pipe fittings in the piping system with a design temperature of 350 °C or less. *(2021)* (2) Valves and pipe fittings made of cast iron with an elongation of less than 12 % are not to be used for the following piping system. (A) Ship-side valves and fittings. (B) Valves fitted on the collision bulkhead. (C) Valves fitted on the external wall of fuel oil tanks, lubricating oil tanks and other flammable oil tanks ~~and subjected to~~ under the static head of internal fluid. *(2024)* (D) Valves and pipe fittings for boiler blow-off piping. (E) Valves fitted on shore connection for cargo pipings of inflammable liquid. (F) Valves and pipe fittings for piping liable to be subjected to water hammer, excessive strain or vibration. (G) Valves and pipe fittings whose design temperature exceeds 220 °C. (H) Valves and pipe fittings used for pipes of Class II. (I) Valves and pipe fittings for clean ballast piping systems which penetrate cargo oil tanks and reach the forepeak tank. (J) Valves and pipe fittings used for cargo oil pipelines exceeding design pressure of 1.6 MPa. (3) Cast iron products are not to be used for valves and pipe fittings in the piping system belonging to Class I, unless specially approved by the Society. 〈Omitted〉	- Reflected of new annex 7-6-1 of Pt.7

Present	Amendment	Note
# CHAPTER 6 AUXILIARIES AND PIPING ARRANGEMENT ## Section 9 Fuel Oil System **901. General** 〈Omitted〉 **11. Fuel oil heating systems** (1) Heating arrangements in tanks (A) Flash point Fuel oil in storage tanks is not to be heated within 10 °C below its flash point, except that where fuel oil in service tanks, settling tanks and any other tanks in the supply system is heated, the following arrangements are to comply with : (a) The length of the air pipes from such tanks and a cooling device is to be sufficient for cooling the vapours to below 60°C, or the outlet of the air pipes is to be located 3m away from a source of ignition. (b) Air pipes are to be fitted with the flame-screens. (c) There are no openings from the vapor space of the fuel tanks leading into machinery spaces, except for bolted manholes. (d) Enclosed spaces, such as workshops, accommodation spaces, etc., are not to be located directly over the fuel tanks, except for vented cofferdams. (e) Electrical equipment is not to be fitted in the vapour space of the tanks, unless it is to be certified to be intrinsically safe. 〈Omitted〉	# CHAPTER 6 AUXILIARIES AND PIPING ARRANGEMENT ## Section 9 Fuel Oil System **901. General** 〈Omitted〉 **11. Fuel oil heating systems** (1) Heating arrangements in tanks (A) Flash point Fuel oil in storage tanks is not to be heated within 10 °C below its flash point, except that where fuel oil in service tanks, settling tanks and any other tanks in the supply system is heated, the following arrangements are to comply with : (a) The length of the air pipes from such tanks and/or a cooling device is to be sufficient for cooling the vapours to below 60°C, or the outlet of the air pipes is to be located 3m away from a source of ignition. (b) Air pipes are to be fitted with the flame-screens. (c) There are no openings from the vapor space of the fuel tanks leading into machinery spaces, except for bolted manholes. (d) Enclosed spaces, such as workshops, accommodation spaces, etc., are not to be located directly over the fuel tanks, except for vented cofferdams. (e) Electrical equipment is not to be fitted in the vapour space of the tanks, unless it is to be certified to be intrinsically safe. 〈Omitted〉	- amended in accordance with UR F35 Rev.8

Amendments of the Guidance to the Rules for Classification of Steel Ships

Pt. 5 Machinery Installations – Chapter 6

(For External opinion inquiry)

2022.11.

Machinery Rule Development Team

- Main Amendments -

(1) Effective date : 1 July 2024 (based on contract date for construction)

◉ Revised for clarification (MET4600-273-2023)

◉ IACS UI SC123 Rev.5 : Fuel Oil Service tank arrangement interpretation amendment

(2) Effective date : on or after 1 Jan. 2024 (conditions below as per SOLAS Reg. II-1/1.3.2)

.1 for which the building contract is placed on or after 1 January 2024; or

.2 in the absence of a building contract, the keel of which is laid or which are at a similar stage of construction on or after 1 July 2024; or

.3 the delivery of which is on or after 1 January 2028.

