

Transport Canada
Marine Safety
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**STANDARDS FOR THE CONSTRUCTION
AND INSPECTION
OF SMALL PASSENGER VESSELS**

Transport Canada
1994

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OF SMALL PASSENGER VESSELS**

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CHAPTER I

GENERAL PROVISIONS

1. INTRODUCTION

These standards have been developed by the Board of Steamship Inspection, to consolidate in one document, the requirements of the many regulations and standards which are applicable to small passenger vessels.

2. APPLICATION

- 2.1 These Standards do not apply to ferry vessels or dynamically supported craft.
- 2.2 These Standards apply to new small passenger vessels that are used in the transport of one or more passengers, are restricted to voyages not more exposed than home-trade Class III or inland waters Class II, and are not more than 24.0 m in length that:
- (a) exceed 15 tons gross tonnage but are not more than 150 tons gross tonnage, and carry not more than 100 unberthed passengers or 25 berthed passengers, or
 - (b) do not exceed 15 tons gross tonnage, and carry more than 12 passengers but not more than 100 unberthed passengers or 25 berthed passengers.
- 2.3 Notwithstanding anything in these Standards:
- (a) the Board may exempt any vessel from full compliance with any of the requirements of these Standards;
 - (b) where the Board considers it necessary in the interests of safety of life, it may impose special requirements in respect of the hull construction, life saving and fire extinguishing equipment in addition to the requirements of these Standards; and

- (c) where these Standards require that the hull of a vessel be constructed in a particular manner or that a particular provisions is made, the Board may allow the hull to be constructed in any other manner or allow any other provision to be made if it is satisfied that such other manner of construction or such other provision is at least as effective as that required by these Standards.

3. INTERPRETATION

In these Standards,

"Act" means the Canada Shipping Act; (*Loi*)

"accommodation space" includes any public space, corridor, lavatory, cabin, crew quarters, pantry not containing cooking appliances and any other similar space; (*local d'habitation*)

"approved classification society" means the American Bureau of Shipping, Bureau Veritas, Det norske Veritas or Lloyd's Register of Shipping; (*société de classification agréée*)

"approved" means approved by the Regional Director or in such a manner as the Regional Director may direct; (*agréée*)

" 'A' Class division" means a division formed by a bulkhead or deck that is

- (a) constructed of steel or an equivalent material, and
- (b) stiffened to be capable of preventing the passage of smoke and flame when subjected to the standard fire test for 60 minutes; (*cloisonnement du type A*)

" 'A-60', 'A-30' and 'A-15' Class divisions" means an 'A' Class division that is insulated with approved non-combustible materials so that if either face of the division is subjected to the standard fire test, the average temperature of the other face of the division will not rise more than 139 degrees C above the original temperature and the temperature at any one point, including any joint, will not rise more than 180 degrees C above the original temperature during

- (a) the first 60 minutes of that test, in the case of an 'A-60' Class division,

- (b) the first 30 minutes of that test, in the case of an 'A-30' Class division,
- (c) the first 15 minutes of that test, in the case of an 'A-15' Class division; (*cloisonnements du type A-60, A-30 et A-15*)

" 'A-0' Class division" means an 'A' Class division that does not meet the insulation requirements specified in the definition " 'A-60', 'A-30' and 'A-15' Class divisions"; (*cloisonnement du type A-0*)

" 'A-60' Class fire rating", " 'A-30' fire rating", " 'A-15' fire rating" and " 'A-0' fire rating" means the thermal and integrity requirements specified in the definition " 'A-60', 'A-30' or 'A-15' Class divisions" or in the definition " 'A-0' Class division", as the case may be; (*cote au feu des cloisonnements du type A-60, A-30, A-15 et A-0*)

" 'B' Class division" means a division formed by a bulkhead, ceiling or lining that is constructed to be capable of preventing the passage of flame when subjected to the standard fire test for a period of 30 minutes; (*cloisonnement du type B*)

" 'B-15' Class division" means a 'B' Class division that is constructed of non-combustible materials so that if either face of the division is subjected to the standard fire test the average temperature of the other face of the division will not rise more than 139 degrees C above the original temperature and the temperature at any one point, including any joint, will not rise more than 225 degrees C above the original temperature during the first 15 minutes of that test; (*cloisonnement du type B-15*)

" 'B-0' Class division" means a 'B' Class division that does not meet the insulation requirements specified in the definition " 'B-15' Class division"; (*cloisonnement du type B-0*)

" 'B-15' Class fire rating and 'B-0' Class fire rating" means the thermal and integrity requirements specified in the definition " 'B-15' Class division" or " 'B-0' Class division" as the case may be; (*cote au feu des cloisonnements du type B-15 et B-0*)

