RULES
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CHINA CLASSIFICATION SOCIETY

RULES FOR CLASSIFICATION OF SEA-GOING STEEL SHIPS

CCS RULE CHANGE NOTICE

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Beijing

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RULES FOR CLASSIFICATION OF SEA-GOING STEEL SHIPS

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5.14.3 Initial classification surveys of ships after construction

5.14.3.1 Initial classification surveys of ships which have been surveyed by the Societies accepted by CCS

(1) Initial classification surveys of ships which have been certified by the Societies accepted by CCS:

① When applying for an initial classification survey, as the prerequisite for issuance of a long-term classification certificate by CCS, the owner is to submit at least one copy each of the plans, calculations and other technical documents to CCS for check, including at least the following:

a. Main plans:
   (a) General arrangement;
   (b) Capacity plan;
   (c) Hydrostatic curves;
   (d) Loading manual (if required);
   (e) Damage Stability calculation, where required.

b. Plans of hull structure:
   (a) Transverse midship section;
   (b) Construction profile, including longitudinal section, decks, inner bottom structure, superstructure and deckhouse;
   (c) Transverse bulkhead;
   (d) Shell expansion;
   (e) Rudder and rudder stock;
   (f) Hatch covers;
   (g) For CSR ships, plans showing, for each structural element, both as-built and renewal thicknesses and any thickness for "voluntary addition";
   (h) Plan of stern frame (if required).

c. Plans of machinery:
   (a) Engine room arrangement;
   (b) Intermediate shaft, thrust shaft and propeller shaft;
   (c) Propeller;
   (d) Main engine, propulsion machinery and clutch systems (or manufacturer, model and specifications);
   (e) In addition, main boiler, superheater and economizer (or manufacturer, model and specifications) and steam piping for steam turbine ships;
   (f) Bilge and ballast piping diagram;
   (g) Wiring Diagram;
   (h) Steering gear piping system and arrangement, manufacturer and model.

d. Torsional vibration calculations for shafting to be submitted for ships less than 2 years of age.

e. Elastic coupling of propulsion shafting and/or shaft torque limiter (or manufacturer, model and specifications) additionally required for ships with ice class notation.

f. Additional plans required for oil tankers:
   (a) Pumping arrangement at the forward and after ends and drainage of cofferdams and pump rooms.

g. Additional plans required for periodically unattended machinery spaces:
   (a) Checklist of measuring instruments and alarms;
   (b) Arrangement of fixed fire alarm system;
   (c) List of automatic safety functions (e.g. slowdowns, shutdowns, etc.);
   (d) Diagram of functional tests.

h. Any other information requested by the flag State Administration.

i. Document(s) of approval of alternative design and arrangements, if any.

j. Additional plans/documents required for passenger ships:

(a) fire control drawings ;
(b) drawings of structural fire protection (including passive fire protection);
(c) HVAC line diagrams and ducting arrangements;
(d) in case of ro-ro passenger ships, plans and documents related to fixed and movable ramps.

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PART THREE MACHINERY INSTALLATIONS

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CHAPTER 1　GENERAL

Section 2　GENERAL PROVISIONS

1.2.1　Ambient conditions

1.2.1.2　Machinery equipment and installations are to be capable of normal operation under the angle of inclination of ships specified in Table 1.2.1.2. Considering the type, size and service conditions of the ship, smaller angles of inclination may be permitted subject to agreement of CCS.

Angle of inclination of ships　　　　Table 1.2.1.2

Installations and equipment	Angle of inclination[1] (°)			
	Athwartships		Fore-and-aft	
	static	dynamic	static	dynamic
Main and auxiliary machinery	15	22.5	5[2]	7.5
Safety equipment: e.g. emergency power installations, emergency fire pumps and their device	22.5[3]	22.5[3]	10	10

Notes: ① Athwartships and fore-and-aft inclinations may occur simultaneously.

② Where the length of the ship exceeds 100 m, the fore-and-aft static angle of inclination may be taken as $500/L$ degrees, where L = length of the ship, in m.

③ For ships carrying liquefied gases and chemicals, the emergency source of electrical power is also to remain operable with the ship being flooded to a final athwartship inclination up to a maximum of 30°. (see 2.7.2.2, Chapter 2, PART THREE of the Rules for Construction and Equipment of Ships Carrying Liquefied Gases in Bulk, and 2.9.3.2, Chapter 2, PART THREE of the Rules for Construction and Equipment of Ships Carrying Dangerous Liquid Chemicals in Bulk)

1.2.4　Astern power

1.2.4.1　~~In order to maintain sufficient manoeuvrability and secure control of the ship in all normal circumstances, the main propulsion machinery is to be capable of reversing the direction of thrust so as to bring the ship to rest from the maximum service speed. The main propulsion machinery is to be capable of maintaining in free route astern at least 70% of the ahead revolution.~~ The minimum astern power required by SOLAS II-1/28.1 to secure proper control of the ship in all normal circumstances is to be determined by the ship designer and is not to exceed the maximum permissible astern power (MPAP) for which the propulsion plant is designed. Astern trials are to be conducted in accordance with the provisions of ISO 19019:2005, section 5.4: Astern trials.

1.2.4.2　Where steam turbines are used for main propulsion, the astern trial is to demonstrate that they are to be capable of ~~maintaining~~ operating at their maximum permissible astern power (MPAP) ~~in free route astern at least 70% of the ahead revolution~~ for a period of at least 15 min. The astern trial is to be limited to 30 min or in accordance with manufacturer's recommendation to avoid overheating of the turbine due to the effects of "windage" and friction.

1.2.4.3　~~For the main~~ Main propulsion systems with reversing gears, controllable pitch propellers or electric propeller drive are to be designed for the maximum permissible astern power, ~~running astern~~ which is not to lead to the overload of propulsion machinery.

1.2.4.4　~~Main propulsion systems are to undergo tests to demonstrate the astern response characteristics.~~

The astern tests are to be carried out ~~at least over the manoeuvring range of the propulsion system and~~ from ~~all~~ control positions. A test plan is to be provided by the yard and accepted by the surveyor. If specific operational characteristics have been defined by the manufacturer these are to be included in the test plan[1].

① This paragraph applies to:

(1) ships contracted for construction on or after ~~1 July 2018~~ 1 January 2026.

(2) ships other than those specified in the preceding (1) on which astern testing is carried out in accordance with 5.9.4.10, Chapter 5, PART ONE of the Rules on or after ~~1 July 2018~~ 1 January 2026.

~~1.2.4.5 The reversing characteristics of the propulsion plant, including the blade pitch control system of controllable pitch propellers, are to be demonstrated and recorded during trials[①].~~

~~① Same as ① above.~~

CHAPTER 2 PUMPING AND PIPING SYSTEMS

Appendix 1 PRODUCTION AND APPLICATION OF PLASTIC PIPING SYSTEMS ON SHIPS①

1.6 Installation

1.6.7 Penetration of Divisions

(1) Where plastic pipes pass through A or B class divisions, arrangements are to be made to ensure that the fire endurance is not impaired. These arrangements are to be tested in accordance with Recommendations for fire test procedures for A, B and F bulkheads 2010 FTP Code, annex 1, part 3 (Res. MSC.307(88) as amended by Res.MSC.437(99)).

(2) When plastic pipes pass through watertight bulkheads or decks, the watertight integrity of the bulkhead or deck is to be maintained. For pipes not able to satisfy the requirements in 1.3.1(3)② of this Appendix, a metallic shut-off valve operable from above the freeboard deck should be fitted at the bulkhead or deck.

(3) If the bulkhead or deck is also a fire division and destruction by fire of plastic pipes may cause the inflow of liquid from tanks, a metallic shut-off valve operable from above the freeboard deck should be fitted at the bulkhead or deck.

(4) For passenger ships, the penetrations used for the passage of plastic piping systems through a watertight bulkhead or deck under SOLAS II-1/13.2.3 shall be successfully prototype tested for watertight integrity, as per paragraphs 3, 4 and 5 of the explanatory notes to regulation II-1/13.2.3 contained in the annex of resolution MSC.429(98)/ Rev.2, as applicable, after the fire test. SOLAS II-1/13.2.3 shall be applicable to heat-sensitive piping systems like plastic piping and shall not be applied to cable penetrations in watertight bulkheads and decks.

① It is addressed by IACS according to the provisions of IMO resolution A.753(18), as amended by IMO Res. MSC.313(88) and IMO Res. MSC. 399(95).

CHAPTER 9 DIESEL ENGINES

Section 4 PIPING SYSTEMS

9.4.1 Lubricating oil systems

9.4.1.3 Lubricating oil drain pipes from the engine sump to the drain tank are to be continuously submerged at their outlet ends.

Section 7 FITTINGS

9.7.5 Vent pipes

9.7.5.1 Ventilation of crankcase, and any arrangement which could produce a flow of external air ~~within~~ into the crankcase, are in principle not permitted except for ~~gas fuel~~ engines fuelled with gas or low-flash point fuel ~~where crankcase ventilation is to be provided in accordance with the applicable requirements of Appendix 1 of this Chapter, CCS Rules for Ships Using Natural Gas Fuels and CCS Guidelines for Design and Installation of Gas Fuel Engine Systems of Liquefied Gas Carriers~~. Vent pipes, where provided, are to be as small as practicable to minimise the inrush of external air after a crankcase explosion.

In order to maintain the gas concentration in the crankcase below LEL, forced ventilation system may be used provided that:

(1)It is demonstrated that the risk connected with a crankcase explosion is not increased by the ventilation system.

(2) The operation of the ventilation system is monitored.

(3)The automatic safety actions to be activated and/or the risk mitigation measures to be implemented in case of detection of a ventilation failure are specified by the engine manufacturer and justified in the safety concept of the engine.

Note: LEL means the Lower Explosive Limit, as defined in IEC 60079-10-1 standard, paragraph 3.6.12. The lowest applicable LEL of all possible gas or low flashpoint fuels, fuel vapours or mixture is to be considered.

