GUIDANCE NOTES GD 16-2014

GUIDELINES FOR SURVEYS OF NON-CONVENTION SHIPS

2014

Effective from December 1, 2014

CONTENTS

General

1 General requirements

1.1 Guidelines for Surveys of Non-convention Ships (referred to as “the Guidelines”) specifies the requirements for the surveys of non-convention ships engaged on international voyages, which is intended to provide basis for the surveys of ISC non-convention ships engaged on international voyages.

1.2 If requirements for non-convention ships engaged on international voyages are specified by the flag State Administration, such requirements are to be complied with; If relevant standards, such as IACS Rec.99 “Recommendations for the Safety of Cargo Vessels of less than Convention Size”, have been accepted by the flag State Administration or parties concerned, requirements of such standards are to be complied with; If no relevant requirement is specified by the flag State Administration, the ship is allowed to comply with relevant requirements of the Guidelines upon the application of the shipowner.

1.3 Chapter 1 of the Guidelines applies to new ships and existing ships, and other chapters of the Guidelines apply to new ships.

1.4 Repairs, alterations and modifications of a non-convention ship engaged on international voyages are at least to comply with the existing standards applicable for that ship, and alterations and modifications of a major character are to comply with the requirements of the Guidelines.

2 Definitions and abbreviations

2.1 Terms and definitions used in the Guidelines are the same as those used in the relevant international conventions, except those defined in 2.2.

2.2 For the purpose of the Guidelines:

(1) Self-propelled ship is a sea-going ship self-propelled by mechanical means for the purpose of navigation.

(2) Non-self-propelled ship is a sea-going ship not self-propelled by mechanical means for the purpose of navigation, including sea-going ships fitted with propulsion machinery used only for purposes such as lateral thrusting, operational actions or auxiliary propulsion during tugging.

(3) A new ship means a ship the keel of which is laid or which is at a similar stage of construction on or after the date of coming into force of the Guidelines.

(4) Manned non-self-propelled ship is a non-self-propelled ship with operators on board the ship during operation at sea and/or a non-self-propelled ship with watchkeeping personnel on board the ship while being towed.

(5) Length (L), in m, refers to the length of ships as defined in Annex I “Regulations for Determining Load Lines” to Annex B to IMO Protocol of 1988 relating to the International Convention on Load Lines, 1966.

2.3 Abbreviations used in the Guidelines are as follows:

(1) International Maritime Organization: IMO;

(2) International Labour Organization: ILO;

(3) International Convention for the Safety of Life at Sea, 1974: SOLAS Convention;

(4) International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978: MARPOL Convention;

(5) Annex I to Annex B to the Protocol of 1988 relating to the International Convention on Load Lines, 1966: 1988 Load Lines Protocol;

(6) International Code on Intact Stability, 2008: 2008 IS Code;

(7) International Code for Fire Safety Systems: FSS Code;

(8) International Code for Application of Fire Test Procedures: FTP Code;

(9) International Life-Saving Appliance Code: LSA Code;

(10) IS Class : the Society or ISC.

3 Application

3.1 Unless specified otherwise, the Guidelines applies to self-propelled cargo ships of less than 500 gross tonnage engaged on international voyages and non-self-propelled ships engaged on international voyages.

3.2 In addition to the requirements of the Guidelines, non-convention ships engaged on international voyages are to comply with, but not limited to the following IMO conventions and regulations:

(1) the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978;

(2) the International Regulations for Preventing Collisions at Sea, 1972;

(3) requirements of Chapter V “Safety of navigation” of the International Convention for the Safety of Life at Sea, 1974 (applicable to self-propelled ships);

(4) applicable requirements of Chapter VI “Carriage of cargoes” and Chapter VII “Carriage of dangerous goods” of the International Convention for the Safety of Life at Sea, 1974.

3.3 Unless specified otherwise by the Guidelines, the hull and machinery and electrical installations of ISC classed non-convention ships engaged on international voyages are to comply with the requirements of ISC Rules for Classifications of Sea-going Steel Ships and Rules for Materials and Welding. Requirements of the rules in so far as reasonable and practicable or standards accepted by ISC are to be complied with, where the size of the ship is less than that specified by the rules.

4 Equivalents

4.1 Any fitting, material or appliance may be allowed to be fitted or carried in a ship, other than that required by the Guidelines, if it is satisfied by trial or otherwise that such fitting, material or appliance, is at least as effective as that required by the Guidelines and approved by ISC.

Chapter 1 Surveys and Certification

1.1 General requirements

1.1.1 This Chapter applies to surveys and certification of non-convention ships engaged on international voyages.

1.1.2 Particular requirements for issuance of the ship's certificate and document of compliance as clearly specified by IMO conventions, regulations and flag State Administrations are not included in this Chapter.

1.2 Certificates

1.2.1 After a satisfactory survey of non-convention ships engaged on international voyages, applicable certificates are to be issued in accordance with Appendix 1 to this Chapter.

1.3 Surveys

1.3.1 Application

1.3.1.1 Owners or operators of non-convention ships engaged on international voyages are to apply for the following surveys to ISC:

(1) an initial survey;

(2) surveys in service, including annual surveys, intermediate surveys, renewal surveys, inspections of the outside of the ship's bottom and additional surveys.

1.3.1.2 Owners or operators of non-convention ships engaged on international voyages are to apply for an additional survey for either of the following conditions:

(1) an accident to a ship which affects its seaworthiness;

(2) alteration of a ship's intended purpose as restricted in its certificate;

(3) invalidity of a ship's certificate;

(4) changes of a ship's owner or operator, and of a ship's name or port of registry;

(5) repairs or modification involved in the safety of a ship.

The additional survey, which may be either general or partial according to the circumstances, is to be such to ensure that the repairs and any renewals have been effectively made and that the ship and its equipment continue to be fit for the service for which the ship is intended.

1.3.2 Initial survey

1.3.2.1 An initial survey is a complete inspection before a ship is put into service of all the items relating to a particular certificate to ensure that the relevant requirements are complied with and that these items are satisfactory for the service for which the ship is intended.

1.3.3 Annual survey

1.3.3.1 The annual survey is to be carried out within three months before or after each anniversary date① of the certificate.

1.3.4 Intermediate survey

1.3.4.1 The intermediate survey is to be carried out within three months before or after the secondary anniversary date or within three months before or after the third anniversary date of the appropriate certificate and is to take the place of one of the annual surveys.

1.3.5 Renewal survey

1.3.5.1 The renewal survey is to be carried out within three months before the expiry date of the certificate.

1.3.6 Inspections of the outside of the ship's bottom

1.3.6.1 An inspection of the outside of the ship's bottom means an inspection of the underwater part of the ship and relevant items to ensure that they are in a satisfactory condition and fit for the service for which the ship is intended. Inspections of the outside of the ship's bottom are normally to be carried out with the ship in a dry dock. However, consideration may be given to alternate inspections being carried out with the ship afloat when the conditions are satisfactory and the proper equipment and suitably trained staff are available. Special consideration is to be given before ships of 15 years of age and over are permitted to have such surveys afloat. Inspections of the outside of the bottom of tankers of 15 years of age and over are to be carried out with the ship in a dry dock.

1.3.6.2 The inspections of the outside of the ship's bottom are to be carried out at least twice during any five-year period of the Ship Safety Navigation Certificate and the interval between any two such inspections is not to exceed three years, and one of the two inspections is to be carried out at the same time as the renewal survey.

1.3.6.3 The inspection of outside of ship's bottom is to consist of:

(1) examining the shell plating including bottom plating, plate keels, side plating, bilge keels, stems, stern posts and stern frames;

(2) examining the propellers and rudders;

(3) noting the clearances measured in the rudder bearings;

(4) noting the clearances measured in the propeller shafts and examining the shaft seals;

① Anniversary date means the day and the month of each year which will correspond to the date of expiry of the relevant certificate.

(5) examining the sea chests, sea valves, side drainage valves, shell connections, and the gratings in way of the sea water inlets;

(6) corrosion protection and coating of hull.

1.3.6.4 After a satisfactory inspection of outside of ship's bottom, the Ship Safety Navigation Certificate is to be endorsed.

1.3.7 Surveys for issue of the Ship Safety Navigation Certificate

1.3.7.1 Surveys for issuing and maintaining the Ship Safety Navigation Certificate are to be carried out as follows:

(1) initial surveys;

(2) annual surveys;

(3) intermediate surveys;

(4) renewal surveys;

(5) inspections of the outside of the ship's bottom.

1.3.7.2 An initial survey is to consist of:

(1) examination of the plans (see Appendix 2 for the List of Plans and Documents to be Submitted for Approval);

(2) during construction and after installation, the survey is to include the following items and be in accordance with the approved plans:

① confirming stability information, loading manual, damage control plans and damage control booklet (where applicable);

② confirming the arrangement of structural fire protection, including detail arrangements for bulkheads and deck structures, penetration and prevention of heat transferring;

③ confirming that the collision bulkhead is watertight up to the freeboard deck, that bulkheads separating both ends of the machinery space from the cargo and other spaces are watertight up to the freeboard deck;

④ confirming the watertightness of watertight decks, trunks, tunnels and ventilators;

⑤ confirming the main and auxiliary steering gears are in compliance with the specified requirements;

⑥ confirming the function of operating the remote means of closing valves fitted to the tanks that contain fuel oil, lubricating oil and other flammable oils;

⑦ confirming the function of the means of closing openings and remote shutdown of mechanical ventilation, and of the control of flame dampers;

⑧ confirming the provision of life-saving appliances;

⑨ confirming the launching and recovery operations of the launching appliances for each survival craft/rescue boat;

⑩ confirming the operation of water fire-extinguishing system is in accordance with the relevant requirements;

⑪ confirming that the fire control plans have been kept on board;

⑫ confirming the fixed fire-extinguishing system, and fire detection and fire alarm system of spaces are in accordance with the relevant requirements;

⑬ confirming fire-fighting appliances (portable/large fire extinguishers, portable foam applicator unit, emergency escape breathing devices, firemen's outfits, etc.) are in accordance with the relevant requirements;

⑭ confirming the provision and operation of lights, shapes and sound signal equipment; examining the provision, specifications and stowage of distress signals;

⑮ confirming the provision and tests of onboard navigational equipment;

⑯ confirming the effectiveness of the motors and the control devices for steering gear, windlass, fire pump, bilge pump, etc.;

⑰ confirming the effectiveness of the main, emergency, interim emergency and reserve sources of power;

⑱ confirming the effectiveness of the internal alarming system and communications system;

⑲ confirming the function of periodically unattended machinery spaces;

⑳ confirming the provision, installation and function of the radio-communication equipment;

㉑ confirming the application of effective corrosion-resistant coating for the seawater ballast tank, e.g. epoxy-based coating;

㉒ the additional requirements for oil tankers are as follows:

(a) examining the cargo tank openings, including gaskets, coamings, covers, screens and vent covers;

(b) examining the cargo tank pressure/vacuum valves and flame screens;

(c) examining the cargo tank vents, including vent mast and manifold;

(d) examining the flame screens for fuel oil tanks, oily-ballast tanks, oily-slop bilge tanks and void spaces;

(e) confirming that no potential ignition sources exist in or near the cargo tanks;

(f) examining the ladders in the cargo pump room;

(g) examining the pump room bulkheads for signs of leakage or fractures and the sealing arrangements of all penetrations of cargo pump room bulkheads;

(h) examining the pipeline in the pump room;

(i) examining the pump room ventilation system including ducts, dampers and flame screens;

(j) examining the cargo, bilge, ballast and stripping pumps for undue gland seal leakage and shutdown devices;

(k) confirming the operation of bilge systems;

(l) confirming the oil level indicator systems;

(m) confirming all electrical equipment in dangerous zones;

(n) confirming the water spray and sprinkler systems;

(o) confirming the cargo lines;

(p) confirming the fixed fire-extinguishing arrangements in the cargo pump room;

(q) examining the auxiliary venting arrangements of cargo tanks;

(r) examining the protective equipment in cargo pump-rooms (including temperature sensing devices, interlock of ventilation and lighting, system for continuous monitoring of the concentration of hydrocarbon gases and bilge level monitoring devices, etc.);

(3) confirming that the ship is provided with all necessary documents.

(4) after a satisfactory initial survey, the Ship Safety Navigation Certificate is to be issued.

1.3.7.3 An annual survey is to consist of:

(1) examining the shell plating (above W.L.), strength deck, inner bottom plating, watertight bulkhead plating, superstructures, deckhouses, etc. and their closing devices;

(2) checking the watertight doors and testing them under operation conditions;

(3) confirming that no significant changes have been made to the arrangement of structural fire protection;

(4) confirming the conditions of the anchoring and mooring equipment;

(5) examining the main and auxiliary steering arrangements including control system and checking the operation test;

(6) examining the lifeboats/rescue boats and their equipment, the launching and embarkation arrangements;

(7) examining the liferafts and their launching and embarkation arrangements, the hydrostatic release units;

(8) randomly examining the technical condition of lifejackets/immersion suits, externally examining the lifebuoys and checking the number and locations;

(9) confirming the validity of distress signals;

(10) confirming that the fire control plans have been posted as required;

(11) checking the number and stowage locations of the fire-fighting articles and emergency escape breathing devices;

(12) externally examining and alarm testing the fixed fire-extinguishing systems;

(13) examining oil fuel tanks, oil fuel pumps and means of remote shutdown of ventilation in machinery spaces, and where practicable, operation testing;

(14) operation testing the closing arrangements of ventilators, funnel annular spaces, skylights, doorways and tunnels;

(15) checking firemen's outfits;

(16) confirming the deviation corrections for magnetic compasses;

(17) examining the navigational aids such as echo sounder, etc.;

(18) examining and testing the ship's navigation lights and flashing lights;

(19) test of the main and emergency sources of power for navigation lights;

(20) examining the ship's shapes, signal flags and smoke signals;

(21) examining the sound signal equipment;

(22) externally examining the main engine, propulsion system and auxiliary machineries, checking the utilization conditions and relevant records;

(23) confirming that means of escape for machinery spaces and accommodation spaces are clear of blockage;

(24) confirming the function of internal alarming and communication systems;

(25) examining the bilge drainage system and operation of bilge pumps;

(26) confirming the effectiveness of boilers, pressure vessels and their appurtenances including gauges and safety valves;

(27) confirming the function of main, emergency, interim emergency and reserve power sources;

(28) confirming the function of fire pumps;

(29) examining the motors and their control devices for steering gear, windlass, fire pumps, bilge pumps, etc.;

(30) confirming the provision, installation and function of radio-communication equipment;

(31) examining randomly the water ingress detection system and its alarm for single cargo tank ship fitted with water level detectors in the cargo tank;

(32) for oil tankers, the applicable items specified in 1.3.7.2(2)22 of this Chapter to be included;

(33) examining the auxiliary venting arrangements of cargo tanks;

(34) checking the validity of the relevant certificates, and that the ship is provided with all necessary documents;

(35) after a satisfactory annual survey, the Ship Safety Navigation Certificate is to be endorsed.

1.3.7.4 An intermediate survey is to consist of:

(1) the provisions of 1.3.7.3 of this Chapter;

(2) for ships over 5 years of age, an internal examination of representative spaces used for water ballast;

(3) for oil tankers over 10 years of age, an internal examination of selected cargo spaces;

(4) for dry cargo ships over 15 years of age, an internal examination of selected cargo spaces;

(5) confirming that the capacity of foam concentration or CO_2 and the effectiveness have been checked and their distribution pipes have been proved to be free from obstacles;

(6) a testing of all fire detection and alarm systems;

(7) an operation testing of the remote shut-down devices for fuel oil tanks, fuel oil pumps and ventilations in machinery spaces, and of the remote controls for opening and closing skylights and other openings;

(8) after a satisfactory intermediate survey, the Ship Safety Navigation Certificate is to be endorsed.

1.3.7.5 A renewal survey is to consist of:

(1) the applicable items as specified in 1.3.7.4 of this Chapter;

(2) internal examination of forepeak and afterpeak tanks, double bottom tanks, chain lockers and other tanks;

(3) examination of engine rooms;

(4) examination of cargo spaces;

(5) hose testing for watertight doors and hatch covers;

(6) launching and hook release testing for launching gear of lifeboats/rescue boats;

(7) operation testing for motor of lifeboats/rescue boats ahead and astern;

(8) closing testing for fans, ventilators and other openings in cargo holds;

(9) function testing for bilge systems;

(10) function testing for anchoring equipment;

(11) function testing for ruddering equipment;

(12) examining and testing the water ingress detection system and its alarm for single cargo tank ship fitted with water level detectors in the cargo tank;

(13) after a satisfactory renewal survey, the new Ship Safety Navigation Certificate is to be issued.

1.3.8 Surveys for issue of the Load Line Certificate (non-convention ships)

1.3.8.1 Surveys for issuing and maintaining the Load Line Certificate (non-convention ships) are to be carried out as follows:

(1) initial surveys;

(2) annual surveys;

(3) renewal surveys.

1.3.8.2 An initial survey is to consist of:

(1) examining the plans (see Appendix 2 for the List of Plans and Documents to be Submitted for Approval);

(2) confirming the stability calculations and loading manual;

(3) during construction and after installation, the survey is to include the following items and to be in accordance with the approved plans:

①checking that, as far as its strength is concerned, the ship has been constructed in accordance with the approved plans;

②confirming that the deck line and load line mark are properly assigned as required;

③examining the superstructure end bulkheads and the openings therein;

④examining the means of securing the weathertightness of cargo hatchways, other hatchways and other openings on the freeboard and superstructure decks and a hose testing to be carried out;

⑤examining the ventilators and air pipes including their coamings and closing devices;

⑥ examining the watertight integrity of the closures to any openings in the ship's side below the freeboard deck;

⑦examining the scuppers, inlets and discharges;

⑧examining the side scuttles and deadlights;

⑨examining the bulwarks including the provision of freeing ports;

⑩ examining the guardrails, gangways, walkways and other means provided for the protection of the crew and for gaining access to and from crew's quarters and working spaces;

⑪checking whether loading and ballast information are provided to the master;

⑫after a satisfactory initial survey, the Load Line Certificate (non-convention ships) is to be issued.

1.3.8.3 An annual survey is to consist of:

(1) checking of the positions of the deck line and load line;

(2) checking that no alterations have been made to the hull or superstructures that would affect the calculations determining the position of the load lines;

(3) examining the superstructure end bulkheads and the openings therein;

(4) examining the means of securing the weathertightness of cargo hatchways, their coamings, other hatchways and other openings on the freeboard and super-structure decks and, where necessary, a hose test to be carried out;

(5) examining the ventilators and air pipes including their coamings and closing devices;

(6) examining the watertight integrity of the closures to any openings in the ship's side below the freeboard deck;

(7) examining the scuppers, inlets and discharges;

(8) examining the side scuttles and deadlights;

(9) examining the bulwarks including the provision of freeing ports;

(10) examining the guardrails, gangways, walkways and other means provided for the protection of the crew and for gaining access to and from crew's quarters and working spaces;

(11) checking the validity of the relevant certificate, and that the ship is provided with all necessary documents;

(12) after a satisfactory annual survey, the Load Line Certificate (non-convention ships) is to be endorsed.

1.3.8.4 A renewal survey is to consist of:

(1) the provisions of 1.3.8.3 of this Chapter;

(2) confirming, in general, that the ship's hull is provided with sufficient strength at the certified draught;

(3) after a satisfactory renewal survey, the new Load Line Certificate (non-convention ships) is to be issued.

1.3.9 Surveys for issue of the Oil Pollution Prevention Certificate (non-convention ships)

1.3.9.1 Surveys for issuing and maintaining the Oil Pollution Prevention Certificate (non-convention ships) are to be carried out as follows:

(1) initial surveys;

(2) annual surveys;

(3) intermediate surveys;

(4) renewal surveys.

1.3.9.2 An initial survey is to consist of:

(1) examining the plans (see Appendix 2 for the List of Plans and Documents to be Submitted for Approval);

(2) during construction and after installation, the survey is to include the following items and be in accordance with the approved plans:

① confirming that the Products Certificate of Oil Pollution Prevention Equipment is available;

② confirming that the installation of oil pollution prevention equipment is in compliance with the design requirements and that the function test has been completed satisfactorily;

③ confirming that the Oil Record Book is available;

④ confirming the provision of the standard discharge connection;

(3) confirming that the ship is provided with all necessary documents;

(4) after a satisfactory initial survey, the Oil Pollution Prevention Certificate (non-convention ships) is to be issued.