◉ SOLAS II-1 Reg.12.6.2 reflected (MSC.474(102)) - Circular will be issued

Amendment	Note

CHAPTER 6 AUXILIARIES AND PIPING ARRANGEMENT

Section 1 General

〈Omitted〉

103. Valves and fittings **【See Rule】**

1. In application to **103. 1.** (1) of the Rules, "the Society may accept to use valves and fittings made of materials which meet Korean Industrial Standards or Equivalent." means the following valves and fittings. *(2021)*

Materials	Design Temperature (°C)	Nominal diameter (D) : A Design pressure (P) : MPa
Carbon and low alloy steel, stainless steel, cast iron with an elongation of 12 % or above	< 300 and	$D \leq 50$ or $P \times D \leq 250$
Copper alloy	< 200 and	$D \leq 50$ or $P \times D \leq 150$

~~**2.** In application to "to comply with the relevant requirement of **Pt 2, Ch 1.**" in **103. 1.** (1) of the Rules, work's certificate with manufacturing process approved by the Society may be accepted. Where, however, it is deemed to be necessary by the Society, the attendance of the Surveyor is required for material tests. *(2021)*~~

2. In application to "to comply with the relevant requirement of **Pt 2, Ch 1.**" in **103. 1.** (1) of the Rules, work's certificate with manufacturing process approved by the Society may be accepted where deemed necessary by the Society *(2024)*

- Revised for clarification. (MET 4600-273-2023)

〈Omitted〉

Amendment	Note
# CHAPTER 6 AUXILIARIES AND PIPING ARRANGEMENT ## Section 1 General 〈Omitted〉 **107. General requirements for piping arrangement** 〈Omitted〉 **7. Watertight Bulkhead 【See Rule】** (1) In application to **107. 8** of the Rules, suction pipes of the stern tank are to be fitted with stop valves at the fore side of the bulkhead. (2) In application to **107. 8.** (2) of the Rules, ships of less than 500 gross tonnage and engaged in under coastal services may be also loosened as follows. (A) The number of the pipe passing through the collision bulkhead may be not applied. (B) If it is not possible to install a screw down valve, a butterfly valve may be fitted. In this cases, a butterfly valve is to be of type with positive holding arrangements, or equivalents, that will prevent movement of the valve position due to vibration or flow of fluids. (3) In application to **107. 8.** (2) of the Rules, for ships contracted for construction on or after 1 January 2024, except as provided in **107. 8.** (3) of the Rules, the collision bulkhead may be pierced below the bulkhead deck of passenger ships and the freeboard deck of cargo ships by not more than one pipe for dealing with fluid in the forepeak tank, provided that the pipe is fitted with a remotely controlled valve capable of being operated from above the bulkhead deck of passenger ships and the freeboard deck of cargo ships. The valve shall be normally closed. If the remote control system should fail during operation of the valve, the valve shall close automatically or be capable of being closed manually from a position above the bulkhead deck of passenger ships and the freeboard deck of cargo ships. The valve shall be located at the collision bulkhead on either the forward or aft side, provided the space on the aft side is not a cargo space. The valve shall be of steel, bronze or other approved ductile material. Valves of ordinary cast iron or similar material are not acceptable. (2024) 〈Omitted〉	- SOLAS II-1/Reg.12.6.2 reflected

CHAPTER 6 AUXILIARIES AND PIPING ARRANGEMENT

Section 9 Fuel Oil System

901. General

〈Omitted〉

8. In application to **901. 14** of the Rules, the example of two fuel oil service tanks for each type of fuel oil used on board are as shown in **Fig 5.6.12** of the Guidance. This requirement applies only to ships subject to the requirements of the SOLAS. **【See Rule】**

(1) Example 1

(A) Requirement according to SOLAS : main, auxiliary engines and boilers operating with Heavy Fuel Oil(HFO) (one fuel ship)

HFO service tank capacity for at least 8 h Main engine + Aux. engine + Aux. boiler	HFO service tank capacity for at least 8 h Main engine + Aux. engine + Aux. boiler	MDO tank For initial cold starting or repair work of engines/boiler

(B) Equivalent arrangement[3]

