CHINA CLASSIFICATION SOCIETY

RULES FOR CLASSIFICATION OF SEA-GOING STEEL SHIPS

2015

Vol.5

PART SIX FIRE PROTECTION, DETECTION AND EXTINCTION
PART EIGHT ADDITIONAL REQUIREMENTS

Beijing

TABLE OF CONTENTS

CHINA CLASSIFICATION SOCIETY

RULES FOR CLASSIFICATION OF SEA-GOING STEEL SHIPS

2015

PART SIX FIRE PROTECTION, DETECTION AND EXTINCTION

Effective from July 1 2015

Add：CCS Mansion,9 Dongzhimen Nan Da Jie,
Bejing 100007,China
Tel： 0086-010-58112288
Fax：0086-010-58112811
Postcode：100007
Email： ccs@ccs.org.cn

CONTENTS

CHAPTER 1 GENERAL

Section 1 GENERAL PROVISIONS

1.1.1 General requirements

1.1.1.1 For passenger ships engaged on international voyages and cargo ships of 500 gross tonnage and upwards, the fire detection, fire protection and fire extinction (hereinafter referred to as fire safety) are to comply with the relevant provisions of the International Convention for the Safety of Life at Sea, 1974 (hereinafter referred to as SOLAS Convention) and its amendments, taking into account the requirements of the flag Administration (if any), other than those for personnel qualification, management, operation and maintenance. Ships of less than 500 gross tonnage are to comply with the fire protection requirements of CCS Guidelines for Surveys of Non-convention Ships.

1.1.1.2 The performance standards and test methods for related systems and equipment are to comply with the relevant provisions of the International Code for Fire Safety Systems (hereinafter referred to as FSS Code) and the International Code for Application of Fire Test Procedures (hereinafter referred to as FTP Code).

1.1.1.3 In addition to the above-mentioned requirements, the fire safety of ships engaged on international voyages is to comply with the requirements of this PART.

1.1.1.4 The fire safety of ships engaged on international voyages is also to comply with the requirements, as appropriate, in PART ONE of the Rules.

1.1.1.5 The fire safety of ships engaged on non-international voyages is to comply with the relevant requirements of the flag Administration or the standards recognized by it.

1.1.1.6 Where necessary, the ship's operator/owner is to pay attention to the standards of other industries and organizations in respect to fire safety of ships. However, such requirements are not conditions for classification with CCS.

1.1.2 Plans and documents

1.1.2.1 The following plans and documents are to be submitted for approval:

(1) Main fire zones and compartmentation bulkheads and decks;

(2) Details of construction of fire protection bulkheads, decks;

(3) Ventilation plan showing the ducts and dampers in them and the position of controls for stopping the system;

(4) Arrangement of fixed fire extinguishing systems (including the fire extinguishing system for scavenge spaces of crosshead type diesel engines) together with extinguishing medium calculations;

(5) Arrangement of water fire-extinguishing systems and calculations;

(6) Arrangement of local water-based fixed fire-extinguishing systems and calculations (if any);

(7) Arrangement of fixed fire detection and fire alarm systems;

(8) Fire control plan;

(9) Arrangement of inert gas systems (if any);

(10) Arrangement of oxygen and acetylene bottle including pipes (if any);

(11) Arrangement of liquefied petroleum gas cooking ranges and gas bottles including pipes (if any);

(12) Arrangement of oil-fired cooking ranges including pipes (if any);

(13) Arrangement of fire-extinguishing means for paint lockers and store rooms containing flammable liquids (if any);

(14) Arrangement of fire-extinguishing system of deep-fat cooking equipment (if any);

(15) Other plans and documents as deemed necessary by CCS.

1.1.2.2 The following plans and documents are to be submitted for information:

(1) Instruction manual or operating manual of the inert gas systems required by Chapter 15 of FSS Code.

1.1.3 Products certificate

1.1.3.1 The principal materials, equipment and installations used for the fire safety of ships are all to be provided with CCS appropriate products certificate, as detailed in Appendix 1B — List of Certification Requirements for Statutory Marine Products, Chapter 3 of PART ONE of the Rules.

1.1.4 Basic requirements for arrangement of fire stations and systems

1.1.4.1 Any fixed fire-extinguishing systems and their stations, fire pumps, fire-extinguishing medium containers as well as other arrangements on board passenger ships are not to be arranged forward of the collision bulkhead.

1.1.4.2 Stations or centralized distribution manifolds for all fixed fire-extinguishing systems and their power sources are to be located in easily accessible positions and are not likely to be cut off by a fire in the space or spaces protected.
1.1.4.3 All fixed fire-extinguishing systems and their stations are to be clearly marked and the walkways leading to the stations are to be kept clear.

1.1.5 Fire safety measures for ships

1.1.5.1 The fire safety measures for tugs are to be dealt with as those for cargo ships of equivalent tonnage; the fire safety measures for ice-breakers, salvage ships and self-propelled working ships (such as dredges, floating cranes and other working ships etc.) are to be dealt with in accordance with the relevant requirements of the Code of Safety for Special Purpose Ships (resolution MSC.266(84)).
1.1.5.2 The fire safety of special purpose ships are to comply with the requirements in the Code of Safety for Special Purpose Ships, 2008, adopted by the International Maritime Organization by resolution MSC.266(84).
1.1.5.3 For non-propelled ships, the fire safety measures are to be provided by making reference to the relevant provisions in this PART according to the ship types and purposes.
1.1.5.4 Tankers carrying products having a flash point exceeding 60℃ (closed-cup test) are to be dealt with as cargo ships of equivalent tonnage, in addition to complying with the following requirements:
(1) Isolation valves are to be fitted in the fire main of the water fire-extinguishing system at the poop front in a protected position and on the tank deck at intervals of not more than 40 m to preserve the integrity of the fire main system in case of fire or explosion.
(2) Four fire-fighter's outfits are to be provided.
(3) In lieu of the fixed fire-extinguishing system for tanks, they are to be fitted with a fixed deck foam system complying with requirements.
1.1.5.5 Unless expressly provided otherwise, for the purpose of this PART, oil tankers mean tankers carrying crude oil or petroleum products having a flash point not exceeding 60℃ (closed-cup test), as determined by an approved flash point apparatus, and a Reid vapour pressure which is below the atmospheric pressure. Other tankers carrying liquids having the same fire hazard, e.g. liquefied gas carriers and chemical tankers, are also to comply with the requirements of CCS Rules for Construction and Equipment of Ships Carrying Liquefied Gases in Bulk and Rules for Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk, as appropriate.

1.1.6 Acceptance of substitutes

1.1.6.1 Where in this PART any particular type of appliances, apparatus, extinguishing media or arrangements is specified for any ship, any other type of appliance etc., not less effective may be allowed, provided the relevant calculations and test or application information are provided.