1.3.9.3 An annual survey is to consist of:

(1) generally examining the oily-water separating equipment or oil filtering equipment, where necessary, testing the operation;

(2) generally examining the oil discharge monitoring and control system, where necessary, testing the automatic or manual operation of the means provided to stop the discharge of effluent;

(3) confirming the working conditions of the indicator and recorder for the discharge monitoring and control equipment;

(4) checking the qualification for sludge tanks and sump tanks and their discharge equipment;

(5) sampling examination for the discharge of oily-water or examining the analysis results of recent records;

(6) confirming that the standard discharge connection is provided;

(7) confirming the separation between fuel oil and water ballast system;

(8) confirming that no alterations have been made to oil pollution prevention systems;

(9) confirming that the oil pollution prevention systems are in compliance with the required provisions (if appropriate);

(10) checking the validity of the relevant certificates and records and that the ship is provided with all necessary documents;

(11) after a satisfactory annual survey, the Oil Pollution Prevention Certificate (non-convention ships) is to be endorsed.

1.3.9.4 An intermediate survey is to consist of:

(1) the provisions of 1.3.9.3 of this Chapter;

(2) examining the oily-water separating equipment or oil filtering equipment, including associated pumps, piping and fittings for wear and corrosion;

(3) examining the oil content meter (15 ppm alarm and bilge monitor) for obvious defects, deterioration or damage, and checking the calibration of the oil content meter;

(4) checking and confirming the effectiveness of oil pollution prevention equipment on board the oil tanker;

(5) checking the validity of the relevant certificates, and that the ship is provided with all necessary documents;

(6) after a satisfactory intermediate survey, the Oil Pollution Prevention Certificate (non-convention ships) is to be endorsed.

1.3.9.5 A renewal survey is to consist of:

(1) the provisions of 1.3.9.4 of this Chapter;

(2) an operation test for the oily-water separating equipment or oil filtering equipment;

(3) an operation test for the oil discharge monitoring system or oil filtering system alarm;

(4) an operation test for the manual or automatic means provided to stop the discharge of effluent;

(5) after a satisfactory renewal survey, the new Oil Pollution Prevention Certificate (non-convention ships) is to be issued.

1.3.10 Surveys for issue of the Sewage Pollution Prevention Certificate (non-convention ships)

1.3.10.1 Surveys for issuing and maintaining the Sewage Pollution Prevention Certificate (non-convention ships) are to be carried out as follows:

(1) initial surveys;

(2) renewal surveys.

1.3.10.2 An initial survey is to consist of:

(1) examining the plans (see Appendix 2 for the List of Plans and Documents to be Submitted for Approval);

(2) during construction and after installation, the survey is to include the following survey items and be in accordance with the approved plans:

① confirming that the Products Certificate of the Sewage Treatment Plant is valid;

② confirming that the installation of equipment and tests of systems have been satisfactorily completed.

(3) after a satisfactory initial survey, the Sewage Pollution Prevention Certificate (non-convention ships) is to be issued.

1.3.10.3 The requirements for the renewal survey are to be the same as specified in 1.3.10.2(2) of this Chapter. After a satisfactory renewal survey, the new Sewage Pollution Prevention Certificate (non-convention ships) is to be issued.

1.3.11 Surveys for issue of the Air Pollution Prevention Certificate (non-convention ships)

1.3.11.1 Surveys for issuing and maintaining the Air Pollution Prevention Certificate (non-convention ships) are to be carried out as follows:

(1) initial surveys;

(2) annual surveys;

(3) intermediate surveys;

(4) renewal surveys.

1.3.11.2 An initial survey is to consist of:

(1) examining the plans (see Appendix 2 for the List of Plans and Documents to be Submitted for Approval):

①examining the arrangements for systems using ozone-depleting substances;

②examining the arrangements for shipboard incinerators, if applicable.

(2) during construction and after installation, the survey is to include the following survey items and be in accordance with the approved plans:

① confirming that installation using ozone depleting substances is well fitted and operated and free from leaks of ozone-depleting substances;

② confirming that all engines which are required to be certified are surveyed and certified in accordance with section 2.2 of the IMO NO_x Technical Code:

(a) if engine parameter check method is used, an onboard verification survey in accordance with section 6.2 of the IMO NO_x Technical Code;

(b) if the simplified method is used, an onboard verification survey in accordance with section 6.3 of the IMO NO_x Technical Code;

③ Shipboard Incinerators (installed on or after 1 September 2009):

(a) confirming that each incinerator is correctly installed and well operated;

(b) confirming that the manufacturer's name, incinerator model number/type and capacity in heat units per hour is permanently marked on the incinerator;

(3) An initial survey is also to consist of the examination of the validity of onboard certificates and documents:

① documents listed in 1.3.11.3(1) of this Chapter, excluding the bunker delivery note specified in 1.3.11.3 (1)③;

(4) after a satisfactory initial survey, the Air Pollution Prevention Certificate (non-convention ships) is to be issued.

1.3.11.3 An annual survey is to consist of:

(1) examining the validity of relevant certificates and checking the following documents:

①confirm that there are Engine International Air Pollution Prevention (EIAPP) Certificates for each engine, required to be certified, as described in chapter 2.1 of the IMO NO_x Technical Code;

②confirm that there is on board an approved Technical File for each engine;

③confirm that there are bunker delivery notes on board and the required fuel oil samples are kept;

④confirm that there is, if required, an IMO Type Approval Certificate for each incinerator on board;

⑤confirm that there is a record book of engine parameters for each engine required to be certified in the case where the engine parameter check method is used as a means of onboard NO_x verification;

⑥confirm that there is an instruction manual for each incinerator installed on or after 1 September 2009.

(2) The annual survey for ozone-depleting substances is to consist of:

①confirming that no new installation or equipment containing ozone depleting substances have been fitted after 1 September 2009;

②confirming that no installations containing hydro-chlorofluocarbons (HCFCs) have been fitted after 1 January 2020;

③examining externally any installation or equipment as far as practicable to ensure satisfactory maintenance and that there are no emissions of ozone-depleting substances.

(3) The annual survey for nitrogen oxide emissions from diesel engine is to consist of:

①if engine parameter check method is used:

(a) review engine documentation contained in the Technical File and the record book of engine parameters to check, as far as practicable, engine rating, duty and limitation/restrictions as given in the Technical File;

(b) confirm that the engine has not undergone any modifications or adjustments outside the options and ranges permitted in the Technical File since the last survey;

(c) conduct survey as detailed in the Technical File;

②if the simplified method is used:

(a) review engine documentation contained in the Technical File;

(b) confirm that the test procedure is approved by the Administration;

(c) confirm that the analysers, engine performance sensors, ambient condition measurement equipment and other test equipment are the correct type and have been calibrated in accordance with the IMO NO_x Technical Code;

(d) confirm that the correct test cycle, as defined in the engine's Technical File, is used for this onboard confirmation test measurements;

(e) ensure that a fuel sample is taken during the test and submitted for analysis;

(f) witness the test and confirm that a copy of the test report has been submitted for approval on completion of the test;

③if the direct measurement and monitoring method is used:

(a) review engine documentation and Technical File, and check that the direct measurement monitoring manual has been approved by the Administration;

(b) the procedures to be checked in the direct measurement and monitoring method and the data obtained as given in the approved onboard monitoring manual are to be followed.

(4) The annual survey for sulphur oxides is to consist of:

①checking the bunker delivery note to verify that the fuel with satisfactory sulphur content has been used;

(5) The annual survey for incinerator is to consist of:

①confirming from an external examination that each incinerator is in a generally satisfactory condition and free from leaks of gas or smoke;

(6) after a satisfactory completion of annual survey, the Air Pollution Prevention Certificate (non-convention ships) is to be endorsed.

1.3.11.4 An intermediate survey is to consist of:

(1) the provisions of 1.3.11.3 of this Chapter;

(2) after a satisfactory completion of intermediate survey, the Air Pollution Prevention Certificate (non-convention ships) is to be endorsed.

1.3.11.5 A renewal survey is to consist of:

(1) the provisions of 1.3.11.3 of this Chapter;

(2) confirming, if necessary by simulated test or equivalent, the satisfactory operation of the alarms and safety devices of incinerators;

(3) after a satisfactory completion of renewal survey, the new Air Pollution Prevention Certificate (non-convention ships) is to be issued.

Appendix 1 Applicable Certificates for Non-convention Ships Engaged on International Voyages

1 Applicable Certificates for Self-propelled Cargo Ships of Less than 500 Gross Tonnage

No.	Type of certificate	Validity	Remarks	Technical and survey requirements to be complied with
1	Ship Safety Navigation Certificate	Not exceeding 5 years	For ships of 300 gross tonnage and above, the Cargo Ship Safety Radio Certificate and its Record of Equipment in compliance with SOLAS are to be issued	The Guidelines
	Cargo Ship Safety Radio Certificate	Not exceeding 5 years	Ships of 300 gross tonnage and above	SOLAS Chapter IV
2	International Load Line Certificate	Not exceeding 5 years	Ships of 24 m in length and upwards	LL Protocol 88
3	International Load Line Exemption Certificate	Not exceeding 5 years	Ships of 24 m in length and upwards	LL Protocol 88
4	Load Line Certificate (non-convention ships)	Not exceeding 5 years	Ships of less than 24 m in length	The Guidelines
5	International Tonnage Certificate	Full-term valid under normal case		International Convention on Tonnage Measurement of Ships, 1969
6	International Oil Pollution Prevention Certificate	Not exceeding 5 years	Ships other than oil tankers of 400 gross tonnage and above and oil tankers of 150 gross tonnage and above	MARPOL Annex I
7	Oil Pollution Prevention Certificate (non-convention ships)	Not exceeding 5 years	Ships other than oil tankers of less than 400 gross tonnage and oil tankers of less than 150 gross tonnage	MARPOL Annex I (technical requirements) The Guidelines (requirements for surveys and certification)
8	International Sewage Pollution Prevention Certificate	Not exceeding 5 years	Ships of 400 gross tonnage and above or ships certified to carry 15 persons or more	MARPOL Annex IV
9	Sewage Pollution Prevention Certificate (non-convention ships)	Not exceeding 5 years	Ships of less than 400 gross tonnage and certified to carry less than 15 persons	MARPOL Annex IV (technical requirements) The Guidelines (requirements for surveys and certification)

No.	Type of certificate	Validity	Remarks	Technical and survey requirements to be complied with
10	Statement of Garbage Pollution Prevention from Ships			MARPOL Annex V
11	International Air Pollution Prevention Certificate	Not exceeding 5 years	Ships of 400 gross tonnage and above	MARPOL Annex VI
12	Air Pollution Prevention Certificate (non-convention ships)	Not exceeding 5 years	Ships of less than 400 gross tonnage	MARPOL Annex VI (technical requirements) The Guidelines (requirements for surveys and certification)
13	International Energy Efficiency Certificate	Full-term valid under normal case	Ships of 400 gross tonnage and above	MARPOL Annex VI
14	International Anti-fouling system Certificate	Full-term valid under normal case	Ships of 400 gross tonnage and above	International Convention on the Control of Harmful Anti-Fouling System on Ships, 2001
15	Declaration on Anti-Fouling System	Full-term valid under normal case	Ships of 24 m in length and upwards but less than 400 gross tonnage are to carry a Declaration on Anti-fouling System signed by shipowner or owner's authorized agent or not, which is required to accompanies by appropriate documentation (such as painting receipt or a contractor invoice) or contain appropriate endorsement	International Convention on the Control of Harmful Anti-Fouling System on Ships, 2001
16	Certificate of Inspection of Crew Accommodation Equipment			For new buildings, applicable s hips are to comply w ith International Marine Labour Convention, 2006 as specified by the flag State Administration; For existing ships, applicable ships are to comply with ILO Convention No.92 and ILO Convention No.133 as specified by the flag State Administration

No.	Type of certificate	Validity	Remarks	Technical and survey requirements to be complied with
17	Statement of Compliance of Inspection of Crew Accommodation Equipment		1 Requirements of the flag State Administrations of countries that have not ratified ILO Convention, or 2 Upon shipowner's voluntary application	For new buildings, applicable ships are to comply with International Marine Labour Convention, 2006 as recommended by the flag State Administration; For existing ships, applicable ships are to comply with ILO Convention No.92 and ILO Convention No.133 as recommended by the flag State Administration
18	Register of Ship's Lifting Appliances and Cargo Handling Gear	Not exceeding 5 years		ISC Rules for Lifting Appliances of Ships and Offshore Installations
19	Document of Compliance (Special Requirements for Ships Carrying Dangerous Goods)			SOLAS Regulation II-2/19
20	DOC of offshore supply vessel		Ships of 24 m in length and upwards	Guidelines for the Design and Construction of Offshore Supply Vessels, 2006
21	Fitness certificate of Transporting of Limited Amounts of Hazardous and Noxious Liquid Substances in Bulk on Offshore Supply Vessels	Not exceeding 5 years		Guidelines for the Transport and Handling of Limited Amounts of Hazardous and Noxious Liquid Substances in Bulk on Offshore Supply Vessels
22	International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances in Bulk	Not exceeding 5 years		MARPOL Annex II
23	International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk	Not exceeding 5 years		International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk
24	International Certificate of Fitness for the Carriage of Liquefied Gases in Bulk	Not exceeding 5 years		International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk

2 Applicable Certificates for Non-Self-Propelled Ships

No.	Type of certificate	Validity	Remarks	Technical and survey requirements to be complied with
1	Ship Safety Navigation Certificate	Not exceeding 5 years		The Guidelines
2	International Load Line Certificate	Not exceeding 5 years	Ships of 24 m in length and upwards	LL Protocol 88
3	International Load Line Exemption Certificate	Not exceeding 5 years	Ships of 24 m in length and upwards	LL Protocol 88
4	Load Line Certificate (non-convention ships)	Not exceeding 5 years	Ships of less than 24 m in length	The Guidelines
5	International Tonnage Certificate	Full-term valid under normal case		International Convention on Tonnage Measurement of Ships, 1969
6	International Oil Pollution Prevention Certificate	Not exceeding 5 years	Ships other than oil tankers of 400 gross tonnage and above and oil tankers of 150 gross tonnage and above	MARPOL Annex I
7	Oil Pollution Prevention Certificate (non-convention ships)	Not exceeding 5 years	Ships other than oil tankers of less than 400 gross tonnage and oil tankers of less than 150 gross tonnage	MARPOL Annex I (technical requirements) The Guidelines (requirements for surveys and certification)
8	International Sewage Pollution Prevention Certificate	Not exceeding 5 years	Ships of 400 gross tonnage and above (manned) or ships certified to carry 15 persons or more	MARPOL Annex IV
9	Sewage Pollution Prevention Certificate (non-convention ships)	Not exceeding 5 years	Ships of less than 400 gross tonnage and certified to carry 1 to 15 persons	MARPOL Annex IV (technical requirements) The Guidelines (requirements for surveys and certification)
10	International Air Pollution Prevention Certificate	Not exceeding 5 years	Ships of 400 gross tonnage and above	MARPOL Annex VI
11	Air Pollution Prevention Certificate (non-convention ships)	Not exceeding 5 years	Ships of less than 400 gross tonnage	MARPOL Annex VI (technical requirements) The Guidelines (requirements for surveys and certification)
12	International Anti-fouling system Certificate	Full-term valid under normal case	Ships of 400 gross tonnage and above	International Convention on the Control of Harmful Anti-Fouling System on Ships, 2001
13	Declaration on Anti-Fouling System	Full-term valid under normal case	Ships of 24 m in length and upwards but less than 400 gross tonnage	International Convention on the Control of Harmful Anti-Fouling System on Ships, 2001

No.	Type of certificate	Validity	Remarks	Technical and survey requirements to be complied with
14	Certificate of Inspection of Crew Accommodation Equipment			For new buildings, applicable ships are to comply with International Marine Labour Convention, 2006 as specified by the flag State Administration; For existing ships, applicable ships are to comply with ILO Convention No.92 and ILO Convention No.133 as specified by the flag State Administration
15	Statement of Compliance of Inspection of Crew Accommodation Equipment		1 Requirements of the flag State Administrations of countries that have not ratified ILO Convention, or 2 Upon shipowner's voluntary application	For new buildings, applicable ships are to comply with International Marine Labour Convention, 2006 as recommended by the flag State Administration; For existing ships, applicable ships are to comply with ILO Convention No.92 and ILO Convention No.133 as recommended by the flag State Administration
16	Register of Ship's Lifting Appliances and Cargo Handling Gear	Not exceeding 5 years		ISC Rules for Lifting Appliances of Ships and Offshore Installations
17	Document of Compliance (Special Requirements for Ships Carrying Dangerous Goods)			SOLAS Regulation II-2/19
18	Special Purpose Ship Safety Certificate	Not exceeding 5 years	Ship Safety Navigation Certificate may be superseded upon shipowner's voluntary application	Code of Safety for Special Purpose Ships, 2008
19	DOC of International Ballast Water Management		Upon shipowner's voluntary application	International Convention for the Control and Management of Ships' Ballast Water and Sediments
20	Statement of Compliance on Inventory of Hazardous Materials		Upon shipowner's voluntary application	
21	International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances in Bulk	Not exceeding 5 years		MARPOL Annex II
22	International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk	Not exceeding 5 years		International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk
23	International Certificate of Fitness for the Carriage of Liquefied Gases in Bulk	Not exceeding 5 years		International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk

Appendix 2 List of Plans and Documents to be Submitted

1 General Requirements

1.1 This Appendix gives a list of plans and documents to be submitted for approval (or for information) for the purpose of obtaining the certificates as provided in 1.3.7 to 1.3.11 of this Chapter. For the list of plans and documents to be submitted (or for information) for the purpose of obtaining other certificates and Document of Compliance as provided in 1.2 of this Chapter, see relevant requirements of flag State Administrations.

1.2 The plans and documents may be different for each ship but the list as a minimum is to be contained. Where any repetition of above-mentioned plans and documents to be submitted occurs, only one copy is required.

2 List of Plans and Documents to be Submitted for Issuing Ship Safety Navigation Certificate

2.1 Hull

(1) General arrangement;

(2) Calculations of intact stability;

(3) Calculations of damage stability (if required);

(4) Fire zone division plan;

(5) ship’s insulation arrangement;

(6) ship’s deck covering arrangement;

(7) typical nodal point plan of fire structure;

(8) Fire control plan;

(9) Arrangement of ship’s ventilation and air-conditioning system;

(10) Arrangement of life-saving appliances;

(11) Arrangement of signal equipment;

(12) Arrangement of doors and windows;

(13) Damage control plan (if required);

(14) Arrangement of lashing of deck cargoes;

(15) Arrangement, calculations and instructions concerning the operation of cross-flooding arrangements (if any);

(16) Lines and offsets (for information);

(17) Capacity plan (for information);

(18) Hydrostatic curve or data (for information);

(19) Cross curves or data (for information);

(20) Tonnage calculations (for information);

(21) Operating manual for semi-submerged operation of semi-submersible vessel.

2.2 Machinery

(1) Arrangement of engine room and boiler room;

(2) Bilge piping and ballast piping;

(3) Fuel oil systems for main and auxiliary engines and boilers;

(4) Lubricating oil piping systems for main and auxiliary engines;

(5) Cooling water piping systems for main and auxiliary engines;

(6) Compressed air piping system;

(7) Steam piping system;

(8) Exhaust piping systems for main and auxiliary engines and boilers;

(9) Ventilation piping systems for engine room;

(10) Electro-hydraulic system for steering gear;

(11) Water fire main system;

(12) Fixed fire-extinguishing system;

(13) Additional requirements for oil tankers:

① Cargo piping systems;

② Bilge piping systems of cargo pump rooms and cofferdams;

③ Arrangement of vent system;

④ Ventilation systems of cargo pump rooms.

2.3 Electrical

(1) Diagrams of power system;

(2) Arrangement of main electrical power equipment;

(3) Schematic diagrams of main lighting;

(4) Arrangement of main lighting;

(5) Schematic diagrams of emergency lighting and temporary emergency lighting;

(6) Arrangement of emergency lighting and temporary emergency lighting;

(7) Schematic diagrams of internal communication system, which is to include commanding telephone and engineers' alarm systems;

(8) Arrangement of internal communication system, which is to include commanding telephone and engineers' alarm systems;

(9) Plan of internal alarm system, which is to include fire detection and fire alarm, pre-warnings for the release of extinguishing media, general emergency alarm and watertight door closing alarm systems;

(10) Arrangement of internal alarm system, which is to include fire detection and fire alarm, pre-warnings for the release of extinguishing media, general emergency alarm and watertight door closing alarm systems;

(11) Plan of division of dangerous zones (applicable to oil tankers or ships carrying explosive dangerous cargoes);

(12) Schematic diagrams of navigation lights and signal lights;

(13) Arrangement of navigation lights and signal lights;

(14) Schematic diagrams of electrical power-driven whistles;

(15) Schematic diagrams of navigational equipment;

(16) Arrangement of navigational equipment;

(17) Plan of radio-communication system;

(18) Arrangement of radio-communication equipment;

(19) Arrangement of antenna;

(20) Capacity calculations of reserve source of energy.