9.7.5.2 In order to avoid the interconnection between crankcases and the possible spread of fire following an explosion, interconnection of ventilating pipes of two or more engines is not permitted nor that of oil drain pipes of crankcase.

9.7.5.3 ~~If provision is made for the extraction of gases from within the crankcase, e.g. for smoke detection purpose, the vacuum within the crankcase is not to exceed 25 mm of water column.~~ When forced extraction of crankcase atmosphere is provided, the crankcase pressure level is not to influence the reliable function of measurement and safety devices (such as oil mist detection) in the crankcase.

9.7.5.4 For engines fuelled with gas or low flashpoint fuel a detailed evaluation regarding the safety of crankcase is to be carried out justifying that:

(1)either the gas concentration in the crankcase remains below the LEL without specific measures, or

(2)the risk of a crankcase explosion is reduced through specific measures (see, for example, 9.7.5 or 9.7.7.13).

9.7.6 Alarms~~[①]~~

9.7.6.1 Oil mist detection arrangements (or engine bearing temperature monitors or equivalent devices[①]) are required for alarm and slowdown purposes for low speed diesel engines of 2,250 kW and above or having cylinders of more than 300 mm bore.

9.7.6.2 Oil mist detection arrangements (or engine bearing temperature monitors or equivalent devices~~[①②]~~) are required for alarm and automatic shutoff purposes for medium and high speed diesel engines of 2,250 kW and above or having cylinders of more than 300 mm bore.

~~① For equivalent devices for high speed engines, refer to UI SC133.~~

9.7.6.3 Oil mist detection arrangements are to be of a type approved by classification societies and tested in accordance with Appendix 8 of this Chapter and comply with the requirements of 9.7.7 of this Section. Engine bearing temperature monitors or equivalent devices used as safety devices have to be of a type approved by classification societies for such purposes.

Note 1: Engine bearing temperature monitors or equivalent devices are defined as follows:
① For crosshead engines: The wording "engine bearing" of the term "engine bearing temperature monitors or equivalent devices" includes at least journal and connecting rod bearings and the crosshead bearings.
② For trunk piston engines: "Engine bearing temperatures monitors" may be accepted as an alternative to the oil mist detector only when the temperature of all bearings, including the piston pin bearings, are monitored.
③ The expression "equivalent devices" includes measures applied to engines where specific design features to preclude the risk of crankcase explosion are incorporated, subject to satisfactory justifications.
④ The examples of acceptable "temperature monitors or equivalent devices" are as follows:
.1) a temperature monitoring system of the bearing concerned
.2) a bearing oil outlet temperature monitoring system
.3) a splash oil temperature monitoring system
.4) measures applied to engines where specific design features to preclude the risk of crankcase explosions are incorporated, subject to satisfactory justifications.
Note 2: 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

9.7.7 Crankcase oil mist detection/monitoring system

9.7.7.2 The oil mist detection/monitoring system and arrangements are to be installed in accordance with the engine designer's and oil mist manufacturer's instructions/recommendations. The following particulars are to be included in the instructions:
(1) Schematic layout of engine oil mist detection/monitoring and alarm system showing location of engine crankcase sample points and piping or electrical cable arrangements together with pipe dimensions to detector/monitor.
~~(2) Evidence of study to justify the selected location of sample points and sample extraction rate (if applicable) in consideration of the crankcase arrangements and geometry and the predicted crankcase atmosphere where oil mist can accumulate.~~
(~~3~~2) The manufacturer's maintenance and test manual.
(~~4~~3) Information relating to type or in-service testing of the engine with engine protection system test arrangements having approved types of oil mist monitoring equipment.

9.7.7.10 Plans showing details and arrangements of oil mist detection and alarm arrangements are to be submitted for approval in accordance with Table 9.1.12.1(19) of this Chapter and the following requirements:
(1)Documentation containing evidence of studies justifying the selected location of sample points and the sample extraction rate (if applicable), supported by a confirmation from the oil mist detection system manufacturer, from the crankcase and the spaces mentioned in 9.7.4.5 of this Chapter, is to be provided.
(2)As an alternative to the evidence of studies, an oil mist inlet test may be performed on a running engine. Test conditions such as setup, records or engine loads are to be agreed upon between engine designer, oil mist detector (OMD) manufacturer and CCS. The test engine is to be chosen to demonstrate OMD arrangement suitability to cover a specified range of engine types and configurations. To allow a repeatable and comparable test, an oil mist generator as described under Appendix 8 of this Chapter is to be used.
9.7.7.1~~0~~1 The equipment together with detectors/monitors is to be tested when installed on the test bed and on board ship to demonstrate that the detection/monitoring and alarm system functionally operates. The testing arrangements are to be submitted to CCS for approval.
9.7.7.1~~1~~2 Where sequential oil mist detection arrangements are provided for each crankcase, the sampling frequency and time is to be as short as reasonably practicable.
9.7.7.1~~2~~3 Where alternative methods are provided for the prevention of the build-up of oil mist that may lead to a potentially explosive condition within the crankcase, the following information is to be included in the details to be submitted for approval:
(1) Engine particulars – type, power, speed, stroke, bore and crankcase volume;
(2) Details of arrangements prevent the build-up of potentially explosive conditions within the crankcase, e.g. bearing temperature monitoring, oil splash temperature, crankcase pressure monitoring, recirculation

arrangements;
(3) Evidence to demonstrate that the arrangements are effective in preventing the build-up of potentially explosive conditions together with details of in-service experience;
(4) Operating instructions and the maintenance and test instructions.
9.7.7.1~~3~~4 Where it is proposed to use the introduction of inert gas into the crankcase to minimize a potential crankcase explosion, details of the arrangements are to be submitted for approval.

CHAPTER 11 SHAFTING AND PROPELLERS

Section 2 SHAFTING

11.2.5 Stern tubes or struts and bearings

11.2.5.1 The length of the ~~bearing in the stern bush next to and supporting the propellers~~ aftmost propeller shaft bearing, next to and carrying the propeller, whether the bearing is in a stern tube or in a strut is to be as follows:

(1) For water lubricated bearings, the length of the bearing is not to be less than 4 times the rule calculated diameter for the screwshaft in way of the bearing. For water lubricated synthetic materials, if the design and materials of bearings comply with CCS provisions as demonstrated by tests, the length of the bearings may be appropriately reduced, but not less than 2 times the rule diameter of the shaft in way of the bearing. Synthetic materials of water lubricated ~~stern tube~~ bearings are to be type approved. The type approval requirements in this clause apply to all aftmost propeller shaft bearings made of synthetic materials. For type approval testing requirements of synthetic material for the aftmost propeller shaft bearing, refer to CCS Guidelines for polymer bearing material.

(2) For bearings which are white-metal lined and oil lubricated, the length of the bearing is not to be less than twice the rule calculated diameter for the screwshaft in way of the bearing. If the normal bearing pressure is less than 0.8 MPa as determined by static bearing reaction calculation taking into account shaft and propeller weight, the length of the bearings may be appropriately reduced. However, the minimum length is to be not less than 1.5 times the actual diameter.

(3) For bearings of synthetic rubber, reinforced resin or plastics materials which are approved for use as oil lubricated stern bush bearings, the length of the bearing is to be not less than twice the rule diameter of the shaft in way of the bearing. If the normal bearing pressure is less than 0.6 MPa as determined by static bearing reaction calculation taking into account shaft and propeller weight, the length of the bearings may be appropriately reduced. However, the minimum length is to be not less than 1.5 times the actual diameter. Synthetic materials for application as oil lubricated ~~stern tube~~ bearings are to be Type Approved. The type approval requirements in this clause apply to all aftmost propeller shaft bearings made of synthetic materials. For type approval testing requirements of synthetic material for the aftmost propeller shaft bearing, refer to CCS Guidelines for polymer bearing material.

Where the material has proven satisfactory testing and operating experience, consideration may be given to an increased bearing pressure.

(4) The length of a grease lubricated bearing is to be not less than 4.0 times the rule diameter of the shaft in way of the bearing.

(5) For bearings which are lined with other materials or lubricated by other methods, background for adopting its bearing length is to be provided, e.g. test results such as expansion characteristics and bearing capability of bearing material or service experience.

CHAPTER 14 STRENGTHENING FOR NAVIGATION IN ICE

Section 2 PROPULSION MACHINERY

14.2.6 Design
14.2.6.2 Propeller blade
(3) Fatigue design of propeller blade

Values of the Parameter *G* for Different *m*/*k* Ratios Table 14.2.6.2(3)③

m/*k*	*G*	*m*/*k*	*G*	*m*/*k*	*G*	*m*/*k*	*G*
3	6	5.5	287.9	8	40320	10.5	11.899E6
3.5	11.6	6	720	8.5	119292	11	39.917E6
4	24	6.5	1871	9	362880	11.5	136.843E6
4.5	52.3	7	5040	9.5	1.133E6	12	479.002E6
5	120	7.5	14034	10	3.62~~3~~9E6		

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PART SIX FIRE PROTECTION, DETECTION AND EXTINCTION

CONTENTS

CHAPTER 3　FIRE SAFETY MEASURES

Section 4　MISCELLANEOUS

~~**3.4.13　Fore peak ballast system on oil tankers**~~
~~3.4.13.1　The fore peak tank can be ballasted with the system serving other ballast tanks within the cargo area, provided:~~
~~(1) the fore peak tank is considered as hazardous;~~
~~(2) the vent pipe openings are located on open deck at an appropriate distance from sources of ignition. In this respect, the hazardous zones distances are to be determined according to the hazardous zones defined in paragraphs 4.2.2.9 and 4.2.3.1 of IEC 60092-502: Electrical installations in ships - Tankers - Special features;~~
~~(3) means are provided, on the open deck, to allow measurement of flammable gas concentrations within the fore peak tank by a suitable portable instrument;~~
~~(4) the sounding arrangement to the fore peak tank is direct from open deck;~~
~~(5) the access to the fore peak tank is direct from open deck. Alternatively, indirect access from the open deck to the fore peak tank through an enclosed space may be accepted provided that:~~
~~① in case the enclosed space is separated from the cargo tanks by cofferdams, the access is through a gas tight bolted manhole located in the enclosed space and a warning sign is to be provided at the manhole stating that the fore peak tank may only be opened after it has been proven to be gas free; or any electrical equipment which is not certified safe in the enclosed space is isolated;~~
~~② in case the enclosed space has a common boundary with the cargo tanks and is therefore hazardous, the enclosed space can be well ventilated.~~

3.4.13　Fore peak ballast tanks and space arrangement on oil & chemical tankers
3.4.13.1　The following definitions apply in this chapter:

Hazardous area means an area in which an explosive gas atmosphere is present, or may be expected to be present, in quantities such as to require special precautions for the construction, installation and use of equipment.