1.1.7 Miscellaneous

1.1.7.1 The arrangement of fuel oil, lubricating oil and other flammable oils is to be in compliance with the relevant requirements of Chapter 4 of PART THREE of the Rules.
1.1.7.2 Unless expressly specified in this PART, the machinery, piping and pressure vessels used in fire safety systems are also to be in compliance with the relevant requirements of PART THREE of the Rules.
1.1.7.3 In addition to complying with the requirements of this PART, the electrical equipment and electronic devices in fire detection systems and other detection and alarm systems used for periodically unattended machinery spaces are to be in compliance with the relevant requirements of PART SEVEN of the Rules.
1.1.7.4 In addition to complying with the requirements of this PART, the electrical equipment and electronic devices used in fire safety systems are to be in compliance with the relevant requirements of PART FOUR of the Rules.
1.1.7.5 Fire extinguishing appliances are to be kept in good order and available for immediate use at all times.

CHAPTER 2 FIRE EXTINCTION SYSTEMS

Section 1 WATER FIRE-EXTINGUISHING SYSTEMS

2.1.1 Capacity of fire pumps

2.1.1.1 Where the water fire-extinguishing system is used for a deck foam system in tankers, the capacity of the fire pumps is to be sufficient to satisfy the requirements for operation of the deck foam system at its required output and the simultaneous use of two water jets with a throw of 12 m at the required pressure from the fire main.

2.1.2 Number and arrangement of fire pumps

2.1.2.1 Cargo ships are to be provided with fire pumps according to the following:

(1) in ships of 500 gross tonnage and upwards but less than 1,000 gross tonnage, at least two power pumps are to be provided, one of which is to be an independent pump;

(2) in ships of less than 500 gross tonnage, at least one independently driven fire pump is to be provided.

2.1.2.2 The emergency fire pump is to be so arranged that the total suction head of the pump will not exceed 4.5 m under all conditions of list and trim likely to be encountered in service and the suction piping is to be designed to minimize suction losses.

2.1.3 Diameter and pressure of fire main

2.1.3.1 The diameter of the fire main and water service pipes is to be sufficient for the effective distribution of the maximum required discharge from two fire pumps operating simultaneously, except that in the case of cargo ships the diameter need only be sufficient for the discharge of 140 m^3/h.

In general, the diameter of the fire main is not to be less than that required in the following formula:

$$d = \frac{L}{1.2} + 25 \quad \text{mm}$$

where: d — internal diameter of the fire main, in mm, but need not exceed 125 mm for cargo ships and 180 mm for passenger ships and in no case to be less than 50 mm;

L — length of ship measured between perpendiculars, in m.

2.1.3.2 In cargo ships of less than 1,000 gross tonnage, with the two pumps simultaneously delivering through the specified nozzles the quantity of water specified in 2.1.3.1 of this Section, through any adjacent hydrants, a minimum pressure of 0.25 N/mm^2 is to be maintained at all hydrants.

Section 2 FIXED GAS FIRE-EXTINGUISHING SYSTEMS

2.2.1 General requirements

2.2.1.1 Means are to be provided for automatically giving audible warning of the release of fire-extinguishing medium into any space in which personnel normally work or to which they have access. The alarm is to operate for not less than 20 s before the medium is released.

Where automatic audible alarms are fitted to warn of the release of fire-extinguishing medium into cargo pump rooms onboard tankers carrying crude oil or petroleum products having a flash point not exceeding 60℃ (closed-cup test), they may be of the pneumatic type or electric type:

(1) if pneumatically operated, air-operated alarms may be used provided the air supply is clean and dry; in cases where the periodic testing of such alarms is required, CO_2-operated alarms should not be used owing to the possibility of the generation of static electricity in the CO_2 cloud;

(2) if electrically operated, the alarms are to satisfy the requirements of Section 16, Chapter 2 of PART FOUR of the Rules and the arrangements are to be such that the electrical actuating mechanism is located outside the cargo pump room, except where the alarms are certified intrinsically safe.

2.2.1.2 At each location of the means of control of any fixed gas fire-extinguishing system, there is to be sufficient illumination including emergency lights in addition to the main lights.

2.2.1.3 Stations used for all fixed gas fire-extinguishing systems are to comply with the following requirements:

(1) Stations are to be used only for the storage of containers and other components and parts of the systems.

(2) Stations are to be provided with direct communications to the bridge or control station.

(3) The key to the container storage rooms or control stations is to be stowed in a box with glass cover which is to be situated in an easily accessible and conspicuous position near the door.

(4) In each station there is to be displayed a clear and permanent schematic diagram showing the arrangement of the containers, manifold, piping and fittings relating to the release of extinguishing medium, together with the concise instructions for the operation of the system.

2.2.2 High-pressure carbon dioxide systems

2.2.2.1 For cargo spaces the quantity of carbon dioxide available is, unless otherwise provided, to be sufficient to give a minimum volume of free gas equal to 30% of the gross volume of the largest cargo space so protected in the ship.

2.2.2.2 For machinery spaces the quantity of carbon dioxide carried is to be sufficient to give a minimum volume of free gas equal to the larger of the following volumes, either:

(1) 40% of the gross volume of the largest machinery space so protected, the volume to exclude that part of the casing above the level at which the horizontal area of the casing is 40% per cent or less of the horizontal area of the space concerned taken midway between the tank top and the lowest part of the casing; or

(2) 35% of the gross volume of the largest machinery space protected, including the casing.

Provided that the above-mentioned percentages may be reduced to 35% and 30% respectively for cargo ships of less than 2,000 gross tonnage; provided also that if two or more machinery spaces are not entirely separate they are to be considered as forming one space.

2.2.2.3 Where the volume of free air contained in air receivers in any space is such that, if released in such space in the event of fire, such release of air within that space would seriously affect the efficiency of the fixed fire-extinguishing system, an additional quantity of fire-extinguishing medium is to be provided.

In general, for the space (e.g. engine room) fitted with starting air receivers, the effect upon free air volume in the air receivers is to be taken into account, when calculating CO_2. Or, if compressed air in the air receivers can be discharged into open space located outside the engine room through safe valves and its conducting pipes, the effect upon air receivers is not to be taken into account, when calculating CO_2.

2.2.2.4 When carbon dioxide is used as an extinguishing medium for the cargo pump room in tankers carrying cargo oil having a flash point not exceeding 60℃, the quantity of carbon dioxide is to be sufficient to give a minimum volume of free gas equal to 45% of the gross volume of the cargo pump room including the casing. For tankers carrying cargo oil having a flash point exceeding 60℃, if the cargo pump room is located in a separate space, it is to be treated as a machinery space.

2.2.2.5 For ro-ro spaces and vehicle spaces, other than special category spaces, which are capable of being sealed from a location outside the spaces, if a carbon dioxide system is fitted, the quantity of gas available is to be at least sufficient to give a minimum volume of free gas equal to 45% of the gross volume of the largest such cargo space which is capable of being sealed.