2.4 Periodically unattended machinery spaces

(1) Items of safety system;

(2) Plans of automatic and remote control systems of main and auxiliary engines;

(3) List of monitored and alarm points, which is to include displays of alarm signals;

(4) Schematic diagrams of power supply to automated system.

3 List of Plans and Documents to be Submitted for Issuing Load Line Certificates (non-convention ships)

3.1 Load line mark;

3.2 Arrangement of weathertight doors and windows;

3.3 Arrangement of ventilators (natural ventilation, mechanical ventilation, air conditioning);

3.4 Arrangement of guardrails, handrails, safety passageways and safety lines;

3.5 Arrangement of gangways (for type A ships);

3.6 Arrangement of small hatchways;

3.7 Structure of cargo hatch coamings;

3.8 Arrangement and structure of cargo hatch covers (including the strength calculations);

3.9 Structure of engine casings;

3.10 Arrangement of air pipes;

3.11 Arrangement of scuppers, inlets and discharges;

3.12 Arrangement of freeing ports;

3.13 Calculations of buoyancy reserve (for semi-submersible vessel, for information);

3.14 Calculations of ship’s strength including longitudinal strength (for information);

3.15 Calculations of intact stability (for information);

3.16 Calculations of damage stability (for offshore supply vessels, for information);

3.17 General arrangement (for information);

3.18 Lines (for information);

3.19 Construction profile (for information);

3.20 Transverse section (for information);

3.21 Hydrostatic curve or data (for information);

3.22 Instructions for operating load lines of semi-submersible vessel (for information);

3.23 Maximum submerged depth draught mark (semi-submersible vessel, for information);

3.24 Freeboard calculations (for information).

4 List of Plans and Documents to be Submitted for Issuing Oil Pollution Prevention Certificates (non-convention ships)

4.1 Arrangement of bilge processing and control systems in machinery spaces;

4.2 Arrangement of oil-water ballast isolating appliances (if any) and systems in oil fuel tanks;

4.3 Arrangement of sludge tanks, including their capacity and that of the sludge pump and the standard discharge connections;

4.4 Arrangement and systems of oily-water tanks, including the calculations of the capacity in oil tankers;

4.5 Drainage piping systems of oily-water and ballast water in oil tankers;

4.6 Size and arrangement of cargo tanks of oil tankers, including damage assumptions, hypothetical outflow and size of cargo tanks;

4.7 Arrangement of operation appliances in special zones of oil tankers;

4.8 Shipboard oil pollution emergency plan.

5 List of Plans and Documents to be Submitted for Issuing Sewage Pollution Prevention Certificates (non-convention ships)

5.1 Schematic diagram of sewage, including standard discharge connection;

5.2 Instruction of processing arrangements for sewage pollution prevention (for information).

6 List of Plans and Documents to be Submitted for Issuing Air Pollution Prevention Certificates (non-convention ships)

6.1 Arrangements for systems using ozone-depleting substances;

6.2 Arrangements for shipboard incinerators, if applicable.

Chapter 2 Tonnage Measurement

2.1 General requirements

2.1.1 Tonnage measurement of non-convention ships is to be conducted in accordance with the International Convention on Tonnage Measurement of Ships, 1969.

2.1.2 The tonnages of ships are to be measured in m^3. All measurement used in the calculation of volumes is to be taken to the second decimal place. The calculated gross tonnage and net tonnage are to be taken as the rounded number with no decimal counted.

2.1.3 All volumes included in the calculation of gross tonnages are to be measured to the inner surface of the shell in ships constructed of metal, and to the outer surface of the shell in ships constructed of any other material.

Chapter 3 Load Lines

3.1 General requirements

3.1.1 Paragraphs 3.2 to 3.3 of this Chapter apply to ships of less than 24 m in length. Unless otherwise specified by this Chapter, the load lines of ships of 24 m in length and upwards are to comply with the requirements of the amended 1988 LL Protocol.

3.1.2 Paragraphs 3.4 to 3.6 of this Chapter apply to live fish carriers, floating cranes, and open hopper dredgers and barges fitted with means of opening at their bottom and non-self-propelled semi-submersible vessels.

3.1.3 For ship the load lines of which are marked in accordance with this Chapter, the strength of the ship is to comply with relevant requirements of ISC Rules for Classification of Sea-going Steel Ships, and the stability and subdivision are to comply with relevant requirements of this Chapter. If the freeboard assigned in accordance with this Chapter is inconsistent with that determined by strength and stability, the greatest is to be taken.

3.1.4 Except as provided in paragraph 3.1.5 of this Chapter , the appropriate load lines on the sides of the ship corresponding to the season of the year and the zone or area in which the ship may be are not to be submerged at any time when the ship puts to sea, during the voyage or on arrival.

3.1.5 When a ship departs from a port situated on a river or inland waters, deeper loading is to be permitted corresponding to the weight of fuel and all other materials required for consumption between the point of departure and the sea.

3.1.6 Terms and definitions used in this Chapter are the same as those defined in 1988 LL Protocol.

3.1.7 The marking and recording of the load line mark and lines to be used with this mark are to comply with the requirements of Chapter 1 of 1988 LL Protocol, as shown in Figure 3.1.7 below.

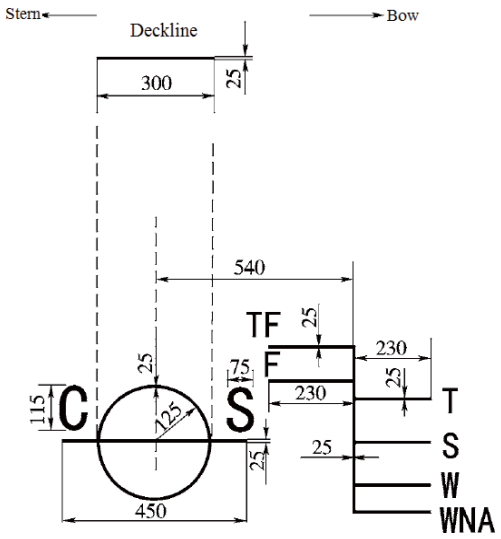


Figure 3.1.7

3.1.8 The Winter Load Line, Winter North Atlantic Load Line and Fresh Water Load Line may be marked as necessary.

3.2 Conditions of assignment of freeboard

3.2.1 General requirements

Unless otherwise specified in paragraphs 3.2.2 to 3.2.10 of this Chapter, all conditions of assignment of freeboard are to comply with the requirements of Chapter 2 of 1988 LL Protocol.

3.2.2 Doors

(1) All access openings in bulkheads at ends of enclosed superstructures are to be fitted with doors of steel or other equivalent material, permanently and strongly attached to bulkhead, and framed, stiffened and fitted so that the whole structure is of equivalent strength to the unpierced bulkhead and weathertight when closed. The means for securing these doors weathertight are to consist of gaskets and clamping devices or equivalent means and are to be permanently attached to the bulkheads or to the doors themselves. The doors are to be so arranged that they can be operated from both sides of the bulkhead and are to open outwards.

(2) Unless otherwise specified in 3.2.7(3) of this Chapter, the height of the sill of access openings in bulkheads at ends of enclosed superstructures is to be at least 300 mm above the deck.

3.2.3 Cargo and other hatchways

The construction and the means for securing the weathertightness of cargo and other hatchways in positions 1 and 2 are to be at least equivalent to the requirements of 3.2.4 or 3.2.5 of this Chapter.

3.2.4 Hatchways closed by portable covers and secured weathertight by tarpaulins and battening devices

(1) The coamings of hatchways closed by portable covers secured weathertight by tarpaulins and battening devices are to be of substantial construction, and their height above the deck is to be at least as follows:

450 mm if in position 1;

300 mm if in position 2.

(2) Where covers are made of mild steel the strength is to be calculated with assumed loads of not less than 1 metric tons per square metre on hatchways in position 1, and not less than 0.75 metric tons per square metre on hatchways in position 2, and the product of the maximum stress thus calculated and the factor 4.25 are not to exceed the minimum ultimate strength of the material. They are to be so designed as to limit the deflection to not more than 0.0028 times the span under these loads.

3.2.5 Hatchways closed by weathertight covers of steel or other equivalent material fitted with gaskets and clamping devices

(1) At positions 1 and 2 the height above the deck of hatchway coamings fitted with weathertight hatch covers of steel or other equivalent material fitted with gaskets and clamping devices is to be as specified in 3.2.4(1) of this Chapter.

(2) Where weathertight covers are of mild steel, the strength is to be calculated as provided for in 3.2.4(2) of this Chapter.

3.2.6 Machinery space openings

Machinery space openings in position 1 and 2 are to be properly framed and efficiently enclosed by steel casings of ample strength. Access openings in such casings are to be fitted with doors complying with the requirements of 3.2.2(1) of this Chapter, the sills of which are to be at least 450 mm above the deck if in position 1, and at least 300 mm above the deck if in position 2. Other openings in such casings are to be fitted with equivalent covers, permanently attached in their proper positions.

3.2.7 Openings in freeboard and superstructure decks

(1) Manholes and flush scuttles in position 1 or 2 or within superstructures other than enclosed superstructures are to be closed by substantial covers capable of being made watertight. Unless secured by closely spaced bolts, the covers are to be permanently attached.

(2) Openings in freeboard decks other than hatchways, machinery space openings, manholes and flush scuttles are to be protected by an enclosed superstructure, or by a deckhouse or companionway of equivalent strength and weathertightness. Any such opening in an exposed superstructure deck or in the top of a deckhouse on the freeboard deck which gives access to a space below the freeboard deck or a space within an enclosed superstructure is to be protected by an efficient deckhouse or companionway. Doorways in such deckhouses or companionways are to be fitted with doors complying with the requirements of 3.2.2(1) of this Chapter.

(3) In position 1 the height above the deck of sills to the doorways in companionways is to be at least 450 mm. In position 2 it is to be at least 300 mm.

3.2.8 Ventilators

(1) Ventilators in position 1 or 2 to spaces below freeboard decks or decks of enclosed superstructures are to have coamings of steel or other equivalent material, substantially constructed and efficiently connected to the deck. Where the coaming of any ventilator exceeds 900 mm in height it is to be specially supported.

(2) Ventilators passing through superstructures other than enclosed superstructures are to have substantially constructed coamings of steel or other equivalent material at the freeboard deck.

(3) Ventilators in position 1 are to have coamings of a height of at least 600 mm above the deck; in position 2 the coaming is to be of a height at least 300 mm above the deck. They are to be provided with efficient weathertight closing appliances which are to be conveniently stowed near the ventilators to which they are to be fitted.

(4) Ventilators in position 1 the coamings of which extend to more than 2.5 m above the deck, and in position 2 the coamings of which extend to more than 1.0 m above the deck, need not be fitted with closing arrangements unless specifically required.

3.2.9 Air pipes

Where air pipes to ballast and other tanks extend above the freeboard or superstructure decks, the exposed parts of the pipes are to be of substantial construction; the height from the deck to the point where water may have access below is to be at least 600 mm on the freeboard deck and 300 mm on the superstructure deck. Where these heights may interfere with the working of the ship, a lesser height may be approved, but in no case to be less than 150 mm. Air pipes are to be provided with automatic closing devices.

3.2.10 Protection of the crew

(1) The strength of the deckhouses used for the accommodation of the crew is to be acceptable.

(2) Guard rails or bulwarks are to be fitted around all exposed decks. The height of the bulwarks or guard rails is to be at least 1 m from the deck, provided that where this height would interfere with the normal operation of the ship, a lesser height may be approved if additional protection (e.g. efficient handrails are fitted in sides and ends of superstructure and deckhouse) is provided but in no case a height of less than 0.4 m is to be permitted.

(3) The opening below the lowest course of the guard rails is not to exceed 230 mm. The other courses are to be not more than 380 mm apart. In the case of ships with rounded gunwales the guard rail supports are to be placed on the flat of the deck.

(4) Satisfactory means (in the form of guard rails, life lines, gangways or underdeck passages etc.) are to be provided for the protection of the crew in getting to and from their quarters, the machinery space and all other parts used in the necessary work of the ship. If a gangway is provided as the means for protection, it is to be constructed of fire resistant and non-slip material.

(5) Deck cargo carried on any ship is to be so stowed that any opening which is in way of the cargo and which gives access to and from the crew's quarters, the machinery space and all other parts used in the necessary work of the ship, can be properly closed and secured against the admission of water. Effective protection for the crew in the form of guard rails or life lines is to be provided above the deck cargo if there is no convenient passage on or below the deck of the ship.

3.3 Freeboard

3.3.1 Calculation of basic freeboard

The basic freeboard F is obtained from the formula:

$$F = 50 + 150L/24$$

where: L = length of ship in m;
F = freeboard in mm.

3.3.2 Correction to the freeboard

(1) Corrections to the basic freeboard are to be applied in accordance with the applicable provisions of 1988 LL Protocol.

(2) Unmanned barges which have on the freeboard deck only small access openings closed by watertight gasketed covers of steel or equivalent material may be assigned a freeboard 25% less than those calculated and corrected.

3.3.3 Minimum freeboards of seasons

(1) The freeboard in salt water in summer, as calculated and corrected in accordance with 3.3.1 and 3.3.2(1) of this Chapter, but without the correction for deck line, is not to be less than 50 mm. For ships having hatchways with covers in position 1 which do not comply with the requirements of 3.2.4(2) or 3.2.5 of this Chapter, the freeboard is not to be less than 150 mm.

(2) The minimum freeboard in the tropical zone without the correction for deck line is not to be less than 50 mm. For ships having hatchways with covers in position 1 which do not comply with the requirements 3.2.4(2) and 3.2.5 of this Chapter, the freeboard is not to be less than 150 mm.

(3) The assigning of freeboards of other seasons is the same as required in regulation 40 of 1988 LL Protocol.

3.3.4 Minimum bow height

(1) The bow height, defined as the vertical distance at the forward perpendicular between the waterline corresponding to the assigned summer freeboard and the designed trim and the top of the exposed deck at side, is not to be less than:

$$56L(1-\frac{L}{500})\frac{1.36}{C_b+0.68} \quad \text{mm}$$

where: L is the length of ship, as defined in 2.3(3) in General of the Guidelines, in m;
C_b is the block coefficient, as defined in 1988 LL Protocol.

(2) Where the bow height required in (1) above is obtained by sheer, the sheer is to extend for at least 15% of the length of the ship measured from the forward perpendicular. Where it is obtained by fitting a superstructure, such superstructure is to extend from the stem to a point at least 0.07L abaft the forward perpendicular, and is to be enclosed as defined in regulation 3(10)(b) of 1988 LL Protocol.

(3) Ships which, to suit exceptional operational requirements, cannot meet the requirements of (1) and (2) above may be given special consideration by ISC.

(4) Minimum bow height may not be required for unmanned barge during voyage.

3.4 Additional provisions for live fish carriers

3.4.1 Definitions

(1) Live fish carrier means a ship the cargo hold of which is loaded with live fish and seawater, and the seawater within the hold may be in overflowed condition or interflow with external seawater during the voyage.

(2) Overflowed condition means the condition in which the height of the seawater within the cargo hold is maintained at a certain level during voyage by means of the facilities as specified in 3.4.2(1) of this Chapter.

(3) Interflow condition means the condition in which seawater within cargo holds and external seawater will interflow during voyage by means of the facilities as specified in 3.4.2(2) of this Chapter.

3.4.2 Conditions of assignment of freeboard

(1) For ships in which the cargo hold is in overflowed condition due to continuous circulation of the seawater within the hold, hatchways may not be fitted with hatch covers, but sufficient freeing ports are to be provided on hatch coamings, and the total area of freeing ports is not to be less than 10% of that of the hatch coamings.

(2) Where the seawater within the cargo hold and external seawater interflow by means of the following facilities, hatchways are to be fitted with hatch covers and cover securing devices, but weathertightness is not required.

① Fish loading ports are to be fitted in the shell plating below the waterlines on both sides of the ship, and the closing arrangement is not to prevent the interflow of seawater within cargo holds and external seawater, or

② Circulation piping arrangements are to be provided in the bilge as appropriate, and the number of inlets and outlets is to be such as to ensure that seawater within cargo holds and external seawater will interflow.

(3) Where the height of the coaming of a cargo hold is less than 1 m and no hatch cover is provided, guard rails of an overall height not less than 1.3 m above the deck are to be fitted.

3.4.3 Freeboard

Ships of 24 m in length and upwards are to be of type ‘B’ freeboard in accordance with 1988 LL Protocol.

3.5 Additional provisions for marking of operating draught of offshore working ships

For floating cranes, and open hopper dredgers and barges fitted with means of opening at their bottom, the maximum operating draught may be assigned and such draught appropriately marked in accordance with Section 13, Chapter 1 of PART TWO of ISC Rules for Classification of Sea-going Steel Ships.

3.6 Special requirements for non-self-propelled semi-submersible vessels

3.6.1 Definitions

(1) Non-self-propelled semi-submersible vessel (hereinafter referred to as “semi-submersible vessel”) means a non-self-propelled ship designed to load and unload cargoes in a semi-submerged condition, with large open weather cargo deck and fitted with a forward or aft high superstructure or deckhouse or pontoon.

(2) Semi-submerged condition means any condition in which the lifting cargo deck is submerged and reserve buoyancy is provided by the superstructure or deckhouse or pontoon only.

(3) Lifting cargo deck means the open deck which is used for the carriage of goods and is submerged during loading and unloading cargoes.

(4) Maximum submerged depth means the maximum draft to which the vessel is allowed to be submerged in semi-submerged operation conditions.

3.6.2 Reserve buoyance in semi-submerged operation conditions

At the maximum submerged depth, the ratio of reserve buoyancy (ratio of the reserve buoyancy to the displacement at this draught) is to comply with the following requirements:

(1) the ratio of reserve buoyance above the maximum submerged depth waterline and below the first tier deck is not to be less than 5%; or

(2) the ratio of reserve buoyance above the maximum submerged depth waterline and below the second tier deck is not to be less than 5%, but the ratio of reserve buoyance above the maximum submerged depth waterline and below the first tier deck is not to be less than 3.5%.

3.6.3 Tightness in semi-submerged operation conditions

(1) Weather deck, shell plating, side and end bulkheads of superstructure or deckhouse or pontoon above the maximum submerged depth waterline and below the first tier deck and all the means of closing for openings in these locations are to be of sufficient strength to ensure the watertightness. Sidescuttles are to be located at least 1 m above the maximum submerged depth waterline. The watertight door below the maximum submerged depth waterline is to be of the power-operated sliding type, and a second power-operated watertight door in other form is to be fitted. Water leakage monitoring device and appropriate drainage facilities are to be provided between the two watertight doors.

(2) Shell plating, side and end bulkheads of superstructure or deckhouse or pontoon between the first tier and second tier decks above the maximum submerged depth waterline and all the means of closing for openings in these locations are to be of sufficient strength to ensure the weathertightness. The height between the first and second tier decks above the maximum submerged depth waterline is not to be less than that of a standard height of superstructure as specified in 1988 LL Protocol.

(3) Where the first tier of deck above the maximum submerged depth waterline is weather deck, the openings in the deck are to comply with the provisions for openings in position 1, as specified in 1988 LL Protocol. Where the second tier deck above the maximum submerged depth waterline is weather deck, suitable means of closing are to be provided for the openings in the deck, and the height is to comply with the provisions for the openings in location 2, as specified in 1988 LL Protocol. For machinery space ventilators above the second tier weather deck, which is extended from the first tier weather deck above the maximum submerged depth waterline, the coamings of the ventilators may be of a height not less than 760 mm above the second weather deck, provided suitable means of closing are fitted for the openings.

(4) In respect to the requirements for piping and valves used in discharging water overboard and the requirements for sealing of rudder and stern shaft and arrangement of accommodation, the maximum submerged depth waterline is to be considered the uppermost load line.

3.6.4 Maximum submerged depth waterline mark

(1) The permissible maximum operating submerged depth waterline is to be marked on the side bulkheads (port and starboard) of superstructure or deckhouse or pontoon fore and aft along the sides of the ship. The maximum submerged depth waterline mark is to be a line of 450 mm in length and 25 mm in width. The upper edge of the line is to be flush with the maximum submerged depth waterline. The operating draught is indicated by the letter W above the left end and the letter D above the right end of that line, each measuring 115 mm in height and 75 mm in width.

(2) Prior to marking the maximum operating submerged depth waterline of a semi-submerged ship, compliance of the ship with the strength requirements and the requirements for stability, load lines or other requirements for operation of ships as specified in the Guidelines is to be confirmed and indicated in the instruction for operating load line.

(3) Compliance of the ship with the strength and stability requirements for its operation is to be summarized in the instruction for operating load line, and a marking sketch showing the maximum submerged depth waterline mark is to be attached thereto.