Non-hazardous area means an area that is not a hazardous area.

Cargo area of tankers are defined in:

- for tankers to which regulation 1.6.1 of SOLAS Chapter II-2 as amended by IMO resolutions up to MSC.421(98) (hereinafter the same) applies, regulation 3.6 of SOLAS Chapter II-2;

- for chemical tankers, Paragraph 1.3.6 of the IBC Code as amended by IMO resolutions up to MSC.460(101).

3.4.13.2 Fore peak ballast tanks and space arrangements on tankers for oil and/or chemicals

1 The fore peak tank can be ballasted with the system serving other ballast tanks within the cargo area, provided:

a) The vent pipe openings are located on open deck at a distance from sources of ignition as required by IEC 60092-502:1999 Electrical installations in ships – Tankers – Special features; This requirement does not apply to sounding arrangements.
b) Access to the fore peak tank is direct from open deck. Alternatively, indirect access from the open deck to the forepeak tank may be from a pump-room, deep cofferdam, pipe tunnel, cargo hold, double hull space, bosun's store or similar compartment not intended for the carriage of oil or hazardous cargoes, conforming to the requirements of SOLAS II-1/3-6.3.1. Electrical

equipment in such indirect access shall be of the certified safe type suitable for use in the hazardous area it opens into or shall be isolated before entry.

c) Continuous ventilation is maintained while accessing the forepeak tank

d) The sounding arrangement to the fore peak tank is direct from open deck.

e) The forepeak tank is gas freed direct from open deck, or through a dedicated trunk to open deck. Before the manhole and the entrance of the dedicated trunk are opened, the trunk and the forepeak tank shall be confirmed as made gas free. Means are to be provided to free the space of gas without opening manholes or the entrance to a dedicated trunk. Manholes on the open deck and away from sources of ignition at the top of the dedicated trunk which are used to gas-free the space are allowed to be opened.

f) The fore peak ballast tank is considered as a hazardous zone 2 if segregated from cargo area with a cofferdam, or as a hazardous zone 1 if located adjacent to a cargo tank. For tankers where a bow thruster space is provided, the piping passing through the non-hazardous bow thruster room shall be fully welded and it is required to have the collision bulkhead valve located within the forepeak tank.

g) Means are to be provided on the open deck by a suitable portable instrument, to allow detection of toxic and flammable vapours within the FPT (based on the cargoes carried in current voyage, and since last de-ballasting of FPT was carried out), in order to ensure the FPT is fully gas freed. In the case that sounding arrangements can be used as the means for the portable instrument additional means for the purpose is not required.

3.4.13.3 Additional requirements for forward spaces not being defined as a ballast tank

1 Any spaces, voids and/or indirect accesses from the open deck or intermediate space being located adjacent to cargo tanks, and/or are defined as hazardous area zone 1 or 2, shall follow the same requirements to openings and access as reflected for fore peak ballast tanks in section 3.4.13.2.

2 In case any spaces or voids are defined as non-hazardous spaces and have access to other non-hazardous spaces (such as bosun store), the following applies:

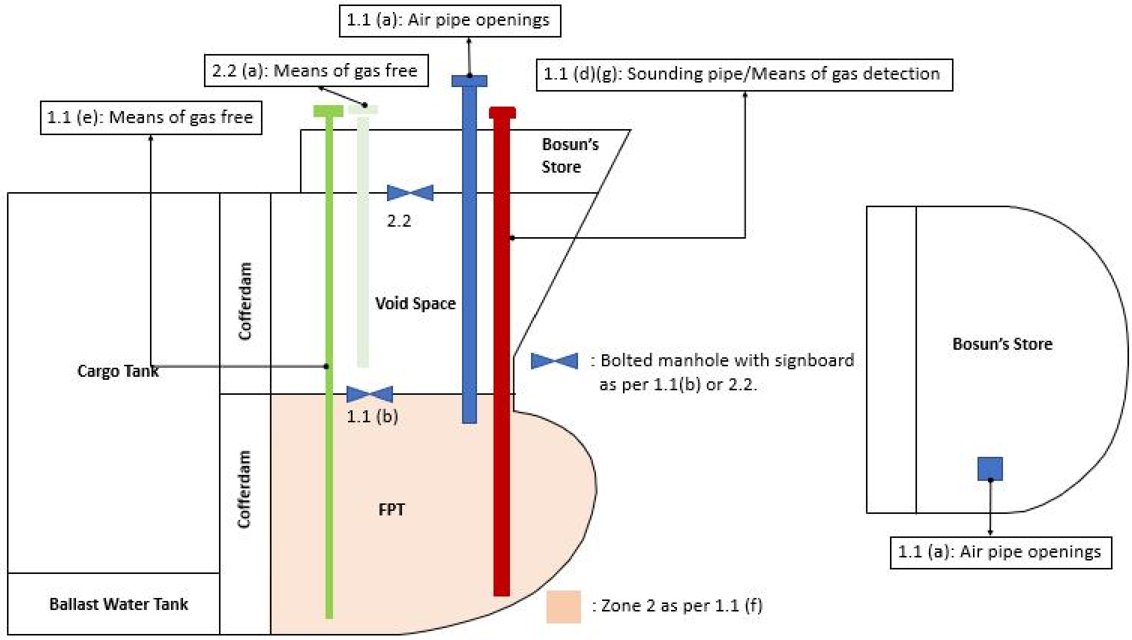
a) For any non-hazardous space with access to a hazardous space (example: fore peak ballast tank), the non-hazardous space must have access directly to open deck and shall be gas freed directly from open deck, and not through the non-hazardous space (example: bosun store).

b) Access from bosun store to a non-hazardous space (example: void) having access to hazardous space (example: fore peak ballast tank) may be accepted through a gas tight bolted manhole, with signboard stating that the non-hazardous space cannot be entered until the space is confirmed gas free. Separation of such spaces are described in IEC 60092-502:1999 section 4.1.4 and 4.1.5 as applicable.

The following figures illustrate the above points:

Arrangements shown in samples 1, 2, 5 and 6 are applicable to both oil tankers and chemical tankers

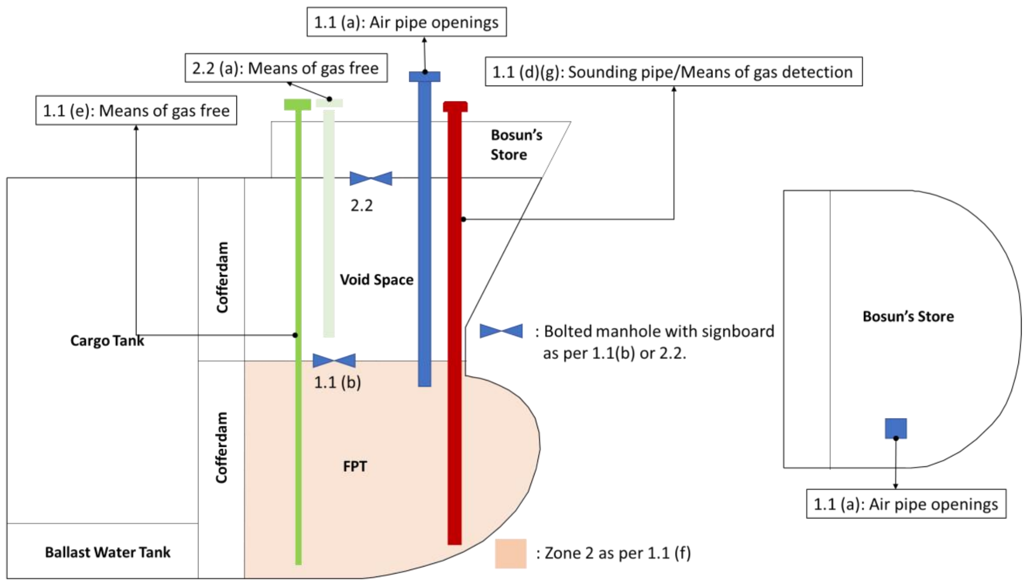
[Sample 1]



<Operational requirements>

1. Continuous ventilation is maintained while accessing the FPT as per 1.1(c).
2. To detect toxic and flammable vapours within the FPT (based on the cargoes carried in current voyage, and since last de-ballasting of the FPT was carried out), in order to ensure the FPT is fully gas freed as per 1.1(g).
3. Where toxic-vapour-detection equipment is not available for some cargoes which require such detection, the FPT may be ventilated by dilution method at a minimum rate of 6 air changes for a minimum of 24hrs. Tank entry procedures to be done in accordance with IMO resolution A.1050(27) and IBC code 13.2.3.