HFO service tank capacity for at least 8 h Main engine + Aux. engine + Aux. boiler	MDO service tank capacity for at least 8 h Main engine + Aux. engine + Aux. boiler

(Note)

1. this arrangement only applies where main and auxiliary engines can operate with heavy fuel oil under all load conditions and, in the case of main engines, during maneuvering.
2. For pilot burners of auxiliary boilers of provided, an additional MDO tank for 8 hours may be necessary.
3. Any fuel oil which requires post service tank heating to achieve the required injection viscosity is not regarded in this context as MDO. *(2024)*

(2) Example 2

(A) Requirement according to SOLAS : main engines and auxiliary boilers operating with Heavy Fuel Oil(HFO), auxiliary engines operating with Marine Diesel Oil(MDO)

HFO service tank capacity for at least 8 h Main engine+Aux. boiler	HFO service tank capacity for at least 8 h Main engine+Aux. boiler	MDO service tank capacity for at least 8 h Aux. engine	MDO service tank capacity for at least 8 h Aux. engine

(B) Equivalent arrangement[3]

HFO service tank capacity for at least 8 h Main engine+Aux. boiler	MDO service tank Capacity for at least the highest of : · 4 h Main engine+Aux. engine+Aux. boiler or · 8 h Aux. engine+Aux. boiler	MDO service tank Capacity for at least the highest of : · 4 h Main engine+Aux. engine+Aux. boiler or · 8 h Aux. engine+Aux. boiler

(Note)

1. The arrangements in above apply, provided the propulsion and vital systems which use two type of fuel support rapid change over and are capable of operating in all normal operating conditions at sea with both types of fuel(MDO and HFO).
2. Service tank is a fuel oil tank which contains only fuel of a quality ready for use. use of a setting tank with or without purifiers, or purifiers alone, and one service tank is not acceptable as an equivalent arrangement to two service tank.
3. Any fuel oil which requires post service tank heating to achieve the required injection viscosity is not regarded in this context as MDO. *(2024)*

Fig 5.6.12 Example of Application for Fuel Oil Service Tank

〈Omitted〉

Amendments of the Guidance relating to the Rules for Classification of Steel Ships

Pt. 5 Machinery Installations – Chapter 6

(For External opinion inquiry)

2024. 1.

Machinery Rule Development Team

- Main Amendments -

(1) Effective date : 1 July 2024 (based on contract date for construction)

◉ IACS UI SC299 reflected.

- Type approval requirements for the heat-sensitive piping penetrating watertight bulkhead or deck on a passenger ship

Present	Amendment	Note
# CHAPTER 6 AUXILIARIES AND PIPING ARRANGEMENT ## Section 1 General **107. General requirements for piping arrangement** 〈Omitted〉 6. **Penetration of pipes** In application to **107. 7** of the Rules, valve stems of various valves are, in principle, not to penetrate through the part subjected to liquid head such as the bottom plate of wing tanks and top plate of double bottom used for tanks. In case where such penetrations are unavoidable, considerations are to be taken by providing such means as protection pipe to prevent liquid head from imposing on the stuffing box. **【See Rule】** 〈Omitted〉	# CHAPTER 6 AUXILIARIES AND PIPING ARRANGEMENT ## Section 1 General **107. General requirements for piping arrangement** 〈Omitted〉 6. **Penetration of pipes** In application to **107. 7** of the Rules, valve stems of various valves are, in principle, not to penetrate through the part subjected to liquid head such as the bottom plate of wing tanks and top plate of double bottom used for tanks. In case where such penetrations are unavoidable, considerations are to be taken by providing such means as protection pipe to prevent liquid head from imposing on the stuffing box. Any penetration used for the passage of heat-sensitive piping systems through a watertight bulkhead or deck on a passenger ship under SOLAS regulation II-1/13.2.3 shall be tested with the heat-sensitive piping and shall be type approved for watertight integrity after the fire test. *(2024)* **【See Rule】** 〈Omitted〉	- Rule 107.7 quoted below 7. Penetrations through bulkheads, decks, etc. Where pipes are led through watertight bulkheads, decks, boundary plates of deep tanks and inner bottom plating, arrangements are to be made to ensure the integrity of the watertightness of the structure.