2.2.2.6 For the purpose of this paragraph the volume of free carbon dioxide is to be calculated at 0.56 m^3/kg.

2.2.2.7 Piping of carbon dioxide is to comply with the following requirements:

(1) Each connecting pipe led from each bottle head valve to the collecting pipe is to be provided with a non-return valve.

(2) The manifold connecting the collecting pipes and distribution manifold is to be provided with a pressure gauge having a maximum range of 1.5 times the working pressure.

(3) For machinery spaces of Category A or cargo pump rooms, the piping is to be provided with sufficient number and adequate size of nozzles so that 85% of carbon dioxide can be discharged into the space within 2 min. Approximately 10% of the total quantity of CO_2 is to be discharged to the protected space below the floor in engine room.

(4) The diameter of carbon dioxide piping leading to the spaces as stated in (3) above is to be determined by calculation in accordance with the proposed quantity to be conveyed through the piping, or from Table 2.2.2.7(4). The maximum quantities of carbon dioxide conveyed by the corresponding pipe diameters are given in Table 2.2.2.7(4).

Internal Diameter of Pipes and Conveyed Quantity Table 2.2.2.7(4)

Maximum quantity of carbon dioxide conveyed by the pipe (kg)	Internal diameter of pipe (mm)
60	15
100	20
135	25
275	32
500	40
1100	50
1600	65
2400	80
3300	90
4750	100
6800	114
9500	127
15250	152

(5) The minimum wall thickness of CO_2 pipes is given in Table 2.2.2.7(5). Slight difference from the thickness listed in the Table will be accepted for the purpose of selecting standard pipes.

Minimum Wall Thickness of CO_2 Pipes Table 2.2.2.7(5)

External diameter of pipe (mm)	Wall thickness (mm)	
	Piping forward of distribution manifold	Piping from distribution manifold to protected space (nozzles)
21.3 ~ 26.9	3.2	2.6
30.0 ~ 48.3	4.0	3.2
51.0 ~ 60.3	4.5	3.6
63.5 ~ 76.1	5.0	3.6
82.5 ~ 88.9	5.6	4.0
101.6	6.3	4.0
108.0 ~ 114.3	7.1	4.5
127.0	8.0	4.5
133.0 ~ 139.7	8.0	5.0
152.4 ~ 168.3	8.8	5.6

Notes:
1. Pipes are to be galvanized at least inside, except those fitted in the engine room where galvanizing may not be required.
2. For threaded pipes, where allowed, the minimum wall thickness is to be measured at the bottom of the thread.
3. The external diameters and thicknesses have been selected from ISO Recommendations R336 for smooth welded and seamless steel pipes. Diameter and thickness according to other national or international standards may be accepted.
4. For larger diameters the minimum wall thickness will be subject to special consideration.
5. In general the minimum thickness is the nominal wall thickness and no allowance need be made for negative tolerance or reduction in thickness due to bending.

(6) Distribution piping leading to cargo spaces is to have a bore of not less than 20 mm, and those leading to the nozzles are to have a bore of not less than 15 mm.
(7) CO_2 piping is to be provided with compressed air cleaning connections at its manifold or distribution manifold.
(8) CO_2 pipes are to be of seamless steel, except that flexible metallic pipes can be used as the connecting pipe led from each bottle head valve to the collecting pipe in accordance with recognized standards.
(9) For closed ro-ro cargo spaces, the piping arrangements are to be such that 2/3 of the gas required for a particular space can be discharged into the space within 10 min.
2.2.2.8 Carbon dioxide bottles are to comply with the following requirements:
(1) CO_2 bottles are to be of seamless steel. Each bottle is to be furnished with a certificate and to have on its body clear and permanent identification of weight, capacity, hydraulic test pressure, date of test, manufacturer' serial number and also inspection stamp.
(2) The bottles are to be wholly painted in bright colour but white in way of the markings, and with letters of "carbon dioxide (or CO_2)".
(3) The charging ratio for CO_2 bottles is to be suitable for the strength of the bottles and generally not to be more than 0.67 kg/L.
(4) Bottle head valves are to be associated with a steel or copper seamless tube having a diameter of 10 to 12 mm snipped off at its lower end and terminated near the bottom of the bottle.
(5) Bottle head valves are to be provided with safety diaphragms or other approved safety devices. The bursting pressure of the safety diaphragms is to be 18.6 ±1 MPa. For other approved safety devices, the relevant technical and test data are to be provided with, to demonstrate that the escape gas is ensured to be capable of being released when the bursting pressure reaches the same as above.

After bursting of safety diaphragms, the escape gas from bottle head valves is to be led to the open atmosphere through suitable piping. However, where the storage room for CO_2 cylinders is fitted with a dedicated mechanical ventilation system capable of providing at least 6 air changes per hour and keeping temperature in the room below 45℃ and provided with a temperature alarm, such piping may be dispensed with.

(6) Bottles head valves are to be made of forged bronze or other suitable materials.

(7) CO_2 bottles are to be divided into groups according to the required quantity for different spaces to be protected. If releasing of the carbon dioxide is hand-operated by mechanical means, the number of bottles in each group is not to exceed 12.

2.2.2.9 Testing of carbon dioxide systems

(1) CO_2 bottles and bottle head valves are to be subjected to a hydraulic test of 24.5 MPa. Safety diaphragms are to be burst-tested in accordance with 2.2.2.8(5) by selecting 10% at random.

(2) On completion of fitting the bottle head valves, CO_2 bottles are to be subjected to an air-tightness test in the workshop to a pressure equal to the design pressure of the bottle.

(3) The pipes and valves of CO_2 piping systems are to be subjected to a hydraulic test with a pressure of at least 11.8 MPa for the distribution manifold and control valves and for pipe lengths between bottle head valves and the distribution manifold, and 1.0 MPa for pipe lengths between the distribution manifold and nozzles. The above tests may be carried out in workshop. On completion of the hydraulic test, CO_2 piping is to be subjected to an airtightness test using compressed air on board the ship to at least 0.69 MPa with the ends closed for checking the tightness of each connection.

(4) On completion of installation on board, the CO_2 piping system is to be function-tested with a pneumatic pressure not less than 2.47 MPa for checking the operation of releasing mechanism.

CHAPTER 3 FIRE SAFETY MEASURES

Section 1 SAFETY MEASURES FOR DUCT KEELS IN DOUBLE BOTTOM UNDER CARGO OIL TANKS

3.1.1 Safety aspects of double bottoms and duct keels under cargo oil tanks (corresponding to SOLAS Reg.II-2/4.5.2.4)

3.1.1.1 Pipe ducts in the double bottom are to comply with the following requirements:

(1) They are not to communicate with the engine room.

(2) Provision is to be made for at least two exits to the open deck arranged at a maximum distance from each other. One of these exits fitted with a watertight closure may lead to the cargo pump room.

(3) In the duct, provision is to be made for adequate mechanical ventilation.