[Sample 1]



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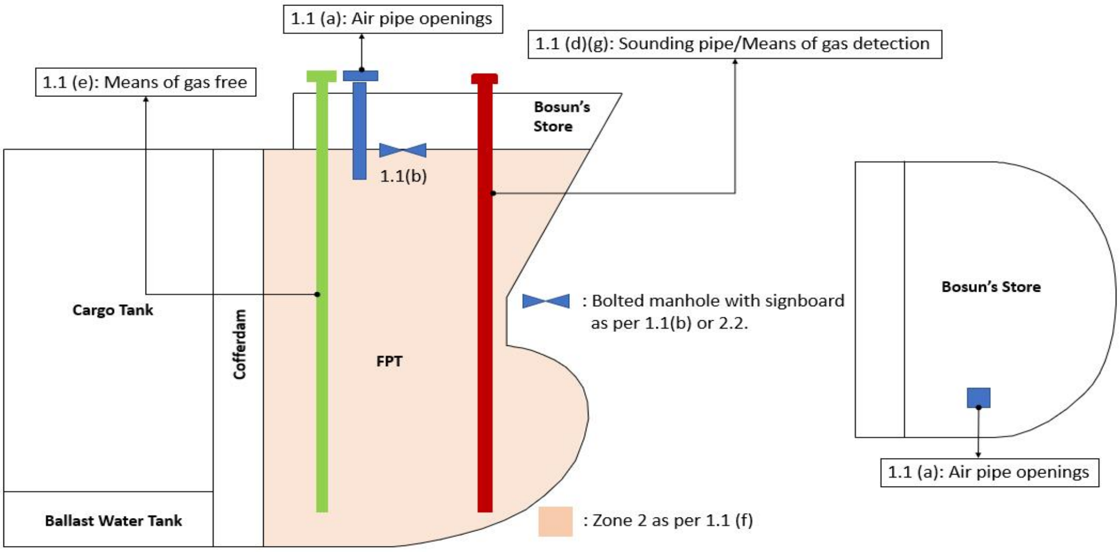
[Sample 2]



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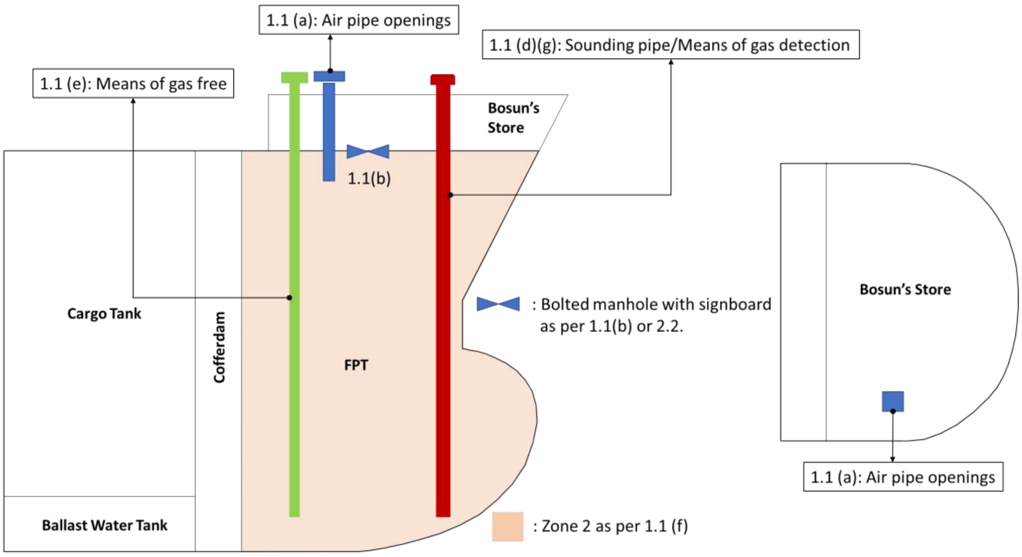
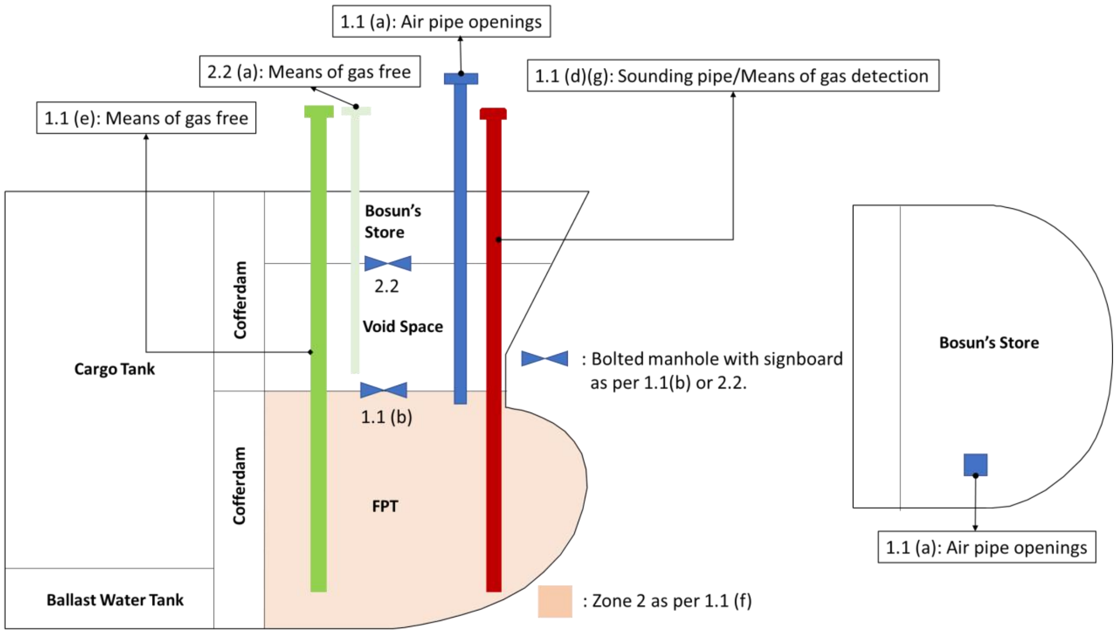
[Sample 2]



<Operational requirements>

1. Continuous ventilation is maintained while accessing the FPT as per 1.1(c).
2. To detect toxic and flammable vapours within the FPT (based on the cargoes carried in current voyage, and since last de-ballasting of the FPT was carried out), in order to ensure the FPT is fully gas freed as per 1.1(g).
3. Where toxic-vapour-detection equipment is not available for some cargoes which require such detection, the FPT may be ventilated by dilution method at a minimum rate of 6 air changes/hr for a minimum of 24 hrs. Tank entry procedures to be done in accordance with IMO resolution A.1050(27) and IBC code 13.2.3.

[Sample 5]



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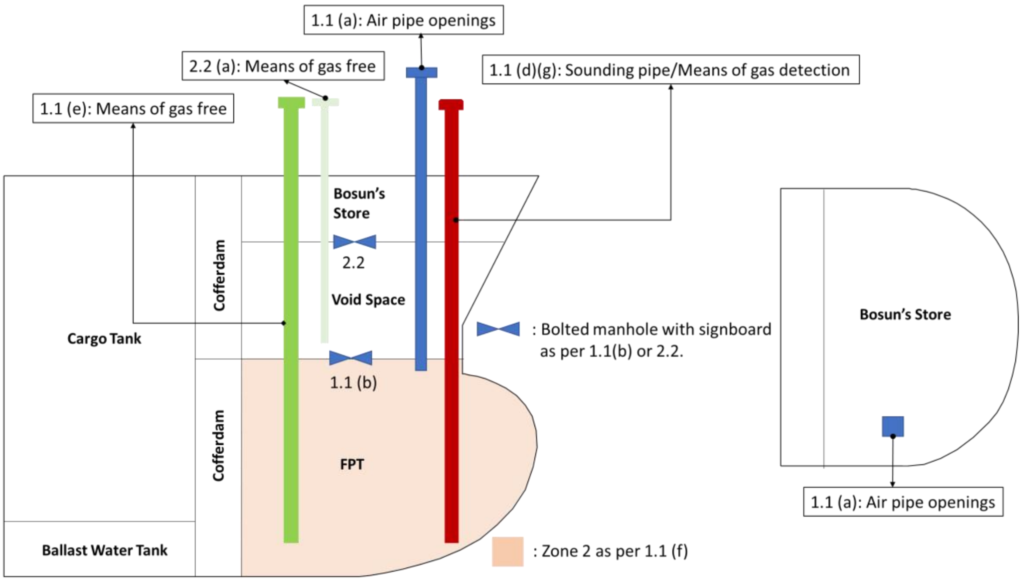
2. To detect toxic and flammable vapours within the FPT (based on the cargoes carried in current voyage, and since last de-ballasting of the FPT was carried out), in order to ensure the FPT is fully gas freed as per 1.1(g).
3. Where toxic-vapour-detection equipment is not available for some cargoes which require such detection, the FPT may be ventilated by dilution method at a minimum rate of 6 air changes for a minimum of 24hrs. Tank entry procedures to be done in accordance with IMO resolution A.1050(27) and IBC code 13.2.3.