Chapter 4 Construction

4.1 General requirements

4.1.1 The construction and strength of hull, superstructures, deck houses, machinery casings, companionways and other structures are to comply with the requirements of PART TWO of ISC Rules for Classification of Sea-going Steel Ships.

4.1.2 All seawater ballast spaces bounded by the shell plating are to be applied with epoxy-based or equivalent coating system. The internal hull structure and inside of hull plating except for seawater ballast space, such as bilges in double bottom ships, spaces below solid floors of single bottom ships and cofferdams are to be applied with suitable protective coating, according to the service of the spaces.

4.1.3 For all ships, new installation of materials which contain asbestos is to be prohibited.

4.1.4 Requirements of 4.2 to 4.4 of this Chapter apply to self-propelled ships, and requirements of 4.5 of this Chapter apply to self-propelled and non-self-propelled ships.

4.2 Collision bulkheads

4.2.1 A collision bulkhead is to be fitted which is to be watertight up to the freeboard deck. This bulkhead is to be located at a distance from the forward perpendicular of not less than 0.05L and not more than 0.08L or 0.05L + 3 m, whichever is the greater.

4.2.2 The bulkhead may have steps or recesses provided they are within the limits prescribed in 4.2.1 of this Chapter. The collision bulkhead may be pierced below the freeboard deck by not more than one pipe, provided that the pipe is fitted with a stop valve capable of being operated from above the freeboard deck, the valve chest being secured inside the forepeak to the collision bulkhead. This valve may be fitted on the after side of the collision bulkhead provided that the valve is readily accessible under all service conditions and the space in which it is located is not a cargo space. All valves are to be of steel, bronze or other approved ductile material.

4.2.3 If the forepeak is divided to hold two different kinds of liquids, the collision bulkhead may be allowed to be pierced below the freeboard deck by two pipes, each of which is fitted as required by paragraph 4.2.2.

4.2.4 No doors, manholes, access openings, ventilation ducts are to be fitted in the collision bulkhead.

4.2.5 Where a long forward superstructure the length of which exceeding 15% length of the ship is fitted, the collision bulkhead is to be extended weathertight to the deck next above the freeboard deck. The extension is to be located within the limits prescribed in 4.2.1 of this Chapter. The part of the deck, if any, between the collision bulkhead and the extension is to be weathertight.

4.2.6 The number of openings in the extension of the collision bulkhead above the freeboard deck is to be restricted to the minimum compatible with the design and normal operation of the ship. All such openings are to be capable of being closed weathertight.

4.3 Machinery space bulkheads and stern tubes

4.3.1 Bulkhead separating the machinery space from cargo and accommodation spaces forward and aft is to be fitted and made watertight up to the freeboard deck.

4.3.2 Stern tubes are to be enclosed in watertight spaces of moderate volume and other measures to minimize the danger of water penetrating into the ship in case of damage to stern tube arrangements may be taken. The stern tube gland is to be located in the space readily accessible for inspection and maintenance.

4.4 Watertight bulkheads, decks, doors and trunks, etc.

4.4.1 Each watertight subdivision bulkhead, whether transverse or longitudinal, and the construction is to be with appropriate strength margin and be capable of supporting at least the pressure to a head of water up to the freeboard deck.

4.4.2 Steps and recesses in bulkheads are to be watertight and be as strong as the bulkhead at the place where each occurs.

4.4.3 Where watertight decks or bulkheads are pierced by frames or beams, the decks or bulkheads are to be watertight structurally without the use of wood or cement.

4.4.4 The number of openings in watertight bulkheads is to be reduced to the minimum compatible with the design and proper working of the ship. Watertight means are to be provided for closing these openings. The watertight door is to be of the same strength as the adjacent structures with no opening.

4.4.5 Watertight decks, trunks, tunnels, duct keels and ventilators are to be of the same strength as watertight bulkheads at corresponding levels. The means used for making them watertight, and the arrangements adopted for closing openings in them, are to be approved.

4.4.6 Testing watertight spaces not intended to hold liquids by filling them with water is not compulsory. When testing by filling with water is not carried out, a hose test is to be carried out where practicable. This test is to be carried out in the most advanced stage of the fitting out of the ship. Where a hose test is not practicable because of possible damage to machinery, electrical equipment insulation or outfitting items, it may be replaced by a careful visual examination of welded connections, supported where deemed necessary by means such as a dye penetrant test or an ultrasonic leak test or an equivalent test. In any case a thorough inspection of the watertight bulkheads is to be carried out.

4.4.7 The forepeak, double bottom and inner skins are to be tested with water to a head corresponding to the requirements of 4.4.1 of this Chapter.

4.4.8 Tanks which are intended to hold liquids, and which form part of the watertight subdivision of the ship, are to be tested for tightness and structural strength with water to a head corresponding to its design pressure. The water head is in no case to be less than the top of the air pipes or to a level of 2.4 m above the top of the tank, whichever is the greater.

4.4.9 The tests referred to in 4.4.7 and 4.4.8 of this Chapter are for the purpose of ensuring that the subdivision structural arrangements are watertight and are not to be regarded as a test of the fitness of any compartment for the storage of oil fuel or for other special purposes for which a test of a superior character may be required, depending on the height to which the liquid has access in the tank or its connections.

4.5 General protection measures against accidents

4.5.1 Hinged covers of hatchways, manholes and other similar openings are to be prevented from being closed suddenly, and especially the heavy hatch cover of the escape hatchway is to be provided with weight equalization device. Escape doors, escape hatch covers and access hatch covers are to be so constructed that they can be opened from either side of the door or cover.

4.5.2 For access hatchways and manholes, the dimensions are to be such that the personnel may traverse the opening and injured persons may be removed. The minimum opening is to be not less than 600 mm × 600 mm. For ships of less than 5,000 gross tonnage, smaller dimensions for the openings may be accepted in special circumstances, provided the personnel may traverse the opening and injured persons may be removed. However, the opening is in no case to be less than 400 mm × 600 mm or 450 mm × 550 mm. The member with the opening is to be of adequate strength.

Chapter 5 Stability

5.1 General requirements

5.1.1 This Chapter applies to non-self-propelled ships engaged on international voyages and self-propelled ships of less than 24 m in length. Unless otherwise specified by this Chapter, ships of 24 m in length and upwards are to comply with the applicable requirements of the International Code on Intact Stability, 2008 (hereinafter referred to as "2008 IS Code").

5.1.2 The stability of floating cranes, dredgers, fire boats, tugs and semi-submersible vessels under operating/sheltering from wind conditions is to comply with the Special Requirements for the Operation Stability of Engineering Ships as set out in the Appendix to this Chapter. The intact stability of these ships under navigation condition is to be calculated in accordance with 2008 IS Code and the loading conditions are to be calculated in accordance with the requirements of the Appendix to this Chapter.

5.1.3 Where alterations, modifications or repairs are made to a ship materially affecting its stability or light condition, the stability is to be re-checked in accordance with 5.2 of this Chapter. The lightweight survey or inclining test is to be carried out in accordance with 5.2 of this Chapter and the stability is to be re-checked if the stability of the ship in service is suspected. Such revised information is to be supplied to the master and the superseded information removed from the ship.

5.1.4 For non-self-propelled ships with 60 persons and more onboard during operation, the angle of heel on account of crowding of passengers to one side is to be calculated in accordance with 3.1.1.1 to 3.1.1.4 of Chapter 3 of PART A of 2008 IS Code. The angle is not to exceed 4/5 of the angle at which the edge of deck immerses, 4/5 of the angle at which the bilge comes out of water, or the angle at which the residual freeboard is only 0.3 m or 5 degrees, whichever is the least.

5.2 Inclining tests and stability information

5.2.1 The lead ship is to undergo an inclining test upon its completion and the lightweight and position of the centre of gravity are to be determined.

5.2.2 Lightweight surveys are to be carried out for sister ships constructed by the same shipyard in accordance with the same plans in the same batch upon completion of construction. The inclining test of the ship may be dispensed with, provided a deviation from the lightship displacement is found not exceeding 2% or a deviation of the longitudinal centre of gravity is found not exceeding 1% of L_{BP} (L_{BP} being the length between perpendiculars of the ship) in comparison with the lead ship, and the weight and position of centre of gravity may be obtained from the inclining test information of the lead ship.

5.2.3 Where alterations are made to a ship affecting its lightweight and the position of the centre of gravity, and the deviation of the lightship data exceeds the standards specified in 5.2.2 of this Chapter, the ship is to be re-inclined and the stability information amended.

5.2.4 Approved stability information is to be supplied to all ships to which this Chapter applies to enable the master to assess with ease and certainty the stability of the ship under various operating conditions. Such information is to include specific instructions to the master warning him of those operating conditions which could adversely affect either stability or the trim of the ship. The information recommended in Chapter 3, PART B of 2008 IS Code is to be included as appropriate.

5.2.5 The approved stability information is to be kept on board.

5.3 Cargo ships

The intact stability of cargo ships is to comply with the applicable requirements of 2008 IS Code. If the requirements for the curve of righting levers are difficult to be met by the whole or part of the curve of righting levers, the criteria specified in 2.4.5.2 of PART B may be applied as an alternative to 2.2 of PART A of 2008 IS Code.

5.4 Offshore supply vessels

The intact stability and damage stability of offshore supply vessels are to comply with the requirements of Guidelines for the Design and Construction of Offshore Supply Vessels, 2006 of IMO.

5.5 Pontoons

The stability of barges with the following characteristics is to comply with the applicable requirements for pontoons of 2008 IS Code:

(1) not self-propelled;

(2) unmanned during towage;

(3) carrying only deck cargo;

(4) having a block coefficient of 0.9 or greater;

(5) having a breadth/depth ratio of greater than 3; and

(6) having no hatchways in the deck except small manholes closed with gasketed covers.

5.6 Other barges

The stability of other barges is to comply with the following requirements:

(1) Stability of ship in the fully loaded departure condition, fully loaded arrival condition, ballast departure condition and ballast arrival condition is to be checked. For barges not carrying consumables, only the stability of fully loaded and ballast conditions are to be checked.

(2) The stability checked under various loading conditions is to comply with the requirements for cargo ships of 2008 IS Code. If the requirements of 2.2 of PART A of 2008 IS Code are difficult to be met by the whole or part of the curve of righting levers, the criteria specified in 2.4.5.2 of PART B may be applied as an alternative to 2.2 of PART A of 2008 IS Code.

5.7 Additional provisions for live fish carriers

5.7.1 The intact stability is to be checked for full load departure/arrival conditions, partially loaded departure/arrival conditions, and for departure/arrival in ballast conditions. However, the intact stability of the ship of which the interflow condition is maintained during the voyage may not be checked for partially loaded departure/arrival conditions.

5.7.2 The load cases on ballast voyages is to be considered, assuming that the cargo tank is loaded with sea water.

5.7.3 The effects of free surface in holds may be considered according to the loading height in their overflowed condition. In other conditions or load cases, the maximum effect of free surface in the tank is to be taken into account.

5.7.4 For all conditions, the correction of the initial metacentric height for the effect of free surfaces of liquids is to be considered.

5.7.5 If stability requirements for partial loading conditions are not met, “No partial loading for the ship” is to be indicated in the loading and stability information.

5.8 Icing considerations

5.8.1 For any ship operating in areas where ice accretion is likely to occur, adversely affecting a ship’s stability, icing allowances are to be included in the analysis of conditions of loading.

5.8.2 Allowance for ice accretion is to be taken as 70% of that as specified in 6.3.1 of Chapter 6, PART B of 2008 IS Code.

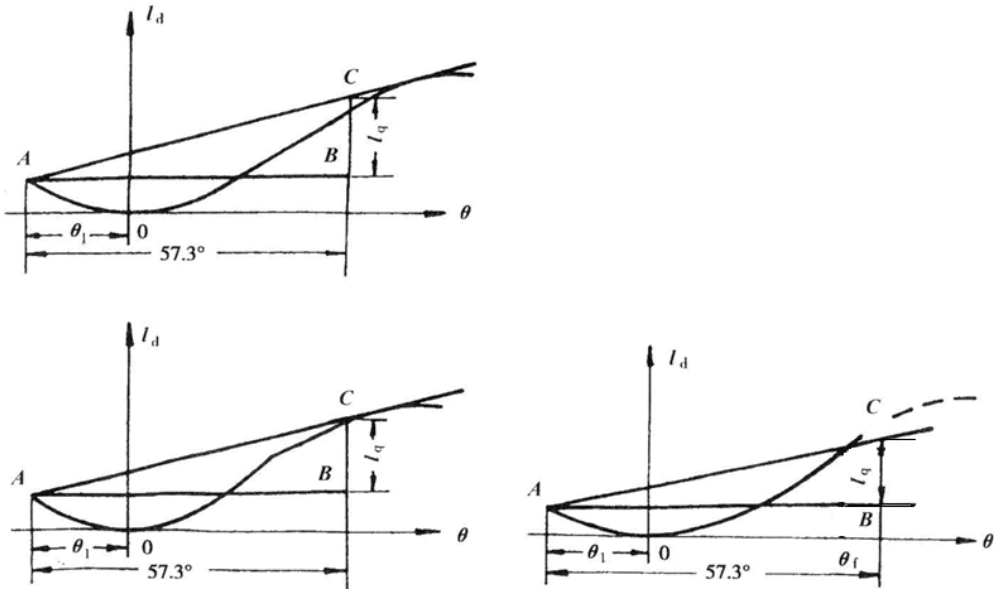
Appendix Special Requirements for the Operation Stability of Engineering Ships

1 Basic Parameters

1.1 The minimum capsizing lever l_q (in m) is to be determined by means of the curve of dynamical stability, to which the rolling effect of the ship has been taken into account.

(1) For ships having a dynamical stability curve of normal form or with stepping, the minimum capsizing lever is to be measured as follows:

Prolong symmetrically the dynamical stability curve towards the negative direction of axis θ, and set a point on the negative side of the abscissa so that the length from this point to origin is equal to the rolling angle θ_1. Through this point, draw a line perpendicular to the abscissa, which intersects the prolonged dynamical stability curve at point *A*. From point *A* draw a line tangent to the dynamical stability curve, and again from point *A* draw a line parallel to the abscissa and lay off a segment *AB* equal to one radian (57.3°). Then from *B* draw a line perpendicular to *AB*, which intersects the tangent at *C*. Segment *BC* is the minimum capsizing lever (see Figure 1.1(1)).



(1) (2)

Figure 1.1 Dynamical stability curve

(2) Where the dynamical stability curve is interrupted due to the effect of flooding angle θ_j, the same method as described in (1) may be used (see Figure 1.1(2)), except that the above mentioned tangent is to be substituted by a secant drawn from point A to the interruption point on the dynamical stability curve.

1.2 The wind heeling lever l_f is to be obtained from the following formula:

$$l_f = \frac{PA_f Z}{9810\Delta} \quad \text{m}$$

where: P — calculated unit wind pressure, in Pa;
A_f — ship's windage area, in m^2, is to be calculated in accordance with 1.4 of this Appendix;
Z — calculated wind pressure lever, in m, is to be calculated in accordance with 1.3 of this Appendix;
Δ — displacement of the ship, in t, for the loading condition under consideration.

1.3 The calculated wind pressure lever Z is the vertical distance between the centre of the windage area and the actual waterline for the loading condition under consideration when the ship is in the upright position. The position of the centre of windage area is to be generally obtained by means of determining the centre of gravity for a plane figure.

1.4 The windage area A_f of the ship is the projected lateral area of all parts of the ships on the centreline plane above the actual waterline for the loading condition under consideration when the ship is in the upright position. The windage area consists of two parts, the continuous surfaces and discontinuous surfaces.

(1) The continuous surfaces include the projected lateral areas of the ship's hull, bulwarks, superstructures, deckhouses, masthouses, deck machinery, masts, derricks, derrick posts, funnels, large ventilators, lifeboats, liferafts and other buoyant apparatus on the centre line plane; for ships intended to carry deck cargoes, the projections of these cargoes are also to be taken into account. For isolated circular section structures, such as funnels, ventilators, masts, etc., the projected lateral areas are to be multiplied by a flow coefficient of 0.6.

(2) The discontinuous surfaces include the projected lateral areas of riggings, rails, trusses of lattice type, aerials and various small objects on the centreline plane.

When calculating the projected lateral area of discontinuous surfaces, 3% of the projected lateral area of the continuous surfaces and 6% of the static moment of the continuous surfaces calculated for the minimum draught of the basic loading conditions are to be taken. For all other loading conditions, the value of the projected lateral area of discontinuous surfaces and the position of its geometrical centre in relation to the base line are to be assumed to be the same as that obtained from the above mentioned minimum draught.

(3) The projected lateral area of discontinuous surfaces may be determined by precise calculation case by case. The overall areas taken into consideration are to be multiplied by the following filling factors:

for rails covered with meshed wire	0.6;
for rails without meshed wire	0.2;
for crane trusses of lattice type	0.5;
For riggings, shrouds and other similar objects	$0.044h/b$.

where: h — height from the point of the mast or derrick post to which riggings are attached to the bulwark (to the deck if there is no bulwark), in m;
b — space of the riggings in way of the bulwark (in way of deck side if there is no bulwark), in m.

Where the projections of two or more than two objects overlap one another on the longitudinal centreline plane, only one overlapped area is to be taken into account, in m.

(4) The calculation of the windage area for floating cranes and dredges is additionally to comply with the relevant requirements of 2 and 3 of this Appendix.

2 Floating cranes

2.1 The stability of floating cranes is to be checked for the following basic loading conditions:

(1) with full fuel and stores;

(2) with 10% fuel and stores.

2.2 The stability of floating cranes is to be checked for operating, sheltering from wind conditions.

2.3 The wind heeling moment M_f and wind heeling lever l_f of floating cranes are to be obtained from the following formulae, with the windage area to be segmented for every 15 m in height from the waterline upwards.

$$M_f = 0.001P\sum C_i A_{fi} Z_i \qquad \text{kN·m}$$

$$l_f = \frac{P}{9810\Delta}\sum C_i A_{fi} Z_i \qquad \text{m}$$

where: P — calculated unit wind pressure, 177 Pa for operating condition and 1844 Pa for sheltering from wind condition;

C_i — coefficient of height correction, obtained from Table 2.3;

A_{fi} — windage area, in m^2, determined in accordance with 1.4 and 2.4 of this Appendix;

Z_i — vertical distance from the centre of windage area A_{fi} to the waterline for the loading condition under consideration, in m;

Δ — displacement for the loading condition under consideration, in t.

Coefficient of height correction C_i **Table 2.3**

Z_i (m)	0～15	15～30	30～45	45～60	60～75	75～90	90～105	105～120
C_i	1.00	1.16	1.32	1.44	1.53	1.61	1.68	1.74

2.4 In calculating the windage area of floating cranes, the following requirements are also to be complied with:

(1) for crane trusses of lattice type, a filling factor of 0.5 is to be taken;

(2) where the projections of several objects overlap one another on the longitudinal centreline plane, the overlapped area is to be multiplied by an overlapping factor of 1.5;

(3) the centre of windage area of the load on hook is to be assumed to be located at the point of suspension, and the windage area A_f of the load is to be obtained from the following formula:

$$A_f = 2.78W^{0.556} \qquad \text{m}^2$$

where: W— mass of load on hook, in t.

2.5 The limit angle of static heel θ_c of floating cranes is to be equal to 4/5 of the angle at which the edge of upper deck immerses, or 4/5 of the angle at which the bilge comes out of water, or the angle at which the residual freeboard is 0.3 m, whichever is the least; furthermore, the limit angle of static heel is not to exceed: 8° for floating cranes under sheltering from wind conditions; 5° for revolving floating cranes under operating conditions; 3° for floating cranes with the booms fixed in relation to the longitudinal centreline plane.

2.6 The stability of floating cranes under operating conditions is to comply with the following formulae:

(1) Metacentric height *GM*:

$$GM \geq \frac{M_f + M_h + M_l}{0.1716\theta_c\Delta} \quad \text{m}$$

where: *GM* — initial metacentric height for the loading condition under consideration, taking into account the free surface effect of liquids and the effect of heavy load on hook to the initial metacentric height, in m;

M_f — wind heeling moment, in kN·m, acting on the floating cranes, determined in accordance with 2.3 of this Appendix;

M_h — heeling moment, in kN·m, due to load on the hook of revolving cranes;

M_l — heeling moment, in kN·m, due to unsymmetrical distribution of load on the floating cranes;

θ_c — permissible limit static heeling angle of floating cranes, in (°), determined in accordance with 2.5 of this Appendix;

Δ — displacement for the loading condition under consideration, in t.