Section 2 FIRE PROTECTION OF MACHINERY SPACES

3.2.1 Measures to prevent the spills of oil fuel, lubricating oil, hydraulic oil, thermal oil and other combustible liquids

3.2.1.1 Tanks (corresponding to SOLAS Reg.II-2/4.2.2.4)

(1) Air pipes from fuel oil tanks are to be led to a safe position on the open deck.

Air pipes from lubricating oil storage tanks may terminate in the machinery space, provided that the open ends are so situated that issuing oil cannot come into contact with electrical equipment or heated surfaces.

(2) Any overflow pipe is to have a sectional area of at least 1.25 times that of the filling pipe and is to be led to an overflow tank of adequate capacity or to a storage tank having space reserved for overflow purposes.

An alarm device is to be provided to give warning when the oil reaches a predetermined level in the tank, or alternatively, a sight glass with good illumination is to be provided in the overflow pipe to indicate when any tank is overflowing. Such sight glasses are to be placed on vertical pipes only and in readily visible positions.

3.2.1.2 Oil fuel gauge (corresponding to SOLAS Reg.II-2/4.2.2.3.5.1 and 4.2.2.3.5.2)

(1) Short sounding pipes may be used for tanks other than double bottom tanks without the additional closed level gauge, provided an overflow system is fitted.

(2) Level switches may be used below the tank top provided they are contained in a steel enclosure or other enclosures not capable of being destroyed by fire.

3.2.1.3 Pump control (corresponding to SOLAS Reg.II-2/5.2.2.3)

Controls of the oil pumps (e.g. oil transfer pumps, oil fuel unit pumps, lubricating oil service pumps, thermal oil circulating pumps and oil separators) required by Regulation II-2/5.2.2.3 of SOLAS are also to be provided from the compartment itself.

3.2.1.4 Oil fuel pipelines (corresponding to SOLAS Reg.II-2/4.2.2.5.1)

Hose clamps and similar types of attachments for flexible pipes are not to be permitted.

3.2.1.5 Arrangements of oil fuel (corresponding to SOLAS Reg.II-2/4.2.2 and 4.2.5.2)

Oil fuel in storage tanks is not to be heated to temperature within 10℃ below the flash point of the oil fuel, except that where oil fuel in service tanks, settling tanks and any other tanks in supply system is heated the following arrangements are to be provided:

(1) the length of the vent pipes from such tanks and/or a cooling device is sufficient for cooling the vapours to below 60℃, or the outlet of the vent pipes is located 3 m away from a source of ignition;

(2) the vent pipes are fitted with flame screens;

(3) there are no openings from the vapour space of the fuel tanks into machinery spaces (bolted manholes are acceptable);

(4) enclosed spaces are not located directly over such fuel tanks, except for vented cofferdams;

(5) electrical equipment is not fitted in the vapour space of the tanks, unless it is certified to be intrinsically safe.

Section 3 PROTECTION OF CARGO PUMP ROOMS

3.3.1 Measures to prevent explosions in cargo pump rooms on oil tankers

3.3.1.1 The requirements of 3.3.1.2 to 3.3.1.5 below apply to the cargo pump rooms of oil tankers where pumps for cargo, such as cargo pumps, stripping pumps, pumps for slop tanks, pumps for COW or similar pumps are provided. Pump rooms intended solely for ballast or oil fuel transfer, however, need not comply with these requirements.

3.3.1.2 Cargo pumps, ballast pumps and stripping pumps, installed in cargo pump rooms and driven by shafts passing through cargo pump room bulkheads are to be fitted with temperature sensing devices for bulkhead shaft glands, bearings and pump casings. These device are to be capable of automatically effecting a continuous audible and visual alarm in the cargo control room or the pump control station.

3.3.1.3 Lighting in cargo pump rooms, except emergency lighting, is to be interlocked with ventilation such that the ventilation is to be in operation when switching on the lighting. Failure of the ventilation system is not to cause the lighting to go out.

3.3.1.4 A system for continuously monitoring the concentration of hydrocarbon gases is to be fitted. Sampling points or detector heads are to be located in suitable positions in order that potentially dangerous leakages are readily detected. When the hydrocarbon gas concentration reaches a preset level, which is not to be higher than 10% of the lower flammable limit, a continuous audible and visual alarm signal is to be automatically effected in the cargo pump room, engine control room, cargo control room and navigation bridge to alert personnel to the potential hazard.

(1) Where a system for sequential sampling is used for sampling of cargo pump rooms including exhaust ducts, the time between two samplings of a same position is to be reasonably short.

(2) For the number of sampling points, appropriate consideration is to be given to the vapour density of carried cargo and the ventilation condition of tanks. Sampling points are to be located in the exhaust ventilation duct or lower part of the pump room not more than 450 mm above floor plates.

3.3.1.5 All cargo pump rooms are to be provided with bilge level monitoring devices together with appropriately located alarms. Bilge high-level alarms are acceptable as an alternative means for the level monitoring devices.

3.3.2 Gland seals in cargo pump room bulkheads

3.3.2.1 Where drive shafts pass through cargo pump room bulkhead or deck plating, gastight glands are to be fitted. The glands are to be efficiently lubricated from outside the cargo pump room.

3.3.2.2 The seal parts of the glands are to be of material that will not initiate sparks. The glands are to be constructed and fitted in accordance with the relevant requirements for fittings attached to watertight bulkheads, and if a bellows piece is incorporated in the design, it is to be pressure tested before fitting.

3.3.3 Cargo pump room ventilation

3.3.3.1 With the following arrangement of exhaust trunking there are to be 20 air changes per hour on the total volume of the cargo pump room:

(1) In the cargo pump room bilges just above the transverse floor plates on bottom longitudinals, so that air can flow over the top from adjacent spaces.

(2) The ventilator inlet of the cargo pump room is to be close to the bottom so far as practicable and above floors or bottom longitudinals. An emergency intake is to be fitted about 2 m above the cargo pump room lower grating. The emergency intake is to have a damper fitted which is capable of being opened or closed from the exposed main deck and cargo pump room lower grating level.

(3) The foregoing exhaust system is in association with open grating floor plates to allow the free flow of air.

(4) Arrangements involving a specific ratio of areas of upper emergency and lower main ventilator openings, which can be shown to result in at least the required 20 air changes per hour through the lower inlets, can be adopted without the use of dampers. When the lower access inlets are closed then at least 15 air changes per hour are to be obtained through the upper inlets.

3.3.4 Temperature of steam and heating media within the cargo area

3.3.4.1 On oil tankers, the steam and heating media temperature within the cargo area is not to exceed 220℃.

3.3.4.2 On liquefied gas carriers and chemical tankers, the maximum temperature is to be adjusted to take into account the temperature class of the cargoes.

3.3.5 Non-sparking fans

3.3.5.1 A fan is considered as non-sparking if in either normal or abnormal conditions it is unlikely to produce sparks.

3.3.5.2 Design criteria

(1) The air gap between the impeller and the casing is not to be less than 0.1 times the shaft diameter in way of the impeller bearing but not less than 2 mm. It need not be more than 13 mm.