[Sample 5]



<Operational requirements>

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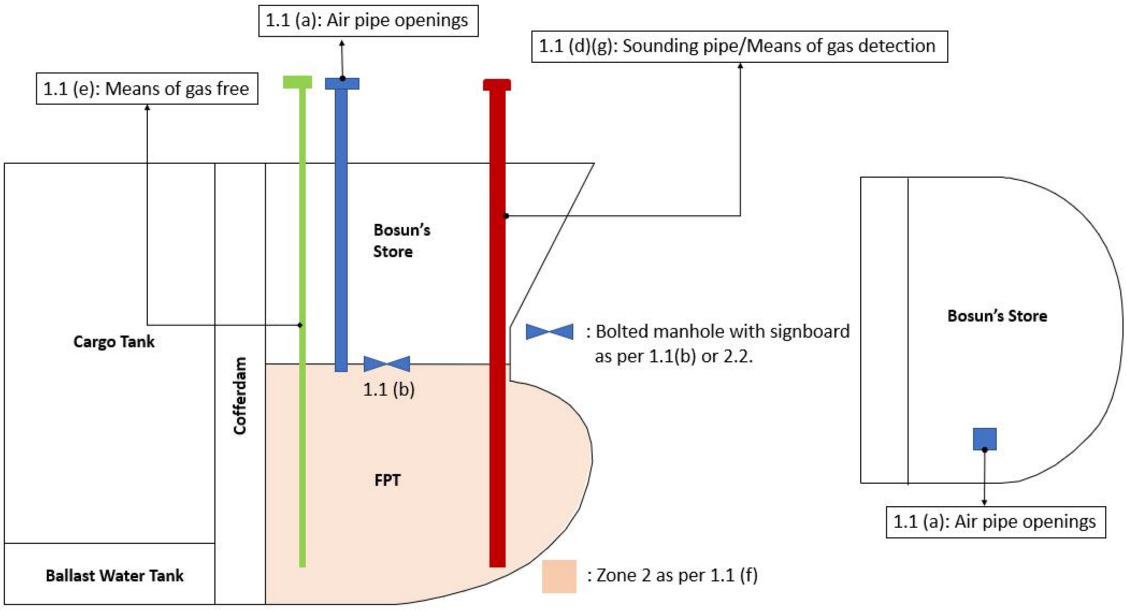
[Sample 6]



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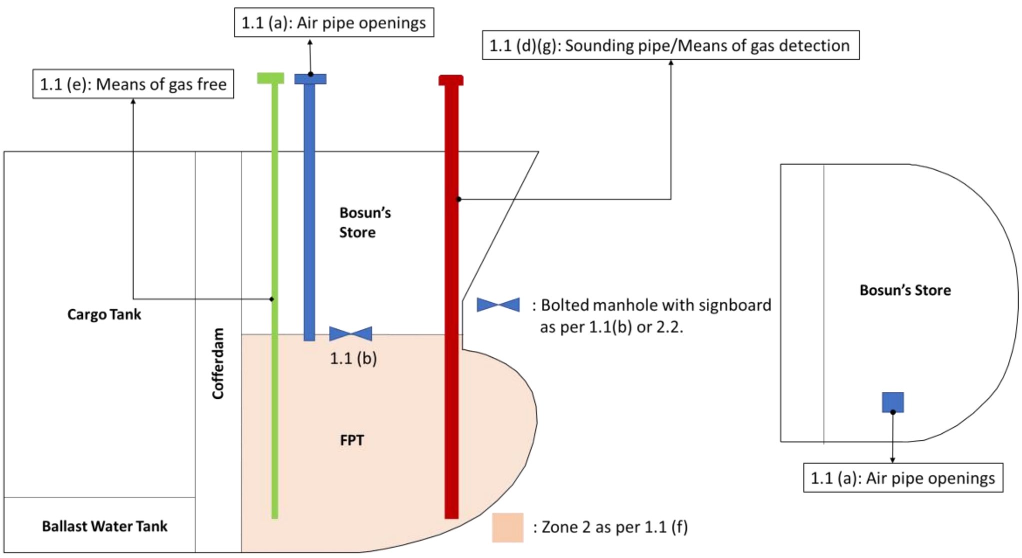
[Sample 6]



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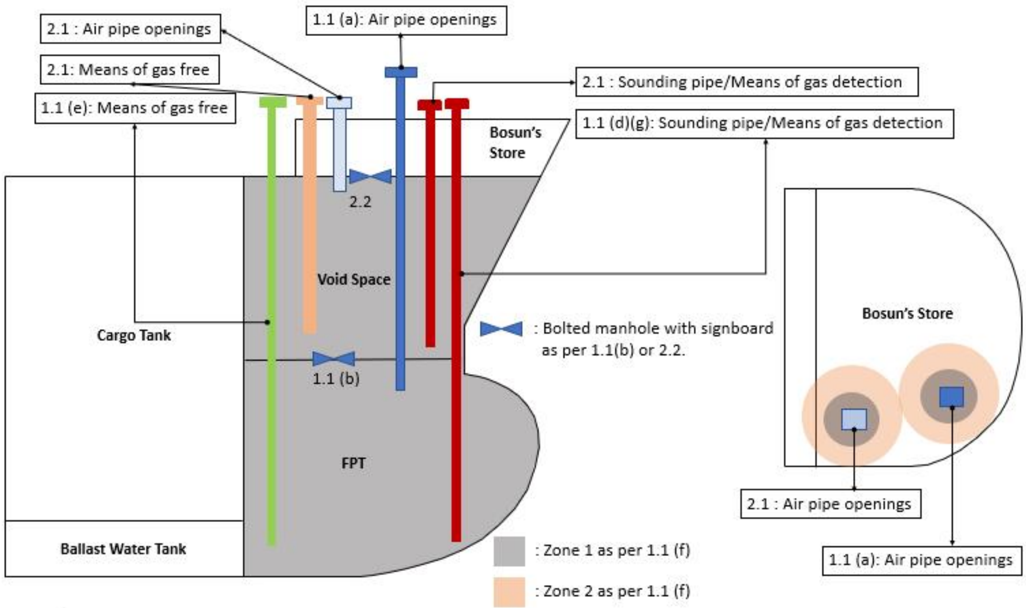
Arrangements shown in samples 3 and 4 are applicable to oil tankers only.

[Sample 3]



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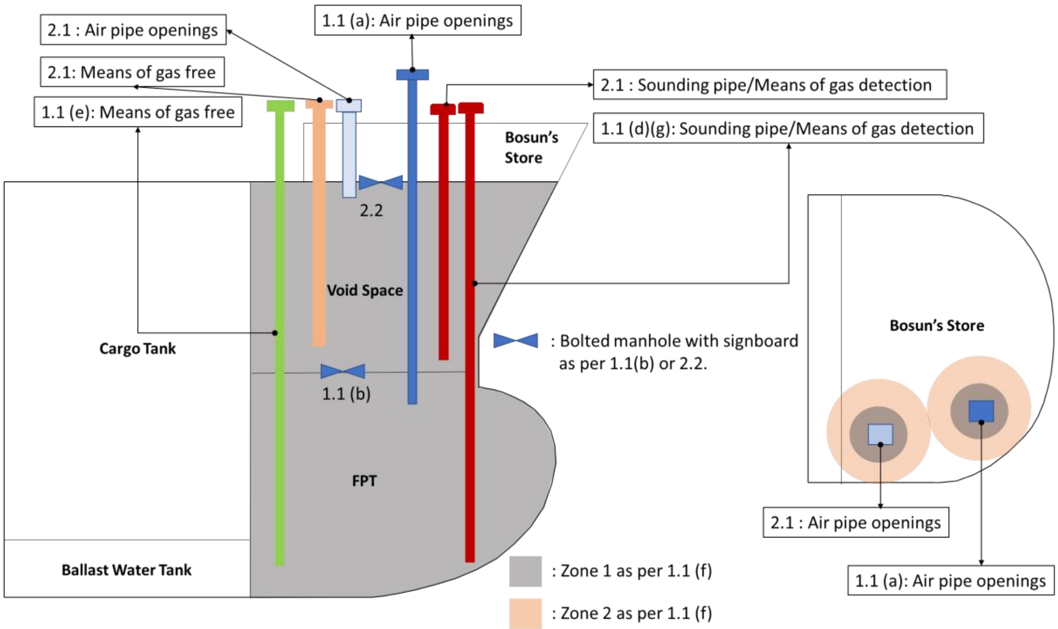
[Sample 3]



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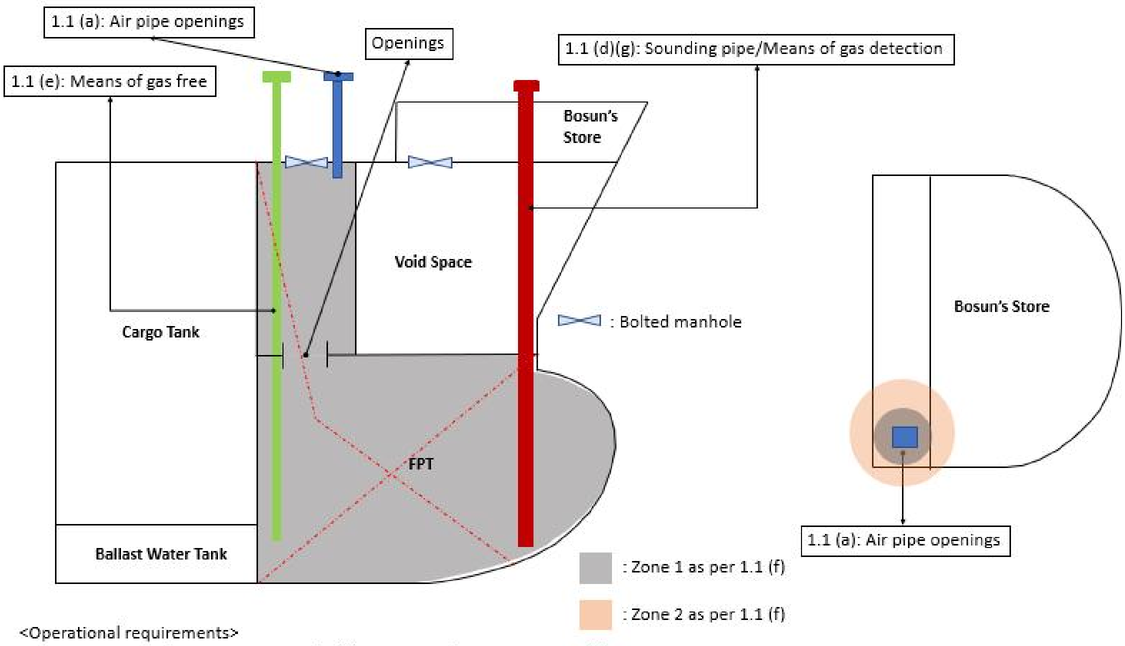
[Sample 4]