(2) Stability criterion numeral K_c:

$$K_c = \frac{l_q}{l_f + \frac{M_h + M_l}{9.81\Delta}} \geq 1$$

where: l_q — minimun capsizing lever, in m, determined in accordance with 1.1 of this Appendix, without taking into account the rolling effect;

l_f — wind heeling lever, in m, determined in accordance with 2.3 of this Appendix;

M_h, M_l, Δ — see 2.6(1) above.

2.7 The stability of floating cranes under sheltering from wind conditions is to comply with the following formulae:

(1) Metacentric height *GM*:

$$GM \geq \frac{M_f + M_l}{0.1716\theta_c\Delta} \quad \text{m}$$

where: M_f, M_l, θ_c, Δ — see 2.6 of this Appendix.

(2) Stability criterion numeral K_c:

$$K_c = \frac{l_q}{l_f + \frac{M_l}{9.81\Delta}} \geq 1$$

where: l_q, l_f, M_l, Δ — see 2.6 of this Appendix.

3 Dredgers

3.1 The stability of hopper dredgers is to be checked for the following basic loading conditions:

(1) in navigating, sheltering from wind conditions:

① hopper unloaded①, with all fuels and stores;

② hopper unloaded①, with 10% of fuels and stores.

(2) in operating condition:

① hopper fully loaded, with all fuels and stores;

② hopper fully loaded, with 10% of fuels and stores;

③ hopper unloaded①, with all fuels and stores;

④ hopper unloaded①, with 10% of fuels and stores;

⑤ hopper partially loaded, with 50% of fuels and stores.

3.2 The stability of dredgers without hopper is to be checked for the following basic loading conditions during navigating, operating and sheltering from wind:

(1) all fuels and stores;

(2) 10% of fuels and stores.

3.3 The initial metacentric height *GM* of dredgers under the operating condition, after the correction of free surface effect of liquids, is to comply with the following requirements:

(1) Cutter suction dredger:

$$GM \geq \frac{1}{0.1716\theta_c \Delta}(M_f + M_h + M_d + M_p) \quad \text{m}$$

where: M_f — wind heeling moment, in kN·m, taken from 3.7 of this Appendix;

M_h — heeling moment due to transverse movement of the dredger, in kN·m, taken from 3.10 of this Appendix;

① Hopper unloaded, with water; the height of water in the hopper is to be taken as the same as that of external water in the calculation.

M_d — heeling moment due to putting down the positioning spuds, in kN·m, taken from 3.11 of this Appendix;

M_p — heeling moment due to discharging mud, in kN·m, taken from 3.12 of this Appendix;

θ_c — limit angle of static heel of the dredger for the loading condition under consideration, in (°), taken from 3.4 of this Appendix;

Δ — displacement of the dredger for the loading condition under consideration, in t.

(2) Bucket dredger:

$$GM \geq \frac{1}{0.1716\theta_c\Delta}(M_f + M_h + M_p) \quad \text{m}$$

where: M_f, M_h, M_p, θ_c and Δ — the same as described in 3.3(1) of this Appendix.

(3) Grab dredger:

$$GM \geq \frac{1}{0.1716\theta_c\Delta}(M_f + M_x) \quad \text{m}$$

where: M_f, θ_c and Δ — see 3.3 (1) of this Appendix;

M_x — maximum heeling moment under operating conditions, as the boom is swung out the side of the dredger, in kN·m, taken from 3.13 of this Appendix.

3.4 The limit angle of static heel θ_c of the dredger for the loading conditions under consideration is not to exceed 4/5 of the angle at which the edge of deck immerses, 4/5 of the angle at which the bilge comes out of water, or the angle at which the residual freeboard is only 0.3 m, whichever is the least. The limit angle of static heel may be proposed by the user to ensure the normal safety operation.

3.5 For non-self-propelled dredgers, the initial metacentric height *GM* in sheltering from wind condition after the correction of free surface effect of liquids is to comply with the following formula:

$$GM \geq \frac{M_f}{0.1716\theta_c\Delta} \quad \text{m}$$

where: M_f, Δ — see 3.3(1) of this Appendix;

θ_c — limit angle of static heel of the dredger for the loading condition under consideration, in (°), taken from 3.6 of this Appendix.

3.6 For non-self-propelled dredgers, the limit angle of static heel θ_c for the loading conditions under considerations is not to exceed 4/5 of the angle at which the edge of deck immerses, 4/5 of the angle at which the bilge comes out of water, or the angle at which the residual freeboard is equal to 0.3 m, whichever is the least.

3.7 The wind heeling moment M_f and the wind heeling lever l_f are to be obtained respectively from the following formulae:

(1) For trailing suction dredgers and bucket dredgers, the wind heeling lever l_f is to be taken in accordance with the requirements described in 1.2, 1.3, 1.4 and 3.8 of this Appendix, and the wind heeling moment M_f is to be taken from the following formula:

$$M_f = 9.81 l_f \Delta \quad \text{kN·m}$$

where: Δ — displacement of the dredger for the loading condition under consideration, in t.

(2) For cutter suction dredgers and grab dredgers, the wind heeling moment M_f and the wind heeling lever l_f are to be obtained respectively from the following formulae:

$$M_f = 0.001 P \sum C_i A_{f\,i} Z_i \quad \text{kN·m}$$

$$l_f = \frac{P}{9810\Delta} \sum C_i A_{f\,i} Z_i \quad \text{m}$$

where: P — calculated unit wind pressure, in Pa, see 3.8 of this Appendix;

A_{fi} — windage area, in m^2, taken in accordance with the requirements described in 1.4 and 3.9 of this Appendix;

Z_i — calculated wind pressure lever, in m, to be the vertical distance between the centre of the windage area and the actual waterline for the loading condition under consideration when the ship is in the upright position;

Δ — displacement of the dredger for the loading condition under consideration, in t;

C_i — factor of correction of height, taken from Table 3.7(2).

Factor of correction of height C_i **Table 3.7(2)**

Z_i (m)	0 ~ 15	>15
C_i	1.0	1.16

3.8 For bucket dredgers, cutter suction dredgers and grab dredgers under operating conditions, the calculated unit wind pressure is not to be less than 235 Pa and not to be less than 1,559 Pa for sheltering from wind conditions.

3.9 For cutter suction dredgers and grab dredgers, the windage area of framed gantry is to be calculated in accordance with the following requirements:

Where the projections of two or more than two framed structures overlap one another on the longitudinal centreline plane, the overlapped area is to be multiplied by the factor of 1.5. The other reliable values of the factor may be assumed subject to approval.

3.10 The heeling moment M_h, due to transverse movement of the dredger, is to be calculated in accordance with the following formula:

$$M_h = P_n (Z_n - \frac{1}{2} d) \quad \text{kN·m}$$

where: P_n — pull of the winch, in kN, when a transverse movement is made to the dredger;

Z_n — vertical height of the suspension point of the girtline, when a transverse movement is made to a dredger, from the base line for the loading conditions under consideration, in m, is to be taken as a positive where in upward direction, and a negative where in downward direction. Where the suspension point for a cutter suction dredger is in way of the pull ring fitted on the cutter ladder, and the cutter suction dredger is in the operating condition, the ring fitted on the cutter ladder (suspension point) may be below $d/2$ of the moulded draught, in such a condition, M_h may be negative, however, when calculating GM in 3.3 (1) of this Appendix, M_h is to be taken as its absolute value;

d — moulded draught for the loading condition under consideration, in m.

3.11 Heeling moment M_d due to putting down the positioning spuds is to be calculated in accordance with the following formula:

$$M_d = 9.81 W_d b_d \quad \text{kN·m}$$

where: W_d — one positioning spud's weight, in t;

b_d — distance from the centerline of the positioning spud to the longitudinal centerline plane of the dredger, in m.

3.12 Heeling moment M_p due to discharging mud overboard from the side of the dredger is to be calculated in accordance with the following formula:

$$M_p = 9.81 W_p b_p \quad \text{kN·m}$$

where: W_p — total weight of mud in discharge device, in t;

b_p — distance from the gravity centre of mud in discharge device to the longitudinal centreline plane of the dredger, in m.

3.13 For grab dredgers, the maximum heeling moment under operating condition, as the boom being swung out the side of the dredger, is to be calculated. Where the grab is hung by wire ropes, the moment M_x is to be calculated in accordance with the following formula:

$$M_x = 9.81 \sum_{i=1}^{n} [C_d (W_{1i} + P_{i)} y_{1i} - W_{1i} y_{0i} + W_{2i} (y_{2i} - y_{0i})] \quad \text{kN·m}$$

where: C_d = 1.30;

i = 1, 2, 3 ... , serial number of the grabs;

W_{1_i} — weight of serial grabs for the ith grab machine, in t;

P_i — weight of mud in grabs when the ith grab machine is in operation, in t;

y_{1_i} — distance from the centre of gravity of the grab (including the mud contained) to the longitudinal centreline plane of the dredger, when the ith grab machine is in operating condition, in m;

y_{0_i} — distance from the centre of gravity of the grab machine to the longitudinal centreline plane of the dredger, where the centreline of the boom of the ith grab machine is in parallel with or within the longitudinal centreline plane of the dredger, in m;

W_{2_i} — total weight of the ith grab machine (excluding the grabs), in t;

y_{2_i} — distance from the centre of gravity of the grab machine (excluding the grabs) to the longitudinal centreline plane of the dredger where the boom of the ith grab machine is swung out the side of the dredger, in m;

y_{1i}, y_{0i} and y_{2i} above are to be taken as a positive for the starboard side, and negative value for the port side.

3.14 For dredgers fitted with hoppers, where the density of the mud in hoppers is 1.4 t/m^3 or less, the initial metacentric height and the stability curves are to be corrected for the free surface effect of mud in hoppers. Consideration is to be given to spilling the mud through the spillway openings or hatch coaming as the ship heels, and the righting lever curves and dynamical stability levers are to be calculated by the actual positions of the displacement and centre of gravity of the mud in hoppers of the dredger.

3.15 For the dredgers fitted with hoppers, where unsymmetrical mud discharging may happen due to failure of the control facilities, the stability criterion numeral for this condition is to be checked as follows:

(1) The distance of parallel movement of the gravity centre of the dredger Y_g is to be obtained from the following formula:

$$Y_g = \frac{WY}{\Delta_1} \qquad \text{m}$$

where: W — total weight of the mud discharged from the hoppers, in t, taken as 20% of the hopper loading;

Y — distance from the gravity centre of the mud discharged to the longitudinal centreline plane of the dredger, in m;

Δ_1 — the displacement of the dredger after discharging mud, in t, obtained from the following formula:

$$\Delta_1 = \Delta - W \qquad \text{t}$$

where: Δ — the displacement of the dredger before discharging mud, in t.

(2) The righting lever curve l_1 and the dynamical stability curve l_{d1} are to be obtained respectively from the following formula:

$$l_1 = l - Y_g \cos\theta$$

$$l_{d1} = l_d - Y_g \sin\theta$$

where: l, l_d — righting lever and dynamical stability lever respectively, in m, where Δ_1 is the displacement, and the gravity centre is within the longitudinal centreline plane;

θ — heeling angle of the ship, in (°).

The stability curve having an angle of static heel obtained from the formulae above is shown in Figure 3.15, where θ_{PB} is the angle of static heel.

(3) Where the density of the mud in hoppers is equal to 1.4 t/m^3 or less, the rolling amplitude θ_r is to be taken as 10° from point A to left direction.

(4) Where the density of the mud in hoppers is greater than 1.4 t/m^3, the rolling amplitude θ_r, taking into account the dynamic characters of discharging mud, is to be calculated in accordance with the following formula:

$$\theta_r = 10 + 0.2\theta_{PB} \qquad (°)$$

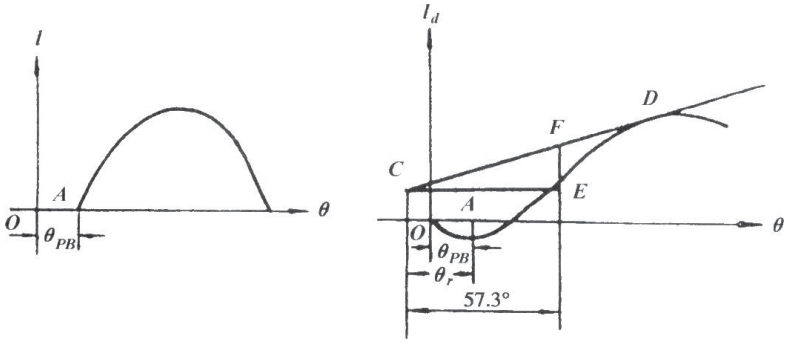


Figure 3.15 Stability curve having an angle of static heel

4 Fire Boats

4.1 The stability of fire boats is to be checked for the following basic loading conditions:

(1) departure condition (with 100% fuel, stores and foam concentrate);

(2) arrival condition (with 10% fuel, stores and foam concentrate).

4.2 The stability of fire boats under the operating conditions is to comply with the following requirements:

$$GM \geq \frac{M}{0.1716\theta_c\Delta} \quad \text{m}$$

where: GM — initial metacentric height of the ship for the loading condition under consideration, taking into account the correction for the free surface effect of liquids, in m;

M — maximum heeling moment due to simultaneous spraying of all the fire water/foam monitors, in kN·m;

θ_c — permissible limit static heeling angle, assumed as 5°;

Δ — displacement for the loading condition under consideration, in t.

5 Semi-submersible Vessels

Stability of semi-submersible vessels in semi-submerged operation mode is to comply with the requirements of 1.9.6 of Section 9 of Chapter 1, PART TWO of ISC Rules for Classification of Sea-going Steel Ships.

6 Tugs

The intact stability of tugs during towage operation is to comply with the relevant requirements for intact stability as specified in IACS Recommendation No.24.

Chapter 6 Machinery Installations

6.1 General requirements

6.1.1 The machinery, boilers and other pressure vessels, associated piping systems and fittings are to be of a design and construction adequate for the service for which they are intended and are to be so installed and protected as to reduce to a minimum any danger to persons on board, due regard being paid to moving parts, hot surfaces and other hazards. The design is to have regard to materials used in construction, the purpose for which the equipment is intended, the working conditions to which it will be subjected and the environmental conditions on board.

6.1.2 All boilers and other pressure vessels, all parts of machinery, all steam, hydraulic, pneumatic and other systems and their associated fittings which are under internal pressure are to be subjected to appropriate tests, including a pressure test, before being put into service for the first time.

6.1.3 Adequate provisions are to be made to facilitate cleaning, inspection and maintenance of machinery installations including boilers and other pressure vessels.

6.1.4 Special consideration is to be given to the design, construction and installation of propulsion machinery systems so that any mode of their vibrations is not to cause undue stresses in machinery in its normal operating ranges.

6.1.5 All spaces, where flammable or toxic gases or vapors may accumulate, including engine rooms and cargo pump-rooms are to be provided with adequate ventilation in any case.

6.1.6 For self-propelled ships, means are to be provided to ensure that the machinery can be brought into operation from the dead ship condition without external aid. This requirement may be dispensed with for ships of less than 20 m in length.

6.1.7 For self-propelled ships, means are to be provided whereby normal operations of propulsion machinery can be sustained or restored even though one of the essential auxiliaries becomes inoperative. Special consideration is to be given to the malfunctioning of:

(1) an electrical power generator which serves as a main source of electrical power;

(2) the sources of lubricating oil pressure;

(3) the fuel oil supply systems for engines;

(4) the sources of water pressure;

(5) an air compressor and receiver for starting or for control purposes;

(6) the hydraulic, pneumatic or electrical means for control in main propulsion machinery including controllable pitch propellers;

(7) steam boilers and boiler feed systems, if provided.

However, a partial reduction in propulsion capability from normal operation may be accepted, having regard to overall safety considerations.

6.2 Machinery

6.2.1 Where risk from overspeeding of machinery exists, means are to be provided to ensure that the safe speed is not exceeded.

6.2.2 Where main or auxiliary machinery including pressure vessels or any parts of such machinery are subject to internal pressure and may be subject to dangerous overpressure, means are to be provided where practicable to protect against such excessive pressure.

6.2.3 All gearing and every shaft and coupling used for transmission of power to machinery essential for the propulsion and safety of the ship or for the safety of persons on board are to be so designed and constructed that they will withstand the maximum working stresses which may be subjected in all service conditions, and due consideration is to be given to the type of engines by which they are driven or of which they form part.

6.2.4 Internal combustion engines of a cylinder diameter of 200 mm or a crankcase volume of 0.6 m^3 and above are to be provided with crankcase explosion relief valves of a suitable type with sufficient relief area. The relief valves are to be arranged or provided with means to ensure that discharge from them is so directed as to minimize the possibility of injury to personnel.

6.2.5 Main turbine propulsion machinery and, where applicable, main internal combustion propulsion machinery and auxiliary machinery are to be provided with automatic shutoff arrangements in the case of failures such as lubricating oil supply failure which could lead rapidly to complete breakdown, serious damage or explosion. Provisions for overriding automatic shutoff devices may be permitted.

6.3 Machinery controls

6.3.1 Main and auxiliary machinery essential for the propulsion and safety of the ship are to be provided with effective means for its operation and control.

6.3.2 In all ships where the main propulsion and associated machinery, including main electrical supply, are provided with various degrees of automatic or remote control and are under continuous manual supervision from a control room, the arrangements and controls are to be so designed, equipped and installed that the machinery operation will be as safe and effective as if it were under direct supervision.

6.3.3 In general, automatic starting, operational and control systems are to include provisions for manually overriding the automatic controls. Failure of any part of such systems is not to prevent the use of the manual override.

6.3.4 Where remote control of propulsion machinery from the navigating bridge is provided, all the requirements in the following subparagraphs (1) to (10) are to be satisfied:

(1) the speed, direction of thrust and, if applicable, the pitch of the propeller are to be fully controllable from the navigating bridge under all sailing conditions, including manoeuvring;

(2) the control is to be performed by a single control device for each independent propeller, with automatic performance of all associated services, including, where necessary, means of preventing overload of the propulsion machinery;

(3) the main propulsion machinery is to be provided with an emergency stopping device on the navigating bridge which is to be independent of the navigating bridge control system;

(4) propulsion machinery orders from the navigating bridge are to be indicated in the main machinery control room (if installed) and at the manoeuvring platform (local control station) as appropriate;

(5) remote control of the propulsion machinery is to be possible only from one location at a time; at such locations interconnected control positions are permitted. At each location there is to be an indicator showing which location is in control of the propulsion machinery. The transfer of control between the navigating bridge and machinery spaces is to be possible only in the main machinery space or the main machinery control room. This system is to include means to prevent the propelling thrust from altering significantly when transferring control from one location to another;

(6) it is to be possible to control the propulsion machinery locally, even in the case of failure in any part of the remote control system. It is also to be possible to control the auxiliary machinery, essential for the propulsion and safety of the ship, at or near the machinery concerned;

(7) the design of the remote control system is to be such that in case of its failure an alarm will be given. Unless it is considered impracticable, the preset speed and direction of thrust of the propellers are to be maintained until local control is in operation;

(8) indicators are to be fitted on the navigating bridge, in the main machinery control room and at the manoeuvring platform (local control station) for:

① propeller speed and direction of rotation in the case of fixed pitch propellers; and

② propeller speed and pitch position in the case of controllable pitch propellers;

(9) an alarm is to be provided on the navigating bridge and in the machinery space to indicate low starting air pressure which is to be set at a level to permit further main engine starting operation. If the remote control systems of the propulsion machinery is designed for automatic starting, the number of automatic consecutive attempts which fail to produce a start is to be limited within three times in order to safeguard sufficient starting air pressure for starting locally;

(10) automation systems are to be designed in a manner which ensures that threshold warning of impending or imminent slowdown or shutdown of the propulsion system is given to the officer in charge of the navigational watch in time to assess navigational circumstances in an emergency. In particular, the systems are to control, monitor, report, alert and take safety action to slow down or stop propulsion while providing the officer in charge of the navigational watch an opportunity to manually intervene, except for those cases where manual intervention will result in total failure of the engine and/or propulsion equipment within a short time, for example in the case of overspeed.

6.4 Periodically unattended machinery spaces (if installed)

6.4.1 Ships having periodically unattended machinery spaces are to comply with relevant requirements of Part E of SOLAS Chapter II-1.

6.5 Steam boilers and boiler feed systems (if installed)

6.5.1 Every steam boiler is to be provided with not less than two safety valves of adequate capacity. Small auxiliary boiler having an evaporating capacity not exceeding 1,000 kg per hour and a design pressure not exceeding 0.78 MPa may be fitted with only one safety valve.

6.5.2 Each oil-fired boiler which is intended to operate without manual supervision is to have safety arrangements which shut off the fuel supply and give an alarm in the case of low water level, air supply failure or flame failure.

6.5.3 Every steam generating system which provides services essential for the safety of the ship, or which could be rendered dangerous by the failure of its feed water supply, is to be provided with not less than two separate feedwater systems from and including the feed pumps, noting that a single penetration of the steam drum is acceptable. Unless overpressure is prevented by the pump characteristics means are to be provided which will prevent overpressure in any part of the systems.