(2) Protection screens of not more than 13 mm square mesh are to be fitted in the inlet and outlet of ventilation openings on the open deck to prevent the entrance of objects into the fan housing.

3.3.5.3 Materials

(1) The impeller and the housing in way of the impeller are to be made of alloys which are recognized as being spark-proof by appropriate test.

(2) Electrostatic charges both in the rotating body and the casing are to be prevented by the use of anti-static materials. Furthermore, the installation on board of the ventilation units is to be such as to ensure the safe bonding to the hull of the units themselves.

(3) Tests may not be required for fans having the following combinations:

① impellers and/or housings of nonmetallic material, due regard being paid to the elimination of static electricity;

② impellers and housings of non-ferrous materials;

③ impellers of aluminium alloys or magnesium alloys and a ferrous (including austenitic stainless steel) housing on which a ring of suitable thickness of non-ferrous materials is fitted in way of the impeller;

④ any combination of ferrous (including austenitic stainless steel) impellers and housings with not less than 13 mm tip design clearance.

(4) The following impellers and housings are considered as sparking and are not permitted:

① impellers of an aluminium alloy or magnesium alloy and a ferrous housing, regardless of tip clearance;

② housing made of an aluminium alloy or a magnesium alloy and a ferrous impeller, regardless of tip clearance;

③ any combination of ferrous impellers and housings with less than 13 mm design tip clearance.

(5) Type tests on the finished product are to be carried out in accordance with an international standard or other standards acceptable to CCS.

Section 4 MISCELLANEOUS

3.4.1 Aluminium coatings on board oil tankers and chemical tankers

3.4.1.1 The use of aluminium coatings containing greater than 10 percent aluminium by weight in the dry film is prohibited in cargo tanks, cargo tank deck area, cargo pump rooms, cofferdams or any other area where cargo vapour may accumulate.

3.4.1.2 Aluminized pipes may be permitted in ballast tanks, in inerted cargo tanks and, provided the pipes are protected from accidental impact, in hazardous areas on open deck.

3.4.2 Tank cleaning openings

3.4.2.1 Ullage plugs, sighting ports and tank cleaning openings are not to be arranged in enclosed spaces.

3.4.3 Portable instruments for measuring oxygen and flammable vapour concentrations

3.4.3.1 Every oil tanker is to be provided with at least two portable gas detectors capable of measuring flammable vapour concentrations in air and at least two portable O_2 analysers.

3.4.3.2 In addition to the requirement in 3.4.3.1, for tankers fitted with inert gas systems, at least two portable gas detectors are to be capable of measuring concentrations of flammable vapours in inerted atmosphere.

3.4.4 Pressurization of cargo tanks

3.4.4.1 PV valves to oil tanks are not to be set at pressures in excess of 0.021 MPa unless the tank scantlings have been specially considered.

3.4.5 Piping passing through dangerous zones

3.4.5.1 Ballast piping passing through cargo tanks and cargo oil pipes passing through segregated ballast tanks, as defined by Reg.19 of Annex I to MARPOL, are to comply with the following requirements:

(1) The pipes are to be of heavy gauge steel of minimum wall thickness according to Table 3.4.5.1 hereunder with welded or heavy flanged joints the number of which is to be kept to a minimum.
(2) Expansion bends only (not glands) are permitted in these lines within cargo tanks for serving the ballast tanks and within the ballast tanks for serving the cargo tanks.

Minimum Wall Thickness of Pipes **Table 3.4.5.1**

Nominal diameter (mm)	Minimum wall thickness (mm)
50	6.3
100	8.6
125	9.5
150	11.0
200 and above	12.5

3.4.5.2 The thicknesses shown in Table 3.4.5.1 refer to carbon steel pipes.
3.4.5.3 Connection between cargo piping and ballast piping referred to above is not permitted except for emergency discharge as specified in the Unified Interpretation to Reg.1.18 of Annex I to MARPOL.
Nevertheless, provision may be made for emergency discharge of the segregated ballast by means of a connection to a cargo pump through a portable spool piece. In this case non-return valves are to be fitted on the segregated ballast connections to prevent the passage of oil to the ballast tanks. The portable spool piece is to be mounted in a conspicuous position in the cargo pump room and a permanent notice restricting its use is to be prominently displayed adjacent to it.
Shut-off valves are to be provided to shut off the cargo and ballast lines before the spool piece is removed.
3.4.5.4 The ballast pump is to be located in the cargo pump room, or a similar space within the cargo area not containing any source of ignition.

3.4.6 Bow and stern loading and unloading arrangements on oil tankers

3.4.6.1 Where a cargo hose connection is arranged outside the cargo tank area, the pipe leading to such connections is to be provided with means of segregation such as a spectacle flange, removable spool piece or equivalent① located within the cargo area. The space within 3 m of the manifold is to be considered as a dangerous area with regard to electrical or incendive equipment.

3.4.7 Direct loading pipes to oil tanker cargo tanks

3.4.7.1 In order to avoid the generation of static electricity when cargo is loaded direct into tanks, the loading pipes are to be led as low as practicable in the tank.

3.4.8 Cargo openings in the bottoms of topside tanks of ships carrying alternatively oil and grain

3.4.8.1 This requirement applies to ships carrying alternatively oil having a flash point not exceeding 60℃ or other cargoes.
When ships are designed to transport alternatively oil or dry cargoes, openings which may be used for cargo operations are not permitted in bulkheads and decks separating oil cargo spaces from other spaces not designed and equipped for the carriage of oil cargoes unless alternative approved means are provided to ensure equivalent integrity.

3.4.9 Emergency fire pumps in cargo ships②

3.4.9.1 In cargo ships, the room(s) where the pump and prime mover are installed is/are to have adequate space for maintenance work and inspections.

3.4.10 Prohibition of carriage in fore peak tanks of oil or other liquid substances which are flammable

3.4.10.1 In ships of 400 gross tonnage and above, compartments forward of the collision bulkhead are not to be arranged for the carriage of oil or other liquid substances which are flammable.

3.4.11 Sea intakes for fire pump on ships with ICE Class

3.4.11.1 On ships with ICE Class at least one of the fire pumps is to be connected to a sea chest which is provided with de-icing arrangements.

---

① Refer to IMO MSC/Circ.474.
② Emergency fire pumps in cargo ships are to additionally comply with the requirements of SOLAS Reg.II-2/10 and Chapter 12 of FSS Code, as appropriate.

3.4.12 Fire testing of flexible pipes

3.4.12.1 Flexible pipes with end attachments which are required to be of fire-resisting materials, are to be subject to a fire for 30 min at a temperature of 800℃, while water at the maximum service pressure is circulated inside the pipe. The temperature of the water at the outlet is not to be less than 80℃. No leak should be recorded during or after the test.

3.4.12.2 An alternative to that required in 3.4.12.1 is to fire test the flexible pipe with flowing water at a pressure of at least 0.5 MPa and subsequent pressure test to twice the design pressure.