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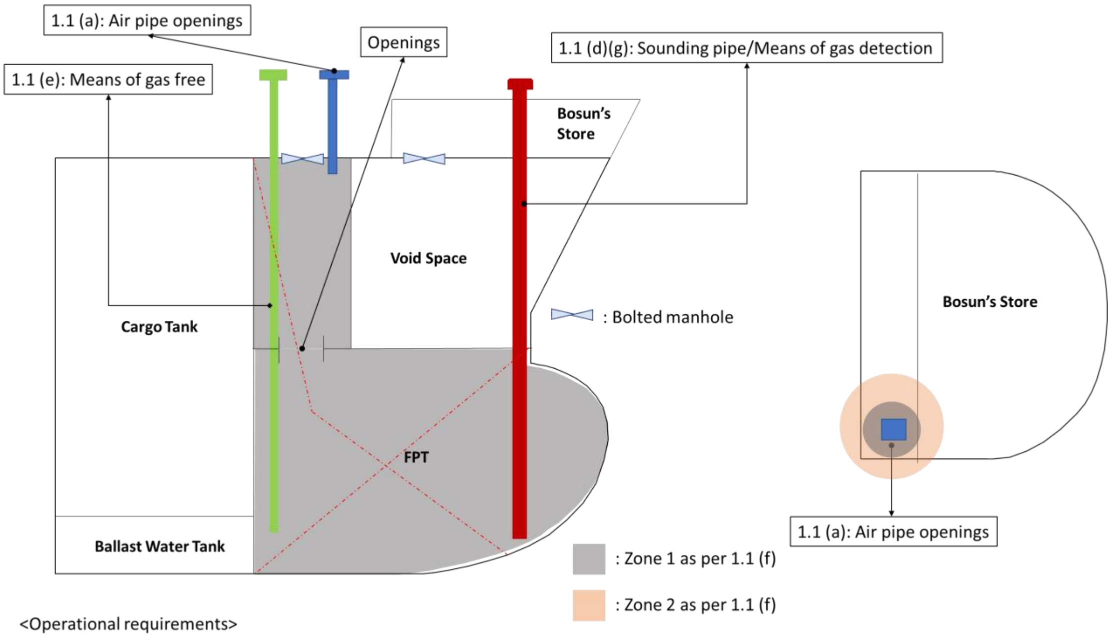
[Sample 4]



<Operational requirements>

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CCS Rule Change Notice For:

RULES FOR CLASSIFICATION OF SEA-GOING STEEL SHIPS

PART SEVEN AUTOMATION SYSTEMS

CONTENTS

CHAPTER 2 BASIC REQUIREMENTS

Section 6 COMPUTER BASED SYSTEMS

2.6.10 Management of change

2.6.10.11 During in operation (vessel in service) phase, the verification by CCS regarding the management of change in operation is generally performed during the annual survey of the vessel. Procedures for management of change and relevant change records shall be made available at the time of survey. In the cases where the change requires approval from CCS up front, the relevant procedures and documentation for the change in question may be verified at that time. During newbuilding, the verification of management of change in the newbuilding phase is divided into two:

(1) Procedures are verified as a part of the verification of the quality management system (Table 2.6.6.2);

(2) Project specific implementation of the procedures are verified during FAT, SAT and SOST~~and after FAT~~.

CCS Rule Change Notice For:

RULES FOR CLASSIFICATION OF SEA-GOING STEEL SHIPS

PART EIGHT ADDITIONAL REQUIREMENTS

CONTENTS

CHAPTER 13 ADDITIONAL REQUIREMENTS FOR POLAR CLASS SHIPS

Section 3 MACHINERY INSTALLATIONS

13.3.5 Ice interaction loads

13.3.5.5 Design ice loads for both open and ducted propellers

(3) Number of ice loads

Number of load cycles in the load spectrum per blade is to be determined according to the formula:

$$\cancel{N_{ice} = k_1 k_2 N_{class} n}$$

$$\underline{N_{ice} = k_1 k_2 k_3 N_{class} n}$$

where: N_{class} — reference number of impacts per propeller revolution for each ice class (Table 13.3.5.5(3));

k_1 — propeller position coefficient, to be taken as 1 for centre propeller; 2 for wing propeller; 3 for pulling propeller (wing and centre);

k_2 — immersion coefficient, to be determined as follows:

when $f < 0$, $k_2 = 0.8 - f$;

when $0 \leqslant f \leqslant 1$, $k_2 = 0.8 - 0.4f$;

when $1 < f \leqslant 2.5$, $k_2 = 0.6 - 0.2f$;

when $f > 2.5$, $k_2 = 0.1$;

where: $f = \dfrac{h_0 - H_{ice}}{D/2} - 1$, if h_0 is not known, h_0 may be taken as $D/2$.

k_3 — thruster type coefficient, to be taken as 1 for fixed thrusters and 1.2 for azimuthing thrusters;

For vessels with the additional notation Icebreaker, the above stated number of load cycles N_{ice} shall be multiplied by a factor of 3.

For components that are subject to loads resulting from propeller/ice interaction with all the propeller blades, the number of load cycles (N_{ice}) is to be multiplied by the number of propeller blades (Z).

Reference number of impacts **Table 13.3.5.5(3)**

Ice class	PC1	PC2	PC3	PC4	PC5	PC6	PC7
N_{class}	21×10^6	17×10^6	15×10^6	13×10^6	11×10^6	9×10^6	6×10^6

13.3.6 Design

13.3.6.1 Design principle

(3) Fatigue design of propeller blade

For materials with a two slope S-N curve the fatigue calculations defined in this chapter are not required if the following criterion is fulfilled.

$$\sigma_{\exp} \geqslant B_1 \cdot \sigma_{ref2}^{B_2} \cdot \log\left(N_{ice}\right)^{B_3}$$

where: B_1, B_2 and B_3 are coefficients for propellers given in Table 13.3.6.2(3).

Value of B_1, B_2 and B_3 **Table 13.3.6.3(3)**

Coefficient	Open propeller	Ducted propeller
B_1	0.00328	0.00223
B_2	1.0076	1.0071
B_3	2.101	2.471

Where the above criterion is not fulfilled the fatigue requirements defined below shall be applied:

The fatigue design of the propeller blade is based on an estimated load distribution for the service life of the

ship and the S-N curve for the blade material. An equivalent stress σ_{fat} that produces the same fatigue damage as the expected load distribution shall be calculated according to Miner's rule and the acceptability criterion for fatigue should be fulfilled as given in this section. The equivalent stress is normalised for 100 million cycles.
The blade stresses at various selected load levels for fatigue analysis are to be taken proportional to the stresses calculated for maximum loads given in section 13.3.5.
The peak principal stresses σ_f and σ_b are determined from F_f and F_b using FEA. The peak stress range $\Delta\sigma_{max}$ and the maximum stress amplitude σ_{Amax} are determined on the basis of load cases 1 and 3, 2 and 4.

$$\Delta\sigma_{\max} = 2 \cdot \sigma_{A\max} = \left|(\sigma_{ice})_{f\max}\right| + \left|(\sigma_{ice})_{b\max}\right| \qquad \text{MPa}$$

The load spectrum for backward loads is normally expected to have a lower number of cycles than the load spectrum for forward loads. Taking this into account in a fatigue analysis introduces complications that are not justified considering all uncertainties involved.
For the calculation of equivalent stress two types of S-N curves are available. Two slope S-N curve (slopes 4.5 and 10), see Figure 13.3.6.3(3)-1. One slope S-N curve (the slope can be chosen), see Figure 13.3.6.3(3)-2.
The type of the S-N-curve shall be selected to correspond with the material properties of the blade. If the S-N-curve is not known the two slope S-N curve shall be used.

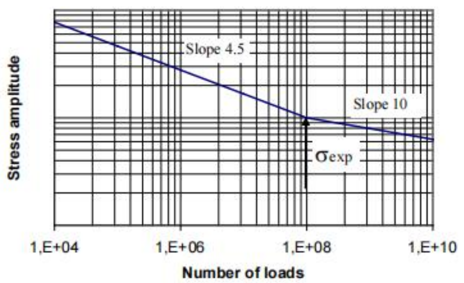

Figure 13.3.6.3(3)-1 Two-slope *S-N* curve

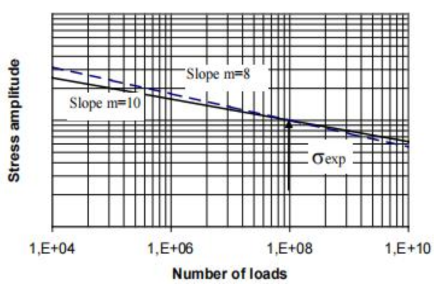

Figure 13.3.6.3(3)-2 Constant-slope *S-N* curve

① Equivalent fatigue stress

A more general method of determining the equivalent fatigue stress of propeller blades is described in 13.3.6.5, where the principal stresses are considered according to 13.3.5.3 and 13.3.5.4 using the Miner's rule. For a total number of load blocks n_{bl} > 100, both methods deliver the same result. Therefore, they are regarded as equivalent.
The equivalent fatigue stress for 10^8 cycles which produces the same fatigue damage as the load distribution is:

$$\sigma_{fat} = \rho \cdot \left(\sigma_{ice}\right)_{\max} \qquad \text{MPa}$$

where: $(\sigma_{ice})_{\max}$ —— mean value of the principal stress amplitudes resulting from design forward and backward blade forces at the location being studied, to be determined as follows:

$$\left(\sigma_{ice}\right)_{\max} = 0.5 \cdot \left(\left(\sigma_{ice}\right)_{f\max} - \left(\sigma_{ice}\right)_{b\max}\right) \qquad \text{MPa}$$

where: $(\sigma_{ice})_{f\max}$ is principal stress resulting from forward load, $(\sigma_{ice})_{b\max}$ is principal stress resulting from backward load.
In the calculation of $(\sigma_{ice})_{\max}$, case 1 and case 3 or case 2 and case 4 are considered as pairs for $(\sigma_{ice})_{f\max}$ and $(\sigma_{ice})_{b\max}$. Case 5 is excluded from the fatigue analysis.