6.5.4 Boilers are to be provided with means to supervise and control the quality of the feedwater. Suitable arrangements are to be provided to preclude, as far as practicable, the entry of oil or other contaminants which may adversely affect the boiler.

6.5.5 Every boiler essential for the safety of the ship and designed to contain water at a specified level is to be provided with at least two means for indicating its water level, at least one of which is to be a direct reading gauge glass, and the other may either be water gauge or other equivalent device (e.g. remote water level indicator).

6.6 Steam pipe systems (if installed)

6.6.1 Every steam pipe and every fitting connected thereto through which steam may pass is to be so designed, constructed and installed as to withstand the maximum working stresses to which it may be subjected.

6.6.2 Means are to be provided for draining every steam pipe in which dangerous water hammer action might otherwise occur.

6.6.3 If a steam pipe or fitting may receive steam from any source at a higher pressure than that for which it is designed a suitable pressure reducing valve, relief valve or pressure gauge is to be fitted.

6.7 Air pressure systems (if installed)

6.7.1 In every ship means are to be provided to prevent overpressure in any part of compressed air systems and wherever water jackets or casings of air compressors and coolers might be subjected to dangerous overpressure due to leakage into them from air pressure parts. Suitable pressure relief arrangements are to be provided for all systems.

6.7.2 The main starting air arrangements for main propulsion internal combustion engines are to be adequately protected against the effects of backfiring and internal explosion in the starting air pipes.

6.7.3 All discharge pipes from starting air compressors are to lead directly to the starting air receivers, and all starting pipes from the air receivers to main or auxiliary engines are to be entirely separate from the compressor discharge pipe system.

6.7.4 Provision is to be made for intercepting and draining oil and water in the air discharge for which purpose a separator or filter is to be fitted in the discharge pipe between compressors and receivers.

6.8 Ventilation systems in machinery spaces

6.8.1 For self-propelled ships, the machinery spaces of category A are to be adequately ventilated so as to ensure that when machinery or boilers therein are operating at full power in all weather conditions including heavy weather, an adequate supply of air is maintained to the spaces for the safety and comfort of personnel and the operation of the machinery.

6.8.2 Any other machinery space is to be adequately ventilated appropriate for the purpose of that machinery space.

6.9 Bilge pumping system

6.9.1 General requirements for bilge pumping arrangements:

(1) All ships are to be provided with efficient bilge pumping systems capable of pumping from and draining any watertight compartment, other than a space permanently appropriated for the carriage of fresh water, water ballast, oil fuel or liquid cargo, and any other space where efficient means of pumping are available under all practical conditions. Where the safety of the ship is considered not impaired the bilge pumping arrangements may be dispensed with in any particular compartment.

(2) Independent power sanitary, ballast and general service pumps may be accepted as independent power bilge pumps, provided they are of the required capacity of the self-priming type or with the self-priming arrangement and connected to the bilge main.

(3) All bilge pipes used in or under fuel storage tanks or in boiler or machinery spaces, including spaces in which oil-settling tanks or oil fuel pumping units are situated, are to be of steel or other suitable material.

(4) The arrangement of the bilge and ballast pumping system is to be such as to prevent the possibility of water passing from the sea and from water ballast spaces into the cargo and machinery spaces, or from one compartment to another.

(5) All distribution boxes and manually operated valves in connection with the bilge pumping arrangements are to be in positions which are accessible under ordinary circumstances.

6.9.2 Bilge pumps

(1) At least two bilge pumps connected to the main bilge system are to be provided, one of which may be driven by the propulsion machinery. For ships of less than 100 gross tonnage may be modified by one of power driven type and one hand pump.

(2) The capacity of each bilge pump (Q) is not to be less than the value calculated by the following formula:

$$Q = 5.66\, d_1^2 \times 10^{-3} \quad \text{m}^3/\text{h}$$

where: d_1— internal diameter of bilge main, obtained from the formula in 6.9.3(1) of this Section, in mm.

The capacity of the hand pump is not to be less than 6 m^3/h (45 strokes per minute).

(3) A power driven pump may be substituted by a bilge ejector in combination with an independently driven high pressure sea-water pump. However, if only one independently power driven pump is installed as the power bilge pump, the independently power driven pump is not to be substituted.

(4) All power bilge pumps are to be of the self-priming type, or with the self-priming arrangements.

6.9.3 Diameter of bilge pipes

(1) The internal diameter of the bilge pipe is to be calculated according the following formulae. However, the actual internal diameter of the bilge pipe may be rounded off to the acceptable nearest standard size, but not less than the calculated value by 5 mm:

$$d_1 = 25 + 1.68\sqrt{L(B+D)}$$

$$d_2 = 25 + 2.15\sqrt{l(B+D)}$$

where: d_1 — internal diameter of the bilge main, in mm;

d_2 — internal diameter of branch bilge suction pipes, in mm;

L — length of ship, in m (measured between perpendiculars taken at the extremities of the deepest subdivision load line);

B — breadth of ship, in m (the extreme width from outside of frame to outside of frame at or below the deepest subdivision load line);

D — molded depth of ship to freeboard deck, in m;

l — length of compartment, in m.

(2) The internal diameter of bilge pipes is not to be less than 35 mm.

6.9.4 The bilge system of non-self-propelled ships is to comply with relevant requirements of Section 7 of Chapter 3, PART THREE of ISC Rules for Classification of Sea-going Steel Ships.

6.10 Means of going astern

6.10.1 Sufficient power for going astern is to be provided to secure proper control of the ship in all normal circumstances.

6.10.2 The ability of the machinery to reverse the direction of thrust of the propeller in sufficient time and so to bring the ship to rest within a reasonable distance from maximum ahead service speed, is to be demonstrated and recorded.

6.10.3 The stopping times, ship headings and distances recorded on trials, together with the results of trials to determine the ability of ships having multiple propellers to navigate and manoeuvre with one or more propellers inoperative, are to be available on board for the use of the master or designated personnel.

6.10.4 Where the ship is provided with supplementary means for manoeuvring or stopping, the effectiveness of such means is to be demonstrated and recorded as referred to in 6.10.2 and 6.10.3.

6.11 Steering gear

6.11.1 Unless expressly provided otherwise, every ship is to be provided with a main steering gear and an auxiliary steering gear. The main steering gear and the auxiliary steering gear are to be so arranged that the failure of one of them will not render the other one inoperative.

6.11.2 The main steering gear and rudder stock is to be:

(1) of adequate strength and capable of steering the ship at maximum ahead service speed;

(2) capable of putting the rudder over from 35° on one side to 35° the other side with the ship at its deepest seagoing draught and running ahead at maximum ahead service speed and, under the same conditions, from 35° on either side to 30° the other side in not more than 28 s;

For propulsion and steering systems other than traditional arrangements for a ship's directional control, the main steering arrangements for ship directional control are to be capable of changing direction of the ship's directional control system from one side to the other at declared steering angle limits at an average rotational speed of not less than 2.3°/s with the ship running ahead at maximum ahead service speed;

(3) operated by power where necessary to meet the requirements of (2) above and in any case when, excluding strengthening for navigation in ice, a rudder stock is over 120 mm diameter in way of the tiller;

For propulsion and steering systems other than traditional arrangements for a ship's directional control, the main steering arrangements for ship directional control are to be operated by power;

(4) so designed that they will not be damaged at maximum astern speed; however, this design requirement need not be proved by trials at maximum astern speed and maximum rudder angle.

6.11.3 The auxiliary steering gear is to be:

(1) of adequate strength and capable of steering the ship at navigable speed and of being brought speedily into action in an emergency;

(2) capable of putting the rudder over from 15° on one side to 15° the other side in not more than 60 s with the ship at its deepest seagoing draught and running ahead at one half of the maximum ahead service speed or 7 knots, whichever is the greater;

For propulsion and steering systems other than traditional arrangements for a ship's directional control, the auxiliary steering arrangements for ship directional control are to be capable of changing direction of the ship's directional control system from one side to the other at declared steering angle limits at an average rotational speed, of not less than 0.5°/s; with the ship running ahead at one half of the maximum ahead service speed or 7 knots, whichever is the greater;

(3) operated by power where necessary to meet the requirements of (2) above and in any case when, excluding strengthening for navigation in ice, a rudder stock is over 230 mm diameter in way of the tiller;

For propulsion and steering systems other than traditional arrangements for a ship's directional control, the auxiliary steering arrangements for ship directional control are to be operated by power and in any ship having power of more than 2,500 kW propulsion power per thruster unit.

6.11.4 Manually operated gears are only acceptable when the operation does not require an effort exceeding 160 N under normal conditions.

6.11.5 Where the main steering gear comprises two or more identical power units, an auxiliary steering gear need not be fitted, provided that:

(1) the main steering gear is capable of operating the rudder as required in 6.11.2(2) of this Chapter while operating with all power units;

(2) the main steering gear is so arranged that after a single failure in its piping system or in one of the power units the defect can be isolated so that steering capability can be maintained or speedily regained.

6.11.6 Main and auxiliary steering gear power units are to be:

(1) arranged to re-start automatically when power is restored after a power failure. They may be arranged to re-start manually for ships of less than 20 m in length;

(2) capable of being brought into operation from a position in the navigation bridge. This requirement may be dispensed with for ships of less than 20 m in length;

(3) in the event of a power failure to any one of the steering gear power units, an audible and a visual alarm are to be given on the navigating bridge.

6.11.7 The angular position of the rudder is to be indicated on the steering gear compartment. Where the main steering gear is power-operated, the angular position of the rudder is to be indicated on the navigating bridge. The ruder angle indication is to be independent of the steering gear control system.

6.11.8 A means of communication is to be provided between the navigating bridge and the steering gear compartment. Means of communication may not be required for ships of less than 20 m in length.

6.11.9 The structure, arrangement and system of steering gears are to comply with relevant requirements of Chapter 13, PART THREE of ISC Rules for Classification of Sea-going Steel Ships.

6.12 Communications between navigation bridge and machinery spaces

6.12.1 At least two independent means are to be provided for communicating orders between the navigating bridge and the machinery spaces or the control room from which the main propulsion engines are normally controlled: one of these is to be an engine-room telegraph which provides visual indication of the orders and responses both in the machinery space and in the navigation bridge. Where it is impractical, the engine-room telegraph may be dispensed with. Appropriate means of communication is to be provided from the navigation bridge and the engine-room to any other positions from which the speed of direction of thrust of the propellers may be controlled.

6.12.2 For ships of less than 20 m in length, the engine-room telegraph referred to in 6.12.1 may be dispensed with if the main propulsion engine is directly controlled from the navigating bridge under normal operating conditions.

6.12.3 Ships of less than 20 m in length may be provided with only one means for communication referred to in 6.12.1 due to close proximity of the navigating bridge and the position of local control of the main propulsion machinery, two means of communication are not necessary.

6.13 Engineer's alarm

6.13.1 An engineer's alarm is to be provided to be operated from the engine control room or at the manoeuvring platform as appropriate and is to be clearly audible in the engineers' accommodation. This requirement may be dispensed with for ships of less than 20 m in length.

Chapter 7 Electrical Installations

7.1 General requirements

7.1.1 Electrical installations are to be such that:

(1) all electrical auxiliary services necessary for maintaining the ship in normal operational and habitable conditions will be ensured without recourse to the emergency source of electrical power;

(2) electrical services essential for safety will be ensured under various emergency conditions; and

(3) the safety of onboard personnel and ship from electrical hazards will be ensured.

7.2 Main source of electrical power in self-propelled cargo ships

7.2.1 A main source of electrical power of sufficient capacity to supply all those services mentioned in 7.1.1(1) is to be provided. This main source of electrical power is to consist of at least two generating sets, one of which may be driven by main propulsion engine. The main source of electrical power is to:

(1) be such that in the event of any one generating set being stopped it will still be possible to supply those services necessary to provide normal operational conditions of propulsion and safety;

(2) be such that the services referred to in 7.1.1(1) can be maintained regardless of the speed and direction of rotation of the propulsion machinery or shafting;

(3) in addition, the generating sets are to be such as to ensure that with any one generator or its primary source of power out of operation, the remaining generating sets are to be capable of providing the electrical services necessary to start the main propulsion plant from a dead ship condition. The emergency source of electrical power may be used for the purpose of starting from a dead ship condition if its capability is sufficient to provide at the same time those services required to be supplied by 7.3.5.

7.2.2 A main electric lighting system which is to provide illumination throughout those parts of the ship normally accessible to and used by passengers or crew is to be supplied from the main source of electrical power.

7.2.3 The arrangement of the main electric lighting system is to be such that a fire or other casualty in spaces containing the main source of electrical power, associated transforming equipment, if any, and the main switchboard, will not render the emergency electric lighting system required by 7.3.5 inoperative.

7.2.4 The arrangement of the emergency electric lighting system is to be such that a fire or other casualty in spaces containing the emergency source of electrical power, associated transforming equipment, if any, and the emergency switchboard will not render the main electric lighting system required by 7.2.2 inoperative.

7.2.5 Where transformers constitute an essential part of the main electrical power supply system required by 7.2.1, the capacity and number of the transformer are to be such as to ensure the same continuity of the supply as is stated in 7.2.1 in the event of one of the transformers being put out of action.

7.3 Emergency source of electrical power in self-propelled cargo ships

7.3.1 A self-contained emergency source of electrical power is to be provided.

7.3.2 The emergency source of electrical power, associated transforming equipment, if any, transitional source of emergency power and emergency switchboard are to be located above the uppermost continuous deck and are to be readily accessible from the open deck. They are not to be located forward of the collision bulkhead, except where permitted in exceptional circumstances.

7.3.3 The location of the emergency source of electrical power, associated transforming equipment, if any, the transitional source of emergency power and the emergency switchboard is to be such as to ensure that a fire or other casualty in the space containing the main source of electrical power, associated transforming equipment, if any, and the main switchboard will not interfere with the supply, control and distribution of emergency electrical power.

7.3.4 Provided that suitable measures are taken for safeguarding independent emergency operation under all circumstances, the emergency generator may be used, exceptionally, and for short periods, to supply non-emergency circuits.

7.3.5 The electrical power available is to supply all those services that are essential for safety in an emergency, due regard being paid to such services as may have to be operated simultaneously. The emergency source of electrical power is to be capable, having regard to starting currents and the transitory nature of certain loads, of supplying simultaneously at least the following services for the periods specified hereinafter, if they depend upon an electrical source for their operation:

(1) For a period of 3 h, emergency lighting at every muster and embarkation station and over the sides.

(2) For a period of 12 h, emergency lighting:

① in all service and accommodation alleyways, stairways and access;

② in the spaces of propulsion machinery used for navigation, if any, main source of electrical power and their control positions;

③ in all control stations, machinery control rooms, and at each main and emergency switchboard;

④ at all stowage positions for firemen’s outfits;

⑤ at the steering gear, if any; and

⑥ at the fire pump referred to in Chapter 8 of the Guidelines and its control position.

(3) For a period of 12 h, the navigation lights and other lights required by the International Regulations for Preventing Collisions at Sea, 1972 in force.

(4) For a period of 12 h:

① radiocommunications as required in Chapter 10 of the Guidelines, the ship's whistle and internal signals that are required in an emergency;

② the fire detection and fire alarm system; and

③ fire pumps as required by Chapter 8 of the Guidelines (if they depend upon an electrical source for their operation).

Equipment listed in ① and ② above may be excluded if they have an independent supply for a specified period from an accumulator battery suitably located for use in an emergency.

(5) In a ship engaged regularly in voyages of short duration, a lesser period than the 12 h period specified in paragraphs (2) to (4) may be accepted as agreed but not less than 3 h.

7.3.6 Emergency source of electrical power is to be:

(1) accumulator battery carrying the emergency electrical load without recharging while maintaining the voltage of the battery throughout the discharge period within 12% above or below its nominal voltage;

(2) generator driven by a suitable prime mover with an independent supply of fuel.

7.3.7 Where the emergency source of electrical power is an accumulator battery it is to be capable of automatically connecting to the emergency switchboard in the event of failure of the main source of electrical power.

7.3.8 Where the emergency source of electrical power is a generator, it is to be started automatically and connect to the emergency switchboard within 45 s in the event of failure of the main source of electrical power. It is to be driven by a suitable prime mover with an independent supply of fuel, having a flashpoint of not less than 43℃. The emergency generator is not required to be started automatically if the accumulator battery complying with the requirements of 7.3.9 is fitted as the emergency source of electrical power.

7.3.9 The accumulator battery fitted as the transitional source of emergency electrical power is to be capable of:

(1) carrying the emergency electrical load without recharging while maintaining the voltage of the battery throughout the discharge period within 12% above or below its nominal voltage;

(2) immediately supplying those services specified in 7.3.5 for a period of 0.5 h in the event of failure of the main and emergency source of electrical power.

7.3.10 Each emergency generating set arranged to be automatically started is to be equipped with approved starting devices with a stored energy capability of at least three consecutive starts.

7.4 Precautions against shock, fire and other hazards of electrical origin

7.4.1 Exposed metal parts of electrical machines or equipment which are not intended to be live but which are liable under fault conditions to become live are to be earthed unless the machines or equipment are:

(1) supplied at a voltage not exceeding 55 V direct current or 55 V root mean square between conductors; auto-transformers are not to be used for the purpose of achieving this voltage; or

(2) supplied at a voltage not exceeding 250 V by safety isolating transformers supplying only one consuming device; or

(3) constructed in accordance with the principle of double insulation.

7.4.2 Additional precautions may be required for portable electrical equipment for use in confined or exceptionally damp spaces where particular risks due to conductivity may exist.

7.4.3 All electrical apparatus are to be so constructed and so installed as not to cause injury to persons and damage to equipment when handled or touched in the normal manner.

7.4.4 Main and emergency switchboards are to be so arranged as to give easy access as may be needed to apparatus and equipment, without danger to personnel. The sides and the rear and, where necessary, the front of switchboards is to be suitably guarded. Exposed live parts having voltages to earth exceeding a voltage to be specified by the Administration are not to be installed on the front of such switchboards. Where necessary, nonconducting mats or gratings are to be provided at the front and rear of the switchboard.

7.4.5 The hull return system of distribution is not to be used for any purpose in a tanker or barge carrying flammable liquid cargoes in bulk.

7.4.6 The requirement of 7.4.5 does not preclude under the approved conditions the use of:

(1) impressed current cathodic protective systems;

(2) limited or locally earthed systems (e.g. starting system of main machinery);

(3) limited or locally earthed welding systems, welding systems with hull return may be installed without the limitation of 7.4.5, if satisfactory measures for ensuring the equal potential of the structure are provided;

(4) insulation level monitoring devices provided the circulation current does not exceed 30 mA under the most unfavorable conditions.

7.4.7 Where the hull return system is used, all final subcircuits, i.e. all circuits fitted after the last protective device, are to be two-wire and special precautions are to be taken.

7.4.8 Earthed distribution systems are not to be used in a tanker or barge carrying flammable liquid cargoes in bulk. However, the use of the following earthed systems is permitted:

(1) intrinsically safe circuits;

(2) power-supplied control circuits and instrumentation circuits where technical or safety reasons preclude the use of a system with no connection to earth, provided the current in the hull is limited to not more than 5 A in both normal and fault conditions;

(3) limited or locally earthed systems, provided that any possible resulting current does not flow directly through any of the dangerous spaces;

(4) alternating current power networks of 1,000 V line to line and over, provided that any possible resulting current does not flow directly through any of the dangerous spaces.

7.4.9 When a distribution system, whether primary or secondary, for power, heating or lighting, with no connection to earth is used, a device capable of continuously monitoring the insulation level to earth and of giving an audible or visual indication of abnormally low insulation values is to be provided.

7.4.10 Except as permitted in exceptional circumstances, all metal sheaths and amour of cables are to be electrically continuous and are to be earthed.

7.4.11 All electric cables and wiring external to equipment are to be at least of a flame-retardant type and are to be so installed as not to impair their original flame-retarding properties. Where necessary for particular applications, the use of special types of cables such as radio frequency cables may be permitted, which do not comply with the foregoing.

7.4.12 Cables and wiring serving essential or emergency power, lighting, internal communications or signals are so far as practicable to be routed clear of galleys, laundries, machinery spaces of category A and their casings and other high fire risk areas. Cables connecting fire pumps to the emergency switchboard are to be of a fire-resistant type where they pass through high fire risk areas. Where practicable all such cables are to be run in such a manner as to preclude their being rendered unserviceable by heating of the bulkheads that may be caused by a fire in an adjacent space.

7.4.13 Where cables which are installed in hazardous areas introduce the risk of fire or explosion in the event of an electrical fault in such areas, special precautions against such risks are to be taken.