3.4.13 Installation requirements for analysing units for continuous monitoring of flammable vapours

3.4.13.1 This requirement applies to gas analysing units of the sampling type located outside gas dangerous zones and fitted on board gas carriers or on board oil/chemical tankers.

3.4.13.2 Gas analysing units with non-explosion proof measuring equipment may be located in areas outside cargo areas, e.g. in cargo control room, navigation bridge or engine room when mounted on the forward bulkhead provided the following requirements are observed:

(1) Sampling lines are not to run through gas safe spaces, except where permitted under (5).

(2) The gas sampling pipes are to be equipped with flame arresters. Sample gas is to be led to the atmosphere with outlets arranged in a safe location.

(3) Bulkhead penetrations of sample pipes between safe and dangerous areas are to be of approved type and have same fire integrity as the division penetrated. A manual isolating valve is to be fitted in each of the sampling lines at the bulkhead on the gas safe side.

(4) The gas detection equipment including sample piping, sample pumps, solenoids, analysing units etc. is to be located in a reasonably gastight enclosure (e.g. a fully enclosed steel cabinet with a gasketed door) which is to be monitored by its own sampling point. At gas concentrations above 30% LFL inside the enclosure the entire gas analysing unit is to be automatically shut down.

(5) Where the enclosure cannot be arranged directly on the bulkhead, sample pipes are to be of steel or other equivalent material and without detachable connections, except for the connection points for isolating valves at the bulkhead and analysing units, and are to be routed on their shortest ways.

3.4.14 Fore peak ballast system on oil tankers

3.4.14.1 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.

3.4.15 Arrangement of oxygen, acetylene cylinders

3.4.15.1 Storage of oxygen, acetylene cylinders is to meet the following requirements:

(1) The design, construction and approval of gas cylinders are to comply with the applicable requirements of PART THREE of the Rules or requirements of the recognized standards. Each gas cylinder is to be provided with proper pressure relief device such as a fusible plug or a rupture disc.

(2) Pipes, pipe fittings, pipe joints and valves are to comply with the requirements of Class I piping systems. Materials for acetylene on the high-pressure side between the cylinders and the regulator are to be steel. Copper or copper alloys containing more than 65% copper are not to be used in the whole fixed acetylene piping. Materials for oxygen piping are to be of steel or copper. Materials for both oxygen and acetylene systems are to be corrosion resistant, all the pipes of the fixed piping are to be seamless drawn.

(3) The connections between fixed pipe sections are to be carried out by means of butt welding. Other types of connections including threaded connections and flange connections are not permitted.
(4) Where there are two or more cylinders of each gas, separate dedicated storage rooms are to be provided for each gas.
(5) Storage rooms are to be constructed of steel, not located below the open deck, and be well ventilated and accessible from the open deck. The ventilation arrangement is to be separate from the ship's ventilation systems.
(6) Possible sources of ignition are not to be fitted in acetylene storage room and any electrical installation, if fitted, is to be of a certified type.
(7) Securing arrangements of gas cylinders are to be released easily and quickly for the expeditious removal of cylinders in the event of fire.
(8) Prominent and permanent "NO SMOKING" signs are to be displayed at the gas cylinder storage room.
(9) Where cylinders are stowed in open locations means are to be provided to:
① protect cylinders and associated piping from physical damage;
② minimize the likelihood of exposure to hydrocarbons;
③ ensure suitable drainage.
(10) If the pipes connecting the work station for oxyacetylene welding and gas storage room need to pass through deck or bulkhead, fixed pipes are to be provided between gas cylinder and work station for welding and they are not to pass through accommodation spaces, service spaces and control stations. Suitable protection is to be provided at the position passing through deck or bulkhead. Outlet stations of fixed pipes are to be fitted with shut-off valves.

3.4.16 Arrangement of liquefied-gas-fired ranges

3.4.16.1 If liquefied-gas-fired ranges are fitted in a galley, the following requirements are to be met:
(1) Ranges, gas cylinders, angle valves and pressure reduction valves, etc. are to be designed, manufactured and tested in accordance with applicable standards and codes.
(2) Unless separated from adjacent spaces by suitable fire division, the galley is to be situated above the main deck. Inside the galley no opening or stairway leading to the spaces below is allowed; or where an opening is arranged, a positive means of closing is to be provided.
(3) Liquefied gas ranges are to be fitted securely at predetermined positions. Means are to be provided to prevent shifting of ranges.
(4) Liquefied gas cylinders are to be positioned vertically and fixed securely. Fixed hoops are to be capable of being released easily and quickly. Cylinders are to be provided with wood blocks under the bottom to avoid impact.
(5) Steel liquefied gas pipe lengths are to be connected by welding. Threaded joints may be adopted for connecting ranges, valves, instrumentation etc. with pipes and valves. The joints are to be fitted with oil-resistant sealing washers or coated with binder to ensure gastightness.
The joints between rubber hoses and pressure reduction valves, ranges or steel pipes are to be cramped by metal clamps. The clamps are to be connected securely. They are to be capable of being easily fitted or removed and to ensure gastightness.
(6) For the pressure of strength test and tightness test on liquefied gas piping system, the requirements given in Table 3.4.16.1 are to be complied with.

Test Pressure of Piping **Table 3.4.16.1**

Liquefied gas piping	Test pressure	
	Strength test (in workshop) (MPa)	Tightness test (after installation on board) (MPa)
Piping from cylinder to pressure reduction valve	2.4	2.0
Piping from pressure reduction valve to range	0.2	0.1

(7) Storage spaces containing liquefied gas cylinders are to comply with the requirements of 3.4.15 of this Section and the fire safety requirements of 3.4.18 of this Section.
3.4.16.2 For galleys where oil or flammable gas is in use, their structure and arrangement are to comply with the following requirements:
(1) The oil fuel tank is to be located outside the galley and is to be fitted with approved means of filling and venting.
(2) The oil fuel or flammable gas supply to the burners is to be capable of being cut off from a readily accessible position outside the galley in the event of a fire occurring in the galley.

(3) Naked fire is not to be in use for ignition of oil fuel or flammable gas, except for galley stoves or water heaters. All pipelines for delivering oil fuel or flammable gas from containers to the stoves or water heaters are to be of steel or other approved materials. And safety appliances for automatic shutoff are to be provided so that they will automatically shut off oil fuel and flammable gas supply when the flame in the stoves goes out.
(4) Naked fire is not to be in use for warming oneself. Galley stoves and similar appliances are to be firmly fixed at their design positions, and means are to be provided to prevent them from shifting. Sufficient fire protection and insulation layers are to be provided under, around and over. The possibility of blocking up by combustion remains is to be kept to a minimum and cleaning tools are to be provided. Where the damper for limitation of the exhaust in the uptake is in a closed position, sufficient flow area is to be kept. The ventilator in way of the stove space is to be of sufficient cross-sectional area so as to supply the stoves with enough air for full combustion.
(5) Galleys are to be provided with ventilation appliances of sufficient capacity so as to purge the smoke and the gas liable to escape to a safe place.