② Calculation of parameter ρ for two-slope S-N curve

When $5 \times 10^6 \le N_{ice} \le 1 \times 10^8$, the error of the following method to determine the parameter ρ is sufficiently small.
The parameter ρ relates the maximum ice load to the distribution of ice loads according to the regression formula.

$$\rho = C_1 \cdot \left(\sigma_{ice}\right)_{\max}^{C_2} \cdot \sigma_{fl}^{C_3} \cdot \log\left(N_{ice}\right)^{C_4}$$

where: $\sigma_{fl} = \gamma_{\varepsilon 1} \cdot \gamma_{\varepsilon 2} \cdot \gamma_v \cdot \gamma_m \cdot \sigma_{exp}$, is the blade material fatigue strength at 10^8 load cycles, see 13.3.6.3(3)④.

The coefficients C_1, C_2, C_3 and C_4 are given in Table 13.3.6.3(3)②.

Value of C_1, C_2, C_3 and C_4 **Table 13.3.6.3(3)②**

Coefficient	Open propeller	Ducted propeller
C_1	0.000747	0.000534
C_2	0.0645	0.0533
C_3	−0.0565	−0.0459
C_4	2.22	2.584

③ Calculation of parameter ρ for constant-slope S-N curve

For materials with a constant-slope S-N curve, see Figure 13.3.6.3(3)-2, the factor ρ shall be calculated from the following formula:

$$\rho = \left(G \frac{N_{ice}}{N_R} \right)^{1/m} \left[\ln(N_{ice}) \right]^{-1/k}$$

where: k —— shape parameter of the Weibull distribution, k=1.0 for ducted propellers and k=0.75 for open propellers;

N_R —— reference number of load cycles (=10^8);

G —— Values for the parameter G are given in Table 13.3.6.3(3)③ below. Linear interpolation may be used to calculate the value of G for m/k ratios other than those given in the Table 13.3.6.3(3)③.

Value for the parameter G for different m/k ratios **Table 13.3.6.3(3)③**

m/k	*G*	*m/k*	*G*	*m/k*	*G*	*m/k*	*G*
3	6	5.5	287.9	8	40320	10.5	11.899E6
3.5	11.6	6	720	8.5	119292	11	39.917E6
4	24	6.5	1871	9	362880	11.5	136.843E6
4.5	52.3	7	5040	9.5	1.133E6	12	479.002E6
5	120	7.5	14034	10	3.62~~3~~9E6		

④ Acceptability criterion for fatigue

The equivalent fatigue stress σ_{fat} at all locations on the blade shall fulfil the following acceptability criterion:

$$\frac{\sigma_{fl}}{\sigma_{fat}} \geqslant 1.5$$

where: $\sigma_{fl} = \gamma_{\varepsilon 1} \cdot \gamma_{\varepsilon 2} \cdot \gamma_v \cdot \gamma_m \cdot \sigma_{exp}$, in MPa;

$\gamma_{\varepsilon 1}$ —— reduction factor due to scatter (equal to one standard deviation);

$\gamma_{\varepsilon 2}$ —— reduction factor for test specimen size effect;

σ_{exp} in Table 13.3.6.3(3)④ has been defined from the results of constant amplitude loading fatigue tests at 10^7 load cycles and 50% survival probability and has been extended to 10^8 load cycles. Fatigue strength values and correction factors other than those given in Table 13.3.6.3(3)④ may be used, provided the values are determined under conditions approved by CCS.

Mean fatigue strength σ_{exp} for different material types at 10^8 load cycles and stress ratio r = -1 with a survival probability of 50%

Table 13.3.6.3(3)④

Bronze and brass（a=1.0）		Stainless steel（a=0.05）	
Mn-Bronze, Cu1 (high tensile brass)	84 MPa	Ferritic (12Cr 1Ni)	144 MPa①
Mn-Ni-Bronze, Cu2 (high tensile brass)	84 MPa	Martensitic (13Cr 4Ni/13Cr 6Ni)	156 MPa
Ni-Al-Bronze, Cu3	120 MPa	Martensitic (16Cr 5Ni)	168 MPa
Mn-Al-Bronze, Cu4	113 MPa	Austenitic (19Cr 10Ni)	132 MPa

Note: ① This value may be used, provided a perfect galvanic protection is active. Otherwise a reduction of about 30 MPa shall be applied.

The S-N curve characteristics are based on two slopes, the first slope 4.5 is from 1000 to 10^8 load cycles; the second slope 10 is above 10^8 load cycles.
The maximum allowable stress for one or low number of cycles is limited to σ_{ref2}/S, with S =1.3 for static loads.
The fatigue strength σ_{fat} is the fatigue limit at 100 million load cycles.
The geometrical size factor ($\gamma_{\varepsilon 2}$) is:

$$\gamma_{\varepsilon 2} = 1 - a \cdot \ln(\frac{t}{0.025})$$

where: a —— as given in Table 13.3.6.3(3)④;
t —— the maximum blade thickness at the considered point.

The mean stress effect γ_m is:

$$\gamma_m = 1.0 - \left(\frac{1.4 \cdot \sigma_{mean}}{R_m}\right)^{0.75}$$

The following values should be used for the reduction factors if actual values are not available:
$\gamma_{\varepsilon 1} = 0.85$, $\gamma_v = 0.75$, $\gamma_m = 0.75$.

CHAPTER 39 TECHNICAL REQUIREMENTS FOR ENHANCED FIREFIGHTING SAFETY OF RO-RO TRANSPORTATION OF LITHIUM BATTERY POWER VEHICLES

Section 1 GENERAL PROVISIONS

39.1.1 Scope of application

39.1.1.1 Sea-going ships engaged in ro-ro transportation of lithium battery power vehicles which voluntarily apply for the class notation BPV-EFS (Battery Power Vehicle - Enhanced Firefighting Safety) specified in 39.1.2 are, in addition to complying with the requirements of this Chapter, to comply with the applicable requirements of other parts and chapters of the Rules.

39.1.2 Class notations

39.1.2.1 Ships complying the requirements of Section 1, Section 3, paragraphs 39.2.4 and 39.2.5 of Section 2, and other optional functional requirements of this Chapter may, upon request, be assigned the class notation BPV-EFS (X) for carrying lithium battery power vehicles, where "X" represents the letter(s) corresponding to the optional functions specified in 39.1.2.2, with multiple letters separated by commas (,).
39.1.2.2 The following letter(s) may be assigned where optional functional requirements in Section 2 are satisfied:
(1) M: compliance with the functional requirements of 39.2.1;
(2) F: compliance with the functional requirements of 39.2.2;
(3) C: compliance with the functional requirements of 39.2.3.
39.1.2.3 The areas covered by the optional functions specified in 39.1.2.2 are to be indicated on the relevant drawings (general arrangement plan, fire control plan, and arrangement of relevant equipment or systems) and noted in the certificate.

39.1.3 General requirements

39.1.3.1 Arrangement and scheme verified as equivalent through analysis, evaluation and testing may be accepted subject to agreement of CCS.
39.1.3.2 Where battery power vehicles with power battery packs not installed at the chassis are carried (e.g large passenger cars, battery power trucks, etc.), a specific alternative fire safety scheme must be developed and approved by CCS.
39.1.3.3 The word "approved" in this Chapter refers to systems and equipment approved by CCS as suitable for the fire safety requirements of battery power vehicles of this Chapter.

39.1.4 Definitions

39.1.4.1 Lithium battery power vehicle means a motor vehicle using a lithium-ion battery pack as its power source, hereinafter referred to as "battery power vehicle".
39.1.4.2 Space for carrying lithium battery power vehicles means vehicle space, special category space, ro-ro space and weather deck intended for carrying lithium battery power vehicles, hereinafter referred to as "battery power vehicle space".
39.1.4.3 Fire control blanket for battery power vehicles means fire-fighting equipment made of high-temperature resistant, fireproof and insulating materials, which is used to isolate the fire source, prevent electrolyte splashing, and slow down the diffusion of harmful gases duringbattery power vehicle fire fighting.
39.1.4.4 Cut-off facility means a facility used to cut off the spread of hot flue gas and flames, e.g. water curtains, fire curtains, or other cut-off facilities with equivalent cut-off effect.
39.1.4.5 Water mist means water droplets sprayed through sprinklers at the minimum design working pressure, forming a mist on the plane 1.0 m below the sprinkler axis with diameter $Dv_{0.50}$ less than 200μm and $Dv_{0.99}$ less than 400μm.
39.1.4.6 Zoned deluge water mist fire-extinguishing system means a water mist fire-extinguishing system composed of water supply devices, filtering devices, control valves, water mist sprinklers and water supply pipelines, which can be activated automatically and manually to uniformly release water mist within the protected zone and protect all objects in the zone.

39.1.4.7 Fire-extinguishing device of vehicle chassis means a water spray fire extinguishing device used for extinguishing fires on vehicle chassis, hereinafter referred to as "chassis spraying".

39.1.5 Drawings and information

39.1.5.1 The following drawings or information are to be submitted for approval:
(1) Arrangement of firefighting equipment and systems related to the requirements of this Chapter;
(2) Drawings referred to in 39.1.2.3.
39.1.5.2 The following drawings or information are to be submitted for information:
(1) Loading arrangement of lithium battery power vehicles;
(2) Fire safety management manual of lithium battery power vehicles.