7.4.14 Cables and wiring are to be installed and supported in such a manner as to avoid chafing or other damage.

7.4.15 Terminations and joints in all conductors are to be so made as to retain the original electrical, mechanical, flame-retarding and, where necessary, fire-resisting properties of the cable.

7.4.16 Each separate circuit is to be protected against short circuit and against overload. The rating or appropriate setting of the overload protective device for each circuit is to be permanently indicated at the location of the protective device. Except in the following situations:

(1) where it is impractical, e.g. the circuits of the starting accumulator battery of the engine;

(2) overload is impossible to occur in the circuit in the design phase, e.g. the control transformer;

(3) the overload protection may be substituted by overload alarms for electric motors and thruster motors provided with duplicated equipment;

(4) circuits of steering gear.

7.4.17 Lighting fittings are to be so arranged as to prevent temperature rises which could damage the cables and wiring, and to prevent surrounding material from becoming excessively hot.

7.4.18 All lighting and power circuits terminating in a coal bunker or cargo space are to be provided with a multiple-pole switch outside the space for disconnecting such circuits.

7.4.19 Accumulator batteries are to be suitably housed, and compartments used primarily for their accommodation are to be properly constructed and efficiently ventilated.

7.4.20 Accumulator batteries are not to be located in sleeping quarters except where hermetically sealed as approved.

7.4.21 No electrical equipment is to be installed in any space where flammable mixtures are liable to collect (including such space in a tanker or barge carrying flammable liquid cargoes in bulk), for example, in compartments assigned principally to accumulator batteries, in paint lockers, acetylene stores or similar spaces, unless it is satisfied that such equipment is:

(1) essential for operational purposes;

(2) of a type which will not ignite the mixture concerned;

(3) appropriate to the space concerned; and

(4) appropriately certified for safe usage in the dusts, vapours or gases likely be encountered.

7.4.22 Lightning protection devices are to be fitted on all the masts made of non-conductive materials.

7.5 Non-self-propelled ships

7.5.1 The capacity and number of main source of power of manned non-self-propelled ships are to be arranged as required by engineering operation and comply with the requirements of 7.1.1(1).

7.5.2 Emergency source of electrical power is to be provided in manned non-self-propelled ships, the period and scope of power supply are at least to comply with the following requirements:

(1) for a period of 3 h, at every muster and embarkation station of survival craft and over the sides, in all alleyways, stairways and exits, main switchboard and emergency source of electrical power spaces, control stations;

(2) for a period of 12 h, the navigation lights and other lights required by the International Regulations for Preventing Collisions at Sea, 1972 in force;

(3) for a period of 12 h, internal communication equipment required in an emergency;

(4) power supply for readiocommunications is to comply with Chapter 10 of the Guidelines.

7.5.3 Electrical installations of manned non-self-propelled ships are also to comply with the requirements of paragraphs 7.2.2 to 7.2.4, 7.3.2 to 7.3.4, 7.3.6 to 7.3.10 and 7.4.1 to 7.4.22.

Chapter 8 Fire Fighting

8.1 General requirements

8.1.1 The performance standards for fire safety systems and appliances and the methods for the tests of fire-resisting materials and structures are to comply with the relevant requirements of the International Code for Fire Safety Systems (hereinafter referred to as "FSS Code") and International Code for Application of Fire Test Procedures (hereinafter referred to as "FTP Code").

8.1.2 Definitions used in this Chapter are the same as those in SOLAS Chapter II-2.

8.1.3 Fire fighting for self-propelled ships is to comply with the relevant requirements of 8.2 to 8.7 and 8.9 of this Chapter and fire fighting for manned non-self-propelled ships is to comply with the relevant requirements of 8.8 and 8.9 of this Chapter.

8.2 Water supply systems

8.2.1 Fire pumps

(1) Capacity

The total capacity of the main fire pump(s) is not to be less than:

$$Q = (0.145\sqrt{L(B + D)} + 2.170)^2 \text{, but need not exceed } 25\text{m}^3\text{/hour}$$

where: B — greatest moulded breadth of ship, in m;
D — moulded depth to freeboard deck, in m;
L — length of ship, in m;
Q — total capacity, in m^3/h.

(2) Fire pumps

Generally one main power pump and one portable fire pump are to be provided as specified below.

① Sanitary, ballast, bilge or general service pumps may be accepted as fire pumps, provided that they are not normally used for pumping oil, and that, if they are subject to occasional duty for the transfer or pumping of fuel oil, suitable changeover arrangements are fitted.

② A power pump is a fixed pump driven by a power source other than by hand.

③ In cargo ships classed for navigation in ice, the fire pump sea inlet valves are to be provided with ice clearing arrangements.

④ Relief valves are to be provided in conjunction with any fire pump if the pump is capable of developing a pressure exceeding the design pressure of the water service pipes, hydrants and hoses. These valves are to be so placed and adjusted as to prevent excessive pressure in any part of the fire main system.

⑤ Where a centrifugal pump is provided in order to comply with this Chapter, a non-return valve is to be fitted in the pipe connecting the pump to the fire main.

(3) Portable fire pumps

① Portable fire pumps are to comply with the following:

a. The pump is to be self-priming.

b. The total suction head and the net positive suction head of the pump are to be determined taking account of actual operation, i.e. pump location when used.

c. The portable fire pump, when fitted with its length of discharge hose and nozzle, is to be capable of maintaining a pressure sufficient to produce a jet throw of at least 12 m, or that required to enable a jet of water to be directed on any part of the engine room or the exterior boundary of the engine room and casing, whichever is the greater.

d. Except for electric pumps, the pump set is to have its own fuel tank of sufficient capacity to operate the pump for three hours. For electric pumps, their batteries are to have sufficient capacity for three hours.

e. Except for electric pumps, details of the fuel type and storage location are to be carefully considered. If the fuel type has a flashpoint below 60°C, further consideration to the fire safety aspects is to be given.

f. The pump set is to be stored in a secure, safe and enclosed space, accessible from open deck and clear of the Category 'A' machinery space.

g. The pump set is to be easily moved and operated by two persons and be readily available for immediate use.

h. Arrangements are to be provided to secure the pump at its anticipated operating position(s).

i. The overboard suction hose is to be non-collapsible and of sufficient length, to ensure suction under all operating conditions. A suitable strainer is to be fitted at the inlet end of the hose.

j. Any diesel-driven power source for the pump is to be capable of being readily started in its cold condition by hand (manual) cranking. If this is impracticable, consideration is to be given to the provision and maintenance of heating arrangements, so that readily starting can be ensured.

(4) Alternatively to the requirements of (3) a fixed fire pump may be fitted, which is to comply with the following:

①The pump, its source of power and sea connection are to be located in accessible positions, outside the compartment housing the main fire pump.

②The sea valve is to be capable of being operated from a position near the pump.

③The room where the fire pump prime mover is located is to be illuminated from the emergency source of electrical power, and is to be well ventilated.

④ Pump is required to supply water for a fixed fire-extinguishing system in the space where the main fire pump is situated, it is to be capable of simultaneously supplying water to this system and the fire main at the required rates.

⑤ The pump may also be used for other suitable purposes.

⑥ Pressure and quantity of water delivered by the pump being sufficient to produce a jet of water, at any nozzle, of not less than 12 m in length.

(5) For ships less than 150 GT fitted with an approved fixed fire-fighting system in the engine room, portable pumps may be omitted.

(6) Means to illuminate the stowage area of the portable pump and its necessary areas of operation are to be provided, and supplied from the emergency source of electrical power.

8.2.2 Fire main

(1) The diameter of the fire main is to be based on the required capacity of the fixed main fire pump(s) and the diameter of the water service pipes is to be sufficient to ensure an adequate supply of water for the operation of at least one fire hose.

(2) The wash deck line may be used as a fire main provided that the requirements of this Chapter are satisfied.

(3) All exposed water pipes for fire-extinguishing are to be provided with drain valves for use in frosty weather. The valves are to be located where they will not be damaged by cargo.

8.2.3 Pressure in the fire main

When the main fire pump is delivering the quantity of water required by 8.2.1(1) of this Chapter, or the fire pump described in 8.2.1(4) of this Chapter, through the fire main, fire hoses and nozzles, the pressure maintained at any hydrant is to be sufficient to produce a jet throw at any nozzle of not less than 12 m in length.

8.2.4 Fire hydrants

(1) Number and position of hydrants

① For ships less than 150 GT the number and position of the hydrants are to be such that at least one jet of water may reach any part normally accessible to the crew, while the cargo ship is being navigated and any part of any cargo space when empty. Furthermore, such hydrants are to be positioned near the accesses to the protected spaces. (At least one hydrant is to be provided in each Category ‘A’ machinery space).

② For ships equal or greater than 150 GT the number and position of hydrants are to be such that at least two jets of water not emanating from the same hydrant, one of which is to be from a single length of hose, may reach any part of the ship normally accessible to the crew while the ship is being navigated and any part of any cargo spaces when empty. Furthermore, such hydrants are to be positioned near the accesses to the protected spaces.

(2) Pipes and hydrants

① Materials readily rendered ineffective by heat are not to be used for fire mains. Where steel pipes are used, they are to be galvanized internally and externally. Cast iron pipes are not acceptable. The pipes and hydrants are to be so placed that the fire-hoses may be easily coupled to them. The arrangement of pipes and hydrants is to be such as to avoid the possibility of freezing. In ships where deck cargo may be carried, the positions of the hydrants are to be such that they are always readily accessible and the pipes are to be arranged, as far as practicable, to avoid risk of damage by such cargo. There is to be complete interchangeability of hose couplings and nozzles.

② A valve is to be fitted at each fire hydrant so that any fire-hose may be removed while the fire pump is at work.

③ Where a fixed fire pump is fitted outside the engine room, in accordance with 8.2.1(4) of this Chapter, an isolating valve is to be fitted in the fire main so that all the hydrants in the ship, except that or those in the space of main fire pump, can be supplied with water. The isolating valve is to be located in an easily accessible and tenable position outside the space of main fire pump and the fire main is not to re-enter the machinery space downstream of the isolating valve.

8.2.5 Fire-hoses

(1) Fire-hoses are to be of approved non-perishable material. The hoses are to be sufficient in length to project a jet of water to any of the spaces in which they may be required to be used. Their length, in general, is not to exceed 18 m. Each hose is to be provided with a nozzle and the necessary couplings. Fire-hoses, together with any necessary fittings and tools, are to be kept ready for use in conspicuous positions near the water service hydrants or connections.

(2) For ship less than 150 GT, one hose is to be provided for each hydrant. In addition one spare hose is to be provided onboard.

(3) Ship equal or greater than 150 GT is to be provided with fire hoses the number of which is to be one for each 30 m length of the ship and one spare, but in no case less than three in all. Unless one hose and nozzle is provided for each hydrant in the ship, there is to be complete interchangeability of hose couplings and nozzles.

8.2.6 Nozzles

(1) For the purpose of this Chapter, standard nozzle sizes are 12 mm, 16 mm or 19 mm, or as near thereto as possible, so as to make full use of the maximum discharge capacity of the fire pump(s).

(2) For accommodation and service spaces, the nozzle size need not exceed 12 mm.

(3) The size of nozzles used in conjunction with a portable fire pump need not exceed 12 mm.

(4) All nozzles are to be of an approved dual purpose type (i.e. spray/jet type) incorporating a shut-off.

8.3 Fire safety measures

8.3.1 Structural fire protection

(1) The minimum fire integrity of bulkheads and decks is to be as prescribed in Table 8.3.1.

Minimum fire integrity of bulkheads and decks Table 8.3.1

Item	Space	Separation By	From Space
(1)	Machinery Space Class 'A'	A-60	Accommodation / control stations / corridors / staircases / service spaces of high fire risk
(2)	Machinery Space Class 'A'	A-0	Other than above item (1)
(3)	Galley	A-0	Unless specified otherwise
(4)	Service space of high fire risk other than galley	B-15	Unless specified above item (1)
(5)	Corridor Staircase	B-0	Unless specified above item (1)
(6)	Cargo space	A-0	Unless specified above item (1)

The divisions used to separate spaces, not mentioned above, are to be of non-combustible material.

(2) Other requirements

① The hull, superstructure, structural bulkheads, decks and deckhouses are to be constructed of steel or other equivalent material. For the purpose of applying the definition of steel or other equivalent material, as given in SOLAS, the 'applicable fire exposure' is to be one hour.

② Stairways are to be enclosed, at least at one level, by divisions and doors or hatches, in order to restrict the free flow of smoke to other decks in the ship and the supply of air to the fire. Doors forming such enclosures are to be self-closing.

③ Openings in 'A' Class divisions are to be provided with permanently attached means of closing which are to be at least as effective for resisting fires as the divisions in which they are fitted.

④ Interior stairways serving machinery spaces, accommodation spaces, service spaces or control stations are to be of steel or other equivalent material.

⑤ Doors are to be self-closing in way of Category 'A' machinery spaces and galleys, except where they are normally kept closed.

⑥ Where 'A' Class divisions are penetrated for the passage of electric cables, pipes, trunks, ducts, etc., or for girders, beams or other structural members, arrangements are to be made to ensure that the fire resistance is not impaired. Arrangements are also to prevent the transmission of heat to un-insulated boundaries at the intersections and terminal points of the divisions and penetrations by insulating the horizontal and vertical boundaries or penetrations for a distance of 450 mm.

8.3.2 Materials

(1) Paints, varnishes and other finishes used on exposed interior surfaces of bulkheads, decks, floor coverings, panel linings and ceilings are not to be capable of producing excessive quantities of smoke, toxic gases or vapours in accordance with the IMO FTP Code, Annex 1, Part 2. Paints, varnishes and other finishes used on exposed interior surfaces are to be of the low flame spread type in accordance with the IMO FTP Code, Annex 1, Part 5.

(2) Except in cargo spaces or refrigerated compartments of service spaces, insulating materials are to be non-combustible.

(3) Where pipes penetrate 'A' or 'B' Class divisions, the pipes or their penetration pieces are to be of steel or other approved materials having regard to the temperature and integrity such divisions are required to withstand.

(4) Pipes conveying oil or combustible liquids through accommodation and service spaces are to be of steel or other approved materials having regard to the fire risk.

(5) Materials readily rendered ineffective by heat are not to be used for overboard scuppers, sanitary discharges and other outlets which are close to the waterline, and where the failure of the material in the event of fire would give rise to the danger of flooding.

(6) Primary deck coverings within accommodation spaces, service spaces and control stations are to be of a type which will not readily ignite, or give rise to toxic or explosive hazards at elevated temperatures in accordance with the IMO FTP Code, Annex 1, Part 2.

(7) Materials used for insulating pipes, etc., in machinery spaces and other compartments containing high fire risks are to be non-combustible. Vapour barriers and adhesives used in conjunction with insulation, as well as the insulation of pipe fittings, for cold service systems need not be of non-combustible materials, but they are to be kept to the minimum quantity practicable and their exposed surfaces are to have low flame spread characteristics.

8.3.3 Surface of insulation

In spaces where penetration of oil products is possible, the surface of the insulation is to be impervious to oil or oil vapours. Insulation boundaries are to be arranged to avoid immersion in oil spillage.

8.3.4 Ventilation systems

(1) Ventilation fans are to be capable of being stopped and main inlets and outlets of ventilation systems closed from outside the spaces being served.

(2) Ventilation ducts for Category 'A' machinery spaces are not to pass through accommodation spaces, galleys, service spaces or control stations, unless the ducts are constructed of steel and arranged to preserve the integrity of the division.

(3) Ventilation ducts for accommodation spaces, service spaces or control stations are not to pass through Category 'A' machinery spaces or galleys unless the ducts are constructed of steel and arranged to preserve the integrity of the division.

(4) Independent ventilation is to be provided in the battery rooms and store rooms containing highly flammable products to prevent the accumulation of gases that may be emitted. If power ventilation is taken, the fan is considered as non-sparking.

(5) Ventilation systems serving Category 'A' machinery spaces and galley exhaust ducts are to be independent of systems serving other spaces.

(6) Ventilation openings may be fitted in and under the lower parts of "B" class doors of cabin, mess and dayroom in corridor bulkheads. The total net area of any such openings is not to exceed 0.05 m^2. Alternatively, a non-combustible air balance duct routed between the cabin and the corridor, and located below the sanitary unit, is permitted where the cross-sectional area of the duct does not exceed 0.05 m^2.

8.3.5 Oil fuel arrangements

(1) In a cargo ship in which oil fuel is used, the arrangements for the storage, distribution and utilization of the oil fuel are to be such as to ensure the safety of the vessel and persons on board.

(2) Oil fuel tanks situated within the boundaries of Category 'A' machinery spaces are not to contain oil fuel having a flashpoint of less than 60℃.

(3) Oil fuel, lubricating oil and other flammable oils are not to be carried in fore peak tanks.

(4) For arrangement of oil fuel lines, and as far as practicable:

① oil fuel lines are to be arranged far apart from hot surfaces, electrical installations or other sources of ignition and are to be screened or otherwise suitably protected to avoid oil spray or oil leakage onto the sources of ignition. The number of joints in such piping systems is to be kept to a minimum;

② surfaces with temperatures above 220℃ which may be impinged as a result of a fuel system failure are to be properly insulated. Precautions are to be taken to prevent any oil that may escape under pressure from any pump, filter or heater from coming into contact with heated surfaces;

③ external high-pressure fuel delivery lines between the high pressure fuel pumps and fuel injectors are to be protected with a jacketed piping system capable of containing fuel from a high-pressure line failure. A suitable enclosure on engines protecting the high pressure fuel pumps and fuel delivery lines and having an output of 375 kW or less having fuel injection pumps serving more than one injector may be used as an alternative to the jacketed piping system.

8.3.6 Special arrangements in Category 'A' machinery spaces and where necessary other machinery spaces

(1) The number of skylights, doors, ventilators, openings in funnels to permit exhaust ventilation and other openings to machinery spaces is to be reduced to a minimum consistent with the needs of ventilation and the proper and safe working of the ship.

(2) Skylights are to be of steel and are not to contain glass panels. Suitable arrangements are to be made to permit the release of smoke, in the event of fire, from the space to be protected.

(3) Windows are not to be fitted in machinery space boundaries. This does not preclude the use of glass in control rooms within the machinery spaces.

(4) Means of control are to be provided for:

① opening and closure of skylights, closure of openings in funnels which normally allow exhaust ventilation, and closure of ventilator dampers;

② permitting the release of smoke;

③ closing power-operated doors or actuating release mechanism on doors other than power-operated watertight doors;

④ stopping ventilating fans; and

⑤ stopping forced and induced draught fans, oil fuel transfer pumps, oil fuel unit pumps and other similar fuel pumps.

(5) The controls required in (4) are to be located outside the space concerned, where they will not be cut off in the event of fire in the space they serve. Such controls and the controls for any required fire-extinguishing system are to be situated at one control position or grouped in as few positions as possible. Such positions are to have a safe access from the open deck.

8.3.7 Arrangements for gaseous fuel for domestic purposes

Where gaseous fuel is used for domestic purposes, the arrangements for the storage, distribution and utilization of the fuel are to comply with the relevant requirements of Section 4 of Chapter 3, PART SIX of ISC Rules for Classification of Sea-going Steel Ships.

8.3.8 Electric radiators

Electric radiators, if used, are to be fixed in position and so constructed as to reduce fire risks to a minimum. No such radiators are to be fitted with an element so exposed that clothing, curtains, or other similar materials can be scorched or set on fire by heat from the element.

8.3.9 Means of escape

(1) Stairways, ladders and corridors serving crew spaces and other spaces to which the crew normally have access are to be arranged so as to provide ready means of escape to a deck from which embarkation into lifeboat and survival craft may be effected.

(2) There are to be at least two means of escape, as widely separated as possible, from each section of accommodation and service spaces and control stations.

① The normal means of access to the accommodation and service spaces below the open deck are to be arranged so that it is possible to reach the open deck without passing through spaces containing a possible source of fire (e.g. machinery spaces, storage spaces of flammable liquids).

② The second means of escape may be through portholes or hatches of adequate size and preferably leading directly to the open deck.

③ Dead-end corridors having a length of more than 7 m are not to be accepted.

(3) Machinery spaces:

① At least two means of escape are to be provided from Category 'A' machinery spaces, except where the small size of a machinery space makes it impracticable. The means of escape are to be as widely separated as possible. Where such means of escape require the use of ladders, these are to be of steel.

② From machinery spaces other than those of category A, two escape routes are to be provided except that a single escape route may be accepted for spaces that are entered only occasionally and for spaces where the maximum travel distance to the door is 5 m or less.

8.3.10 Emergency escape breathing devices

An emergency escape breathing device is to be provided in Category 'A' machinery space.

8.4 Fixed fire detection and fire-alarm systems

8.4.1 An approved and fixed fire detection system is to be installed in all Category 'A' machinery spaces and cargo pump rooms.