3.4.17 Provision of fire extinguishers

3.4.17.1 In passenger ships, at least two portable fire extinguishers for each main vertical zone or enclosed space divided by watertight bulkheads, and for each floor of passenger spaces above the bulkhead deck are to be provided; and at least one for each galley and for store room is to be provided.
3.4.17.2 In cargo ships and tankers, at least two portable fire extinguishers for each deck and at least one for each galley are to be provided.

3.4.18 Fire-extinguishing arrangements for paint lockers and flammable liquid lockers

3.4.18.1 Paint lockers and flammable liquid lockers are to be provided with a fire-extinguishing arrangement enabling the crew to extinguish a fire without entering the space.
3.4.18.2 For paint lockers and flammable liquid lockers of a deck area of 4 m^2 and more, one of the fixed arrangements as specified below are to be provided:
(1) a CO_2 system, designed for 40% of the gross volume of the space;
(2) a dry powder system, designed for at least 0.5 kg powder/m^3;
(3) a pressure water-spraying or an automatic sprinkler system, designed for 5 $l/m^2 \cdot min$.
3.4.18.3 The pressure water-spraying system may be connected to the ship's fire main.
3.4.18.4 Systems or arrangements other than those mentioned in 3.4.18.2(1), (2), (3) may be accepted by CCS provided that relevant technical and test data are provided.
3.4.18.5 For paint lockers and flammable liquid lockers of a deck area of less than 4 m^2, which do not give access to accommodation spaces, a CO_2 portable fire extinguisher sized to provide a minimum volume of free gas equal to 40% of the gross volume of the space may be accepted in lieu of a fixed system as specified in 3.4.18.2. The extinguisher may be discharged through a port on the wall of the locker. The required portable fire extinguisher is to be stowed adjacent to the port. Alternatively, a port or hose connection may be provided to facilitate the use of fire main water.

CHAPTER 4 INERT GAS SYSTEMS

Section 1 GENERAL PROVISIONS

4.1.1 General requirements

4.1.1.1 This Chapter applies to ships fitted with the inert gas systems and nitrogen generator systems.

4.1.1.2 All types of inert gas systems are to comply with the following:

(1) An automatic control capable of producing suitable inert gas under all service conditions is to be fitted.

(2) Materials used in inert gas systems are to be suitable for their intended purpose in accordance with the relevant requirements of CCS Rules for Materials and Welding.

(3) All the equipment installed on board is to be tested under working conditions.

4.1.2 Class notation

4.1.2.1 Inert gas systems complying with the requirements of this Chapter may be assigned the following class notation:

Inert Gas Systems (IGS)

4.1.3 Plans and documents

4.1.3.1 In addition to the plans and documents required by relevant PARTs of the Rules, the following ones are to be submitted for approval:

(1) Details and arrangement of the inert gas generating plant including all control and monitoring devices;

(2) Arrangement of the inert gas system.

Section 2 INERT GAS SYSTEMS AND NITROGEN GENERATOR SYSTEMS FOR DIFFERENT TYPES OF SHIPS

4.2.1 Inert gas systems on tankers carrying crude oil and petroleum products

4.2.1.1 The following requirements apply where an inert gas system based on boiler flue gas and/or oil fired inert gas generators is fitted on board tankers intended for the carriage of crude oil and petroleum products in bulk having a flash point not exceeding 60℃ (closed-cup test) and a Reid vapour pressure which is below atmospheric pressure, and other liquid products having a similar fire hazard.

4.2.1.2 Inert gas systems are to comply with the requirements of Chapter 15 of FSS Code.

4.2.1.3 In addition to the requirements of Chapter 15 of FSS Code, the following are to be complied with:

(1) When two blowers are provided, the total required capacity of the inert gas system is preferably to be divided equally between the two blowers, and in no case is one blower to have a capacity less than 1/3 of the total capacity required.

(2) In particular those parts of scrubbers, blowers, non-return devices, scrubber effluent and other drain pipes which may be subjected to corrosive action of the gases and/or liquids are to be either constructed of corrosion resistant material or lined with rubber, glass fibre, epoxy resin or other equivalent coating material.

(3) The compartment in which any oil fired inert gas generator is situated is to be treated as machinery space of Category A with respect to fire protection.

(4) Arrangements are to be made to vent the inert gas from oil fired inert gas generators to the atmosphere when the inert gas produced is off specification, e.g., during start-up or in the event of equipment failure.

(5) Automatic shut-down of the oil fuel supply to inert gas generators is to be arranged on predetermined limits being reached with respect to low water pressure or low water flow rate to the cooling and scrubbing arrangement and with respect to high gas temperature.

(6) Automatic shut-down of the gas regulating valve is to be arranged with respect to failure of the power supply to the oil fired inert gas generators.

4.2.2 Inert gas systems on chemical tankers

4.2.2.1 The following requirements apply where an inert gas system based on oil fired inert gas generators is fitted on board chemical tankers.

4.2.2.2 The inert gas system is to comply with the requirements of IMO resolution A.567(14).

4.2.2.3 As an alternative to the water seal in the inert gas line on deck, an arrangement consisting of two shut-off valves in series with a venting valve in between may be accepted (double block and bleed). The following conditions apply:

(1) The operation of the valve is to be automatically executed. Signal(s) for opening/closing is (are) to be taken from the process directly, e.g. inert gas flow or differential pressure.
(2) Alarm for faulty operation of the valves is to be provided, e.g. the operation status of "Blower stop" and "supply valve(s) open" is an alarm condition.
4.2.2.4 In addition to the requirements detailed in resolution A.567(14), the requirements for inert gas systems, contained in paragraphs 4.2.1.3(1) to (3), are to be complied with.