Section 2 FIREFIGHTING AND PROCESSING AFTER ASSESSMENT

39.2.1 Detection and alarm system

39.2.1.1 The purpose of this paragraph is to detect any abnormal temperature caused by thermal runaway of the battery power vehicle's power battery pack as early as possible, give audible and visual alarms, and identify the location in the battery power vehicle space under the required ventilation changes during normal transportation conditions and within the possible ambient temperature range.
39.2.1.2 The detection and alarm system is to satisfy one of the following functional requirements:
(1) Alarm is given when any abnormal conditions is detected through internal monitoring of the power battery pack;
(2) Alarm is given when any abnormal conditions is detected through external monitoring of the power battery pack;
(3) Alarm is given immediately when visible smoke or open flames occur due to thermal runaway of the power battery pack.
39.2.1.3 One of the following measures may be taken in order to satisfy the functional requirements of 39.2.1.2:
(1) An approved battery power vehicle thermal runaway early warning system based on the vehicle's Battery Management System (BMS) is to be provided. When abnormal temperature of the vehicle's power battery is detected by BMS, the vehicle is to continuously emit flashing light and audible alarms; meanwhile, the flashing light is identified by means of a CCTV video surveillance system with image recognition function, or BMS signals are transmitted via the ship's wireless network, the audible and visual alarms are given on the control panel and indicating devices required in 39.2.1.3(2)②. The indicating device is to be capable of identifying the position of each vehicle that triggers the alarm individually.
(2) An approved infrared temperature monitoring system for the vehicle chassis is to be provided, capable of monitoring temperature changes on the surface of the power battery pack housing at the chassis of all vehicles. When the surface temperature of the power battery pack housing at the vehicle chassis is detected to exceed 60°C, visual and audible alarm signals are to be given on the control panel and indicating device. The system is also to satisfy the following requirements:
① With identification and positioning functions;
② The control panel of the detection system is to be fitted on the bridge or in the fire control room. If the control panel is fitted in the fire control room, a set of indicating devices is to be provided on the bridge. For passenger ships, where a safety center is provided, the control panel of the detection system is to be fitted in the ship's safety center, with a set of indicating devices provided on the bridge.
(3) An approved CCTV video surveillance system with monitoring and image recognition functions is to be provided. When the release of smoke due to thermal runaway of the vehicle's power battery is detected, it is to be capable of automatic identification and give audible and visual alarm signals on the control panel and indicating device required in 39.2.1.3(2)②, with a quick playback function on the bridge or in the fire control room.
39.2.1.4 Equivalent detection and alarm arrangement and scheme are accepted by CCS.

39.2.2 Fire-extinguishing and control systems

39.2.2.1 The purpose of this paragraph is to suppress and swiftly extinguish an battery power vehicle fire within the thermally runaway/ignited vehicle itself, and cool the adjacent area to prevent fire spread and structural damage.
39.2.2.2 In order to satisfy the functional requirements of 39.2.2.1, battery power vehicle spaces other

than the weather deck are to be provided with the following fire-extinguishing systems and equipment:
(1) A zoned deluge water mist fire-extinguishing system suitable for extinguishing and controlling battery power vehicle fires, with water mist spray intensity covering the protected area, which is to be approved;
(2) Approved means capable of effectively reducing the external temperature of the power battery pack (e.g., chassis spraying);
(3) For ro-ro passenger ships, an approved auto tracking and targeting jet suppression system① is to be provided at the top of the space or at the upper parts of port and starboard, which is to be so arranged that in case of fire of any vehicle within the space, the vehicle is protected by two jets of water, with each jet having a flow rate of not less than 5L/s.
39.2.2.3 The use of more effective fire-extinguishing and fire control systems for battery power vehicles (e.g., water mist systems with additives specific to battery power vehicle fires) is recommended, subject to approval.
39.2.2.4 The battery power vehicle space on the weather deck is to be provided with a water-based fire-extinguishing system based on monitors, which is to satisfy the following requirements:
(1) The protected area is to be the entire length and width of the area for the carriage of battery power vehicles.
(2) The combined capacity of all fixed monitors is to be minimum 2.0 L/min per square metre of the protected area, but in no case is the output of any monitor to be less than 1,250 L/min. Even distribution of water is to be ensured.
(3) The distance from the monitor to the farthest extremity of the protected area forward of that monitor is not to be more than 75% of the monitor throw in still air conditions.
(4) Each monitor is to be located outside the area which it protects, in a safe position, with access not likely to be cut off in case of fire.
(5) The system is to be available for immediate use and capable of continuously supplying water. The water supply is to be capable of simultaneously supplying water at the required rate for the entire width of the area for carriage of electric vehicles and a length of 40 m, or the entire length of the weather deck if this is less
than 40 m. In no case is the supply capacity to be less than that required for the largest monitor.
39.2.2.5 Equivalent arrangement and scheme of fire-extinguishing and control are accepted by CCS.

39.2.3 Zone Cut-off arrangement

39.2.3.1 The purpose of this paragraph is to ensure that in case of an battery power vehicle thermal runaway/fire, effective measures are in place to prevent the spread of the electric vehicle fire.
39.2.3.2 In order to satisfy the functional requirements of 39.2.3.1, battery power vehicle spaces may be provided with approved cut-off facilities to separate the local area on fire within the space in case of fire.
39.2.3.3 Equivalent zone cut-off measures are accepted by CCS.

39.2.4 Condition assessment

39.2.4.1 The purpose of this paragraph is to assess the combustion status of battery power vehicles with thermal runaway/ on fire to safely carry out subsequent control. The requirements for provision and measures specified herein are to be reflected in the emergency procedure plans of the fire safety management manual.
39.2.4.2 In order to satisfy the functional requirements of 39.2.4.1, temperature measurement devices (e.g., infrared thermal imagers) may be provided to detect the temperature of the battery pack surface and the area around the pressure relief valve.
39.2.4.3 When the temperature of the power battery pack surface and the area around the pressure relief valve drops below 100°C, and the power battery pack no longer emits smoke for at least 1 hour, it may be considered that the prerequisite for subsequent control has been met.

39.2.5 Subsequent control

39.2.5.1 The purpose of this paragraph is to monitor electric vehicle wrecks to ensure timely measures can be taken to prevent further hazards due to re-ignition. The requirements for provision and measures specified herein are to be reflected in the emergency procedure plans of the fire safety management manual.
39.2.5.2 In order to satisfy the functional requirements of 39.2.5.1, the following measures may be adopted:

① Refer to recognized national or industry standards, e.g., GB51427-2021 Technical standards for auto tracking and targeting jet suppression system.

(1) On-duty personnel are arranged to carry continuous monitoring of battery power vehicle wrecks.
(2) Battery power vehicle wrecks are covered by fire control blankets or mobile barriers.
(3) Portable means are provided to effectively reduce the temperature of the power battery pack, and ensure they can be activated at any time.

Section 3 OTHER REQUIREMENTS

39.3.1 Fire safety management manual and training and drill

39.3.1.1 A ship fire safety management manual specific to battery power vehicle fire is to be developed, including but not be limited to the following contents:
(1)Post responsibilities and on-duty arrangements for personnel responding to battery power vehicle fire on board;
(2)Training and drill plans for crew members and on-board staff to respond to battery power vehicle fire;
(3)Daily patrol arrangements for battery power vehicle spaces;
(4)List, performance, maintenance requirements of systems and equipment for battery power vehicle fire, as well as the reserve status of fire extinguishing media (with an explanation of whether the reserve quantity is sufficient to support the implementation of the emergency plan);
(5) Emergency procedure plans for battery power vehicle fire.
(6) Safety measures for the loading of battery power vehicles and the management during navigation:
① For vehicle carriers/vehicle ro-ro ships, the state of charge (SOC) of the vehicle power batteries is to be within the range of 20%—50%.
② Before the ship departs, the electric vehicles are to be secured.
③ The battery power vehicles are to be in a shut-down state and prohibited from being started during navigation.
④ Charging, discharging, or battery replacement of the vehicles is prohibited during navigation.

39.3.1.2 Crew members and on-board staff are to receive regular training and drills on fire safety of battery power vehicles, including but not limited to the following contents:
(1) Understanding the fire risks, hazards, combustion characteristics of battery power vehicles, possible toxic gas emissions, personal protective measures, and basic fire extinguishing and control methods;
(2) Being familiar with the ship's fire emergency plans and crew responsibilities;
(3) Correct use of fire safety systems, fire extinguishing equipment, and personal protective equipment;
(4) Knowing the effectiveness and usage strategies of the ship's fire-fighting systems for extinguishing and controlling battery power vehicle fires;
(5) Improving the ability to effectively use CCTV video surveillance systems to detect and confirm fires, and enhance emergency response speed;
(6) Carrying out regular battery power vehicle fire fighting drills and training to enable fire-fighting personnel to familiarize themselves with the differences between oil fuel vehicle fire and electric vehicle fire;
(7) Ship-shore joint fire safety drills.

39.3.2 Other requirements

39.3.2.1 Closed battery power vehicle spaces are to be provided with mechanical smoke extraction systems to effectively reduce the concentration of hot smoke in the space and prevent the accumulation of flammable gas. The system is to satisfy the following requirements:
(1) The capacity of the smoke extraction fans is to be such as to achieve at least 6 air changes per hour, in order to extract smoke from the space.
(2) The system is to be manually controlled, and the manual control devices are to be located in a readily accessible safe position outside the protected space.
(3) The inlet of the smoke extraction pipe is to be fitted at both the upper and lower parts of the compartment. The outlet is to be located in a safe position, and away from the doors, windows and other openings of superstructures or deckhouses, as well as other equipment that may constitute ignition sources insofar as practicable.
(4) When the temperature at the inlet of the smoke extraction pipe reaches 280℃, all smoke extraction fans in the space are to be automatically shut down.
(5) The smoke extraction fans are to be of non-sparking type. Electrical equipment fitted in the exhaust pipe and smoke extraction pipe is to be of a type suitable for use in the flammable gas-air mixture released during the thermal runaway of vehicle power batteries, with an explosion-proof grade of at least IIA, T3.

39.3.2.2 At least 2 sets of portable infrared cameras are to be provided for fire patrols.
39.3.2.3 At least 1 fire control blanket is to be provided on each deck of the battery power vehicle space.
39.3.2.4 The covered area specified in 39.1.2.3 is to be marked with prominent signs.