8.5 Fire-Extinguishing Arrangements

8.5.1 Fixed Fire-extinguishing arrangements in Category 'A' machinery spaces

(1) Machinery spaces of category 'A' on ships with GT greater than or equal to 150 are to be provided with one of the approved fixed fire-extinguishing system as specified in SOLAS Chapter II-2 in the following situations. Fixed fire-fighting systems where required, are to be in accordance with the requirements of the IMO FSS Code.

① category 'A' machinery spaces containing oil-fired boiler or oil fuel unit;

② category 'A' machinery spaces containing internal combustion machinery with total power output of 750 kW and above.

(2) Ships other than those specified in (1) may be fitted with water fire-extinguishing systems only.

8.5.2 Protection of paint lockers and flammable liquid lockers

Paint lockers and flammable liquid lockers are to comply with the relevant requirements of PART SIX of ISC Rules for Classification of Sea-going Steel Ships.

8.5.3 Portable fire-extinguishers

(1) Number

Spaces	Total number
Accommodation and service spaces①	
Ships greater than or equal to 150 GT	≥ 3
Ships less than 150 GT	≥ 1
Machinery spaces② (one extinguisher per every 375 kW of internal combustion engine power)	≥ 2, ≤ 6

Notes: ① Portable carbon dioxide fire extinguishers are not to be used.

② Category 'A' machinery spaces containing oil-fired boiler or oil fuel unit or those containing internal combustion machinery with total power output of 375 kW and above are to be provided with at least one foam extinguishers of capacity not less than 18*l* for the effective protection of the above mentioned equipment, but the total capacity need not exceed 45*l*. For machinery spaces fitted with fixed fire-fighting systems as required by 8.5.1 of this Chapter, foam extinguishers of capacity not less than 18*l* are not required.

(2) Performance requirements

All portable fire-extinguishers are to be of approved types and designs in compliance with FSS Code.

① The extinguishing media employed is to be suitable for extinguishing fires in the compartments in which they are intended to be used.

② The extinguishers required for use in the machinery spaces using oil as fuel are to be of a type discharging foam, carbon dioxide gas, dry powder or other approved media suitable for extinguishing oil fires.

(3) The following capacities may be taken as equivalents for extinguishing same typed of fires:

① 9 litre fluid extinguisher (water or foam);

② 5 kg dry powder;

③ 5 kg carbon dioxide.

(4) Spare charges

A spare charge is to be provided for each required portable fire-extinguisher that can be readily recharged on board. If this cannot be done, duplicate extinguishers are to be provided.

(5) Location

① The extinguishers are to be stowed in readily accessible positions and are to be spread as widely as possible and not be grouped.

② One of the portable fire-extinguishers intended for use in any space is to be stowed near the entrance to that space.

(6) Portable fire-extinguishers in accommodation spaces, service spaces and control stations

Accommodation spaces, service spaces and control stations are to be provided with a sufficient number of portable fire-extinguishers to ensure that at least one extinguisher will be readily available for use in every compartment of the crew spaces. In any case, their number is to be not less than three, except where this is impractical for very small ships, in which case one extinguisher is to be available at each deck having accommodation or service spaces, or control stations.

Accommodation spaces of greater fire risk (e.g. galley) and battery room are to be provided with at least one portable extinguisher suitable for extinguishing such fires.

8.6 Fire-fighting equipment

8.6.1 Fire-fighting equipment is at least to be provided as follows:

(1) A fire blanket is at least to be provided in the galley or any spaces fitted with naked fire stoves, and the blanket is to be readily available and ready for immediate use.

(2) All ships greater than or equal to 150 GT are to carry at least one firefighter's outfit complying with the Requirements of the IMO FSS Code.

(3) Fire control plans

① In all ships, fire control plans are to be permanently exhibited, using graphical symbols that are in accordance with IMO Resolution A.952(23), which show clearly for each deck the control stations, the various fire sections enclosed by steel or 'A' , 'B' Class divisions, together with particulars of:

(a) the fire detection and fire-alarm systems;

(b) fixed fire-fighting system;

(c) the fire-extinguishing appliances;

(d) the means of access to different compartments, decks, etc.;

(e) the position of firemen's outfits;

(f) the ventilating system, including particulars of the fan control positions, the position of dampers and identification numbers of the ventilating fans serving each section; and

(g) the location and arrangement of the emergency stop for the oil fuel unit pumps and for closing valves to the pipes from oil fuel tanks.

② Alternatively, the details required by ① may be set out in a booklet, a copy of which is to be supplied to each officer, and one copy is at all times to be available on board in an accessible position.

③ Fire control plans are to be kept up to date and description in such plans is to be written in Chinese and English.

④ In all ships greater than or equal to 150 GT, a duplicate set of fire-control plans or a booklet containing such plans is to be permanently stored in a prominently marked weathertight enclosure outside the deckhouse for the assistance of shoreside fire-fighting personnel.

8.7 Additional fire safety measures for tankers

8.7.1 Application

The additional requirements for tankers of SOLAS Chapter II-2 are to apply to tankers carrying crude oil and petroleum products having a flash point not exceeding 60°C (closed cup test), as determined by an approved flash point apparatus, and a Reid vapour pressure which is below atmospheric pressure, and other liquid products having a similar fire hazard.

8.7.2 Tankers carrying petroleum products having a flashpoint exceeding 60°C (closed cup test) are to comply with the following requirements:

(1) Cargo area deck protection

① at least one mobile foam appliance is to be provided for use on the cargo tank deck including the cargo manifolds. It is to be capable of simple and rapid operation. Self-contained appliances are to have a foam solution capacity of at least 135 litres;

② a portable foam applicator unit is to consist of an air foam nozzle of an inductor type capable of being connected to the fire main by a fire hose, together with a portable tank containing at least 20 litres of foam-making liquid and one spare tank. The nozzle is to be capable of producing effective foam, suitable for extinguishing an oil fire, at the rate of at least 1.5 m^3/min;

③ the type of foam used is to be suitable for the cargoes to be carried.

8.8 Fire-fighting requirements for manned non-self-propelled ships

8.8.1 Non-self-propelled ships with not more than 60 people onboard are to comply with the fire-fighting requirements for cargo ships, as specified in SOLAS Chapter II-2.

8.8.2 Non-self-propelled ships with more than 60 people onboard are to comply with the fire-fighting requirements in passenger ship carrying not more than 36 passengers, as specified in SOLAS Chapter II-2.

8.9 Others

8.9.1 Carriage of dangerous goods in self-propelled and non-self-propelled ships

(1) Requirements of SOLAS Chapter VII apply to the carriage of dangerous goods as specified in regulation 2 of that chapter, and such goods are to be carried in packaged form or in solid form in bulk as required by the Convention.

(2) The ship is to comply with the requirements of SOLAS regulation II-2/19 during the carriage of dangerous goods.

(3) Carriage of other dangerous goods:

①stowage of marine explosives is to comply with relevant requirements for explosives stowage, as specified in the Code of Safety for Special Purpose Ships;

②storage of liquid which emits dangerous vapour, flammable gas and gas bottles containing flammable or other dangerous gas is to be located in a well ventilated space or on the deck, subject to the provisions of the Code of Safety for Special Purpose Ships, and no hazard due to rise of the temperature exists. All pipes and fittings related to gas bottles are to be adequately protected from any damage. If store room is necessary, the division of the store room is to comply with the requirements of the International Maritime Dangerous Goods (IMDG) Code;

③materials which are liable to spontaneous heating or combustion, are not to be carried unless adequate precautions have been taken to minimize the likelihood of the outbreak of fire;

④radioactive materials are not to be carried, unless precautions have been taken.

8.9.2 Use of oxyacetylene

Where oxyacetylene is used on board the ship for maintenance and engineering work, the arrangement and design of oxyacetylene are to comply with relevant requirements of PART SIX of ISC Rules for Classification of Sea-going Steel Ships.

Chapter 9 Life-saving Appliances

9.1 General requirements

9.1.1 The life-saving appliances and arrangements as required by this Chapter are to be the products approved by ISC. The performance of life-saving appliances is to comply with the relevant provisions of IMO International Life-saving Appliance Code (LSA Code).

9.1.2 Unless otherwise specified in this Chapter, the arrangement of life-saving appliances is to comply with the requirements of SOLAS Chapter III.

9.1.3 For manned non-self-propelled ships under towing condition, the provision of life-saving appliances is to comply with the relevant requirements of ISC Guidelines for Towage at Sea.

9.2 Self-propelled cargo ships

9.2.1 Communications

(1) Each ship is to be provided with:

① radio life-saving appliances as specified in 10.6 of Chapter 10 of the Guidelines;

② at least 6 rocket parachute flares are to be carried on the navigation bridge. The rocket parachute flares may be substituted by portable flares, taking into account the nature and condition of the navigation;

③ an emergency means comprised of either fixed or portable equipment is to be provided for two-way communications between emergency control stations, muster and embarkation stations and strategic positions on board;

④ a general emergency alarm system is to be provided and is to be used for summoning passengers and crew to muster stations and to initiate the actions included in the muster list.

9.2.2 Personal life-saving appliances

(1) Lifebuoys

At least 6 lifebuoys are to be provided on each ship, among which:

①2 fitted with a self-activating light signal;

②2 with a buoyant lifeline;

③2 fitted with a self-activating smoke and light signal and are to be capable of quick release from the navigation bridge;

④lifebuoys with lights and those with lights and smoke signals are to be equally distributed on both sides of the ship.

(2) Lifejackets and immersion suits

①at least one lifejacket is to be provided for every person on board the ship. A sufficient number of lifejackets are to be carried for persons on watch. The lifejackets carried for persons on watch are to be stowed on the bridge, in the engine control room and at any other manned watch station. Each lifejacket is to be fitted with a lifejacket light;

② an immersion suit is to be provided for every person on board the ship. If the ship is constantly engaged on voyages in warm climates①, immersion suites are unnecessary.

9.2.3 Survival craft and rescue boats

(1) Ships excluding oil tankers, chemical tankers and gas carriers carrying cargoes having a flashpoint not exceeding 60ºC (closed-cup test) are to comply with the following:

① they are to carry on each side of the ship, one or more liferafts and of such aggregate capacity as will accommodate the total number of persons on board;

② unless the liferafts required by 9.2.3(1)① are stowed in a position providing for easy side-to-side transfer at a single open deck level, additional liferafts are to be provided so that the total capacity available on each side will accommodate 150% of the total number of persons on board.

(2) Oil tankers, chemical tankers and gas carriers carrying cargoes having a flashpoint not exceeding 60℃ (closed-cup test) are to be provided with totally enclosed fire protected lifeboats capable of accommodating the total number of persons on board on each side of the ship or a single fire protected free-fall lifeboat throughout the ship. In addition, at least one inflatable liferaft capable of accommodating the total number of persons on board and one rescue boat are to be carried on each side of the ship.

(3) Chemical tankers and gas carriers carrying cargoes emitting toxic vapours or gases② are to be provided with lifeboats capable of accommodating the total number of persons on board on each side of the ship with the addition of a self-contained air support system or a single free-fall lifeboat with the addition of a self-contained air support system throughout the ship. In addition, at least one inflatable liferaft capable of accommodating the total number of persons on board and one rescue boat are to be carried on each side of the ship.

(4) Any other cargo ships of 45 m in length and upwards, except those specified in 9.2.3(2) and 9.2.3(3), are to be provided with a rescue boat.

(5) If the lifeboat and its launching appliance are in compliance with the requirements for rescue boat, the rescue boat may be substituted.

9.3 Manned non-self-propelled ships during operation

① Refer to the Guidelines for the assessment of thermal protection (MSC/Circ.1046).

② Refer to the products for which emergency escape respiratory protection is required in chapter 17 of the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code), and in chapter 19 of the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code).

9.3.1 Communications

Ships of 20 m in length and upwards are to be provided with at least 6 rocket parachute flares or portable flares, and ships of less than 20 m in length are to be provided with at least 4 rocket parachute flares or portable flares.

9.3.2 Personal life-saving appliances

(1) A lifejacket is at least to be provided for every person on board the ship.

(2) Lifebuoys are at least to be provided in accordance with Table 9.3.2(2).

Provision of lifebuoys **Table 9.3.2(2)**

Length of ship, in m	Number of lifebuoys①
$L<20$	2
$45>L\geq20$	4
$75>L\geq45$	6
$100>L\geq75$	8
$150>L\geq100$	10
$200>L\geq150$	12
$L\geq200$	14

Note ① At least one of the lifebuoys provided on each side of the ship is to be fitted with the self-igniting light.

(3) Lifebuoys are to be equally distributed on both sides of the ship. At least one lifebuoy on each side of the ship is to be fitted with a buoyant lifeline equal in length to not less than twice the height at which it is stowed above the waterline in the lightest seagoing condition, or 30 m, whichever is the greater.

9.3.3 Liferafts capable of accommodating the total number of persons on board are at least to be provided throughout the ship.

9.4 Stowage, launching and recovery of survival craft

9.4.1 Each survival craft is to be stowed:

(1) so that neither the survival craft nor its stowage arrangements will interfere with the operation of any other survival craft or rescue boat at any other launching station;

(2) so that it is easy for the lifeboat and rescue boat to be launched from the ship and an appliance which is capable of launching and recovering is to be provided;

(3) in a state of continuous readiness so that two crew members can carry out preparations for embarkation and launching in less than 5 min;

(4) liferafts intended for throw-overboard launching are to be so stowed as to be readily transferable for launching on either side of the ship unless the liferafts are in compliance with the requirements of 9.2.3(1)②.

9.4.2 Every liferaft is to be stowed with its painter permanently attached to the ship. Each liferaft or group of liferafts is to be stowed with a float-free arrangement complying with the requirements of LSA Code.

9.4.3 Provision of launching and embarkation appliances

(1) Launching and embarkation appliances are to be provided for all survival craft except those which are:

①boarded from a position on deck less than 4.5 m above the waterline in the lightest seagoing condition and which have a mass of not more than 185 kg; or

② boarded from a position on deck less than 4.5 m above the waterline in the lightest seagoing condition and which are stowed for launching directly from the stowed position under unfavorable conditions of trim of up to 10° and list of up to 20° either way; or

③carried in excess of the survival craft for 200% of the total number of persons on board the ship and which have a mass of not more than 185 kg; or

④carried in excess of the survival craft for 200% of the total number of persons on board the ship, are stowed for launching directly from the stowed position under unfavorable conditions of trim of up to 10° and list of up to 20° either way.

(2) An approved embarkation ladder extending, in a single length, from the deck to the waterline in the lightest seagoing condition under all conditions of trim of up to 10° and a list of up to 20° either way is to be provided at each embarkation station or at every two adjacent embarkation stations for survival craft launched down the side of the ship to permit access to survival craft after launching,

9.5 Operational readiness, maintenance and inspections

9.5.1 Before the ship leaves port and at all times during the voyage, including operation condition, all life-saving appliances are to be ready for immediate use.

9.5.2 Maintenance and inspections of the life-saving appliances are to be carried out in accordance with SOLAS regulation III/20.

9.6 Emergency training and drills

9.6.1 Emergency training and drills are to be carried out in accordance with SOLAS regulation III/19.

9.7 Muster list and emergency instructions

9.7.1 Every self-propelled cargo ship is to be provided with muster list and emergency instructions in accordance with SOLAS regulations III/8 and 37.

Chapter 10 Radiocommunications

10.1 General requirements

10.1.1 This Chapter applies to non-self-propelled ships engaged on international voyages and self-propelled ships of less than 300 gross tonnage engaged on international voyages. Self-propelled ships of 300 gross tonnage and upwards engaged on international voyages are to comply with the requirements of SOLAS Chapter IV.

10.1.2 Radiocommunications are to be approved by ISC and the performance standards they conform to are not to be inferior to those adopted by IMO.

10.1.3 The terms and definitions used in this Chapter are the same as those defined in SOLAS Chapter IV.

10.1.4 No provision in this Chapter is to prevent the use by any ship, survival craft or person in distress, of any means at their disposal to attract attention, make known their position and obtain help.

10.2 Radio personnel

10.2.1 Every ship is to carry personnel qualified for distress and safety radiocommunication purposes. The personnel are to be holders of certificates as appropriate, any one of whom is to be designated to have primary responsibility for radiocommunications during distress incidents.

10.3 Watches

10.3.1 Every self-propelled cargo ship, while at sea, is to maintain a continuous watch:

(1) on VHF DSC channel 70, if the ship is fitted with a VHF radio installation;

(2) on the distress and safety DSC frequency 2,187.5 kHz, if the ship is fitted with an MF radio installation;

(3) on the distress and safety DSC frequencies 2,187.5 kHz and 8,414.5 kHz and also on at least one of the distress and safety DSC frequencies 4,207.5 kHz, 6,312 kHz, 12,577 kHz or 16,804.5 kHz, appropriate to the time of day and the geographical position of the ship, if the ship is fitted with an MF/HF radio installation. This watch may be kept by means of a scanning receiver;

(4) for satellite shore-to-ship distress alerts, if the ship is fitted with an Inmarsat ship earth station.

10.3.2 Every self-propelled cargo ship, while at sea, is to maintain a radio watch for broadcasts of maritime safety information on the appropriate frequency or frequencies on which such information is broadcast for the area in which the ship is navigating.

10.4 Radio records

10.4.1 A record is to be kept, as required by the Radio Regulations, of all incidents connected with the radiocommunication service which appear to be of importance to safety of life at sea.

10.5 Maintenance and test

10.5.1 Radio equipment required by this Chapter is to be maintained to provide the availability of the functional requirements and to meet the recommended performance standards of such equipment.

10.5.2 Adequate information is to be provided to enable the radio installations and equipment to be properly operated and maintained.

10.5.3 The satellite EPIRBs are to be annually tested for all aspects of operational efficiency, with special emphasis on checking the emission on operational frequencies, coding and registration. The test is to be conducted on board the ship or at an approved testing station, within 3 months before the expiry date of Safety Radio Certificate, or 3 months before or after the anniversary date. The satellite EPIRB is to be subject to maintenance at intervals not exceeding five years, to be performed at an approved shore-based maintenance facility.

10.6 Provision of the ship

10.6.1 Self-propelled cargo ships

(1) Self-propelled cargo ships are to be provided with radiocommunications in accordance with Table 10.6.1.

Radiocommunications provided on self-propelled cargo ships Table 10.6.1

<table>
<tr><th>No.</th><th>Name</th><th>A1</th><th>A1+A2</th><th>A1+A2+A3</th></tr>
<tr><td>1.</td><td>VHF</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>2.</td><td>NAVTEX</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>3.</td><td>EPIRB</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>4.</td><td>MF</td><td></td><td rowspan="4">1(optional)</td><td></td></tr>
<tr><td>5.</td><td>MF/HF</td><td></td><td rowspan="3">1(optional)</td></tr>
<tr><td>6.</td><td>HF</td><td></td></tr>
<tr><td>7.</td><td>Inmarsat ship earth station</td><td></td></tr>
<tr><td>8.</td><td>Location device for search and rescue①</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>9.</td><td>TWO-WAY VHF for survival craft</td><td>2</td><td>2</td><td>2</td></tr>
<tr><td colspan="5">Note ①: Namely SART and AIS-SART, either one is to be chosen.</td></tr>
</table>

(2) VHF, MF/HF and HF as specified in Table 10.6.1 are to be with DSC and telephone functions.

10.6.2 Non-self-propelled Ships

(1) For manned non-self-propelled ships, if watched by ships around, VHF (with radiotelephone function) as listed in item 1 of Table 10.6.1 is at least to be provided, or portable VHF for the effective communications with the ship watching around. If no ship is watching around, equipment as listed in item 1 and items 3 to 7 of Table 10.6.1 are to be provided based on the operating area for the effective communications with the shore.

(2) If survival craft are provided on the manned non-self-propelled ships, TWO-WAY VHF for survival craft as listed in item 9 and location device for search and rescue as listed in item 8 of Table 10.6.1 are to be provided.

10.7 Sources of energy

10.7.1 Unless otherwise specified in 10.7.4, radiocommunications are to be supplied by separate feeders from main and emergency switchboards.

10.7.2 Unless otherwise specified in 10.7.4, batteries used as the reserve source of energy for the radio equipment are to be provided on every ship and to be charged, to supply radiocommunications in the event of failure of the ship's main and emergency sources of electrical power.

10.7.3 The reserve source of energy is to be located above the uppermost continuous deck and is to be at least sufficient to supply radio equipment and necessary electrical lighting for 1 hour.

10.7.4 Portable radiocommunications are at least to be provided with a set of reserve batteries with the same capacity, if no charging device is fitted on board the ship.

10.8 Installation

10.8.1 The installation of radiocommunications (including installation location) is to comply with relevant requirements of SOLAS Chapter IV.