"Board" means the Board of Steamship Inspection; (*Bureau*)

"bulkhead deck" means the uppermost deck up to which transverse watertight bulkheads are carried; (*pont de cloisonnement*)

" 'C' Class division" means a division constructed of approved non-combustible materials; (*cloisonnement du type C*)

"Chairman" means the Chairman of the Board of Steamship Inspection; (*président*)

"combustible material" means material other than non-combustible material; (*matériau combustible*)

"continuous 'B' Class ceiling" or "continuous 'B' Class lining" means a ceiling or lining that is constructed to the standard required for a 'B' Class division and that terminates only at an 'A' Class or 'B' Class division; (*vaigrage continu du type B ou lambrissage continu du type B*)

"control station" includes:

- (a) every space containing emergency sources of power and lighting,
- (b) the wheelhouse and chartroom,
- (c) every space containing the ship's radio equipment, and
- (d) every space containing a fire extinguishing agent for use in another space; (*poste de commande*)

"dynamically supported craft" means a craft that possesses either of the following characteristics:

- (a) the weight, or a significant part thereof, is balanced in one mode of operation by other than hydrostatic forces, or
- (b) the craft is able to operate at speeds such that the function $v/\sqrt{gL_{wl}}$ is equal to or greater than 0.9, where "v" is maximum speed, "L_{wl}" is the waterline length and "g" is the acceleration due to gravity, all in consistent units; (*embarcation à soutien dynamique*)

"emergency boat", means a boat complying with TP 9241E that is approved by the Board; (*embarcation de sauvetage*)

" 'F' Class division" means a division formed by a bulkhead, ceiling or lining that complies with the following:

- (a) is constructed to be capable of preventing the passage of flame when subjected to the standard fire test for 30 minutes, and

- (b) if either face of the division is subjected to the standard fire test, the average temperature of the other side of the division will not rise more than 139 degrees C above the original temperature and the temperature at any one point, including any joint, will not rise more than 225 degrees C above the original temperature during the first 30 minutes of that test; (*cloisonnement du type F*)

"fire retardant coating" means a coating as defined in TP 439E, "Structural Fire Protection Standards: Testing and Approval Procedures", or a fire retardant coating that is labelled by Underwriters' Laboratories of Canada or Underwriters' Laboratories Inc. (U.S.A.) as having a Flame Spread Classification not exceeding 25; (*enduit protecteur*)

"ferry vessel", means any vessel, having provision only for unberthed passengers and/or for vehicles, which is operated on a schedule between two or more points over the most direct water route and offers a public service of a type normally attributed to a bridge or tunnel; (*traversier*)

"galley" means any space used for the cooking of food, but excludes any space which contains only a means for heating food; (*cuisine*)

"inspector" means a steamship inspector appointed under the Act; (*inspecteur*)

"length" means the distance from the foreside of the foremost permanent structure to the aft side of the aftermost permanent structure of the vessel, not including bulwarks, guards or rubbing strakes; (*longueur*)

"limited voyage" is a voyage in which:

- (a) the distance between suitable harbours does not exceed 15 nautical miles and the distance from shore does not exceed 5 nautical miles, or
- (b) the area of operation from the port of departure does not exceed a radius of 1.5 x the vessel's service speed or 15 nautical miles whichever is less; (*voyage limité*)

"long forward superstructure" means a decked structure above the bulkhead deck which extends for at least 50 per cent of the length of the vessel; (*superstructure à l'avant à grande longueur*)

"low flame spread characteristics" means in respect of a surface or a material applied to a surface, that the surface or material restricts the spread of flame as defined in TP 439E, "Structural Fire Protection Standards: Testing and Approval Procedures", or is labelled by Underwriters' Laboratories of Canada or Underwriters' Laboratories Inc.(U.S.A.) as having a Flame Spread Classification not exceeding 25; (*faible pouvoir propageur des flammes*)

"machinery space" means a machinery space of category 'A' and any other space containing propelling machinery and includes all trunks to such spaces; (*local des machines*)

"machinery spaces of category 'A' " means a space and trunks to such spaces, which contain

- (a) internal combustion type machinery that is used for main propulsion, or that is used for any other purpose where such machinery has in the aggregate a total power output of not less than 373 kW, or
- (b) any oil-fired boiler, oil fuel unit or oil fired incinerator; (*local des machines de catégorie A*)

"margin line" means a line drawn at least 76mm below the upper surface of the bulkhead deck at the side of a vessel, and assumed for determining the floodable length of the vessel; (*ligne de surimmersion*)

"midships" means the