4.2.3 Nitrogen generator systems
4.2.3.1 The following requirements are specific only to the gas generator system and apply where inert gas is produced by separating air into its component gases by passing compressed air through a bundle of hollow fibres, semi-permeable membranes or adsorber materials.
4.2.3.2 Where such systems are provided in place of the boiler flue gas or oil fired inert gas generators referred to in 4.2.1 and 4.2.2 of this Section, the following requirements of 2.3.1.3.1, 2.3.1.3.2, 2.3.1.5, 2.3.2, 2.4.2, 2.4.3.1.6, 2.4.3.1.8, 2.4.3.1.9, 2.4.3.3, 2.4.3.4, 2.4.4 of Chapter 15 of FSS Code and SOLAS Reg.II-2/4.5.3.4.2, 4.5.6.3, 11.6.3.4 or equivalent requirements of resolution A.567(14) remain applicable for the piping arrangements, alarms and instrumentation downstream of the gas generator.
4.2.3.3 A nitrogen generator consists of a feed air treatment system and any number of membrane or adsorber modules in parallel necessary to meet the required capacity which is to be at least 125% of the maximum discharge capacity of the ship expressed as a volume.
4.2.3.4 The air compressor and the nitrogen generator may be installed in the engine room or in a separate compartment. A separate compartment is to be treated as one of "other machinery spaces" with respect to fire protection.
4.2.3.5 Where a separate compartment is provided, it is to be positioned outside the cargo area and is to be fitted with an independent mechanical extraction ventilation system providing 6 air changes per hour. A low oxygen alarm is to be fitted as well.
The compartment is to have no direct access to accommodation spaces, service spaces and control stations.
4.2.3.6 The nitrogen generator is to be capable of delivering high purity nitrogen with O_2 content not exceeding 5% by volume. The system is to be fitted with automatic means to discharge "off-spec" gas to the atmosphere during start-up and abnormal operation.
4.2.3.7 The system is to be provided with two air compressors. The total required capacity of the system is preferably to be divided equally between the two compressors, and in no case is one compressor to have a capacity less than 1/3 of the total capacity required.
Only one air compressor may be accepted provided that sufficient spares for the air compressor and its prime mover are carried on board to enable their failure to be rectified by the ship's crew.
4.2.3.8 A feed air treatment system is to be fitted to remove free water, particles and traces of oil from the compressed air, and to preserve the specification temperature.
4.2.3.9 Where fitted, a nitrogen receiver/buffer tank may be installed in a dedicated compartment or in the separate compartment containing the air compressor and the generator or may be located in the cargo area. Where the nitrogen receiver/buffer tank is installed in an enclosed space, the access is to be arranged only from the open deck and the access door is to open outwards. Continuous ventilation and alarm are to be fitted as required in 4.2.3.5 of this Section.
4.2.3.10 The oxygen-enriched air from the nitrogen generator and the nitrogen-product enriched gas from the protective devices of the nitrogen receiver are to be discharged to a safe location on the open deck.
Safe location needs to address the two types of discharges separately:
(1) oxygen-enriched air from the nitrogen generator – safe locations on the open deck are:
① outside of hazardous areas;
② not within 3 m of areas traversed by personnel; and
③ not within 6 m of air intakes for machinery (engines and boilers) and all ventilation inlets;
(2) nitrogen-product enriched gas from the protective devices of the nitrogen receiver - safe locations on the open deck are:
① not within 3 m of areas traversed by personnel; and
② not within 6 m of air intakes for machinery (engines and boilers) and all ventilation inlets/outlets.
4.2.3.11 In order to permit maintenance, means of isolation are to be fitted between the generator and the receiver.
4.2.3.12 At least two non-return devices are to be fitted in the inert gas supply main, one of which is to be of the double block and bleed arrangement as specified in 4.2.2.3 of this Section. The second non-return device is to be equipped with positive means of closure.
4.2.3.13 Instrumentation is to be provided for continuously indicating the temperature and pressure of air:

(1) at the discharge side of the compressor;
(2) at the entrance side of the nitrogen generator.
4.2.3.14 Instrumentation is to be fitted for continuously indicating and recording the oxygen content of the inert gas downstream of the nitrogen generator when inert gas is being supplied.
4.2.3.15 The instrumentation referred to in 4.2.3.14 of this Section is to be placed in the cargo control room where provided. But where no cargo control room is provided, they are to be placed in a position easily accessible to the officer in charge of cargo operations.
4.2.3.16 Audible and visual alarms are to be provided to indicate:
(1) low feed-air pressure from compressor as referred to in 4.2.3.13(1) of this Section;
(2) high air temperature as referred to in 4.2.3.13(1) of this Section;
(3) high condensate level at automatic drain of water separator as referred to in 4.2.3.8 of this Section;
(4) failure of electrical heater, if fitted;
(5) oxygen content in excess of that required in 4.2.3.6 of this Section;
(6) failure of power supply to the instrumentation as referred to in 4.2.3.14 of this Section.
4.2.3.17 Automatic shut-down of the system is to be arranged upon alarm conditions as required in 4.2.3.16(1) to (5) of this Section.
4.2.3.18 The alarms required in 4.2.3.16(1) to (6) of this Section are to be fitted in the machinery space and cargo control room, where provided, but in each case in such a position that they are immediately received by responsible members of the crew.

4.2.4 Nitrogen/inert gas systems fitted for purposes other than inerting required in SOLAS Reg.II-2/4.5.5.1.1

4.2.4.1 This Section applies to systems fitted on oil tankers of less than 20,000 DWT, gas tankers or chemical tankers.
4.2.4.2 The requirements of 4.2.3 of this Section apply except 4.2.3.1, 4.2.3.2, 4.2.3.3 and 4.2.3.7 of this Section.
4.2.4.3 Where the connections to the cargo tanks, to the hold spaces or to cargo piping are not permanent, the non-return devices required in 4.2.3.12 of this Section may be substituted by two non-return valves.

Section 3 EXAMINATION AND TESTING

4.3.1 General requirements

4.3.1.1 The devices and equipment required by this Chapter are, after having been installed on board, to be tested under working conditions to confirm their performance.

CHAPTER 5 HELICOPTER FACILITIES

Section 1 GENERAL PROVISIONS

5.1.1 Application

5.1.1.1 This Chapter applies to all ships requesting the class notation specified in 5.1.2 below and fitted with areas and facilities for normal takeoff and landing of helicopters.

5.1.1.2 Helicopter deck facilities covered by this Chapter mean all deck structure, fire-fighting appliances and other equipment necessary for the safe operation of helicopters as well as any refueling and hangar facilities.

5.1.1.3 Helicopter deck structure, strength and arrangement, and related plans and documents to be submitted for approval are to comply with the requirements of Section 18, Chapter 2 of PART TWO of the Rules.

5.1.2 Class notation

5.1.2.1 Ships complying with the requirements of this Chapter may be assigned the following class notation:

Helicopter Facilities

5.1.3 Plans and documents

5.1.3.1 The following plans and documents are to be submitted for approval:

(1) Arrangement of structural fire protection of helicopter deck, including fire division, means of escape, openings, drainage facilities;

(2) Arrangement of fire-fighting appliances provided for helicopter deck, including calculations of quantity of extinguishing agents to be used;

(3) Arrangement of helicopter refueling facilities and systems, where fitted.

5.1.4 Fire safety of helicopter deck

5.1.4.1 The fire prevention and fire extinction of helicopter deck is to comply with the requirements of SOLAS Reg.II-2/18, other than those for personnel qualification, management, operation and maintenance.

5.1.4.2 Where the helicopter deck forms a part of the strength deck or a hatch cover, aluminum or other low melting point metal construction is not to be used.

5.1.4.3 The means of escape required for the helicopter deck may be used as working access for crew, provided the access is maintained clear.

5.1.4.4 Where the helicopter deck is of aluminum alloy that is made equivalent to steel, the drainage facilities thereof may also be made of aluminum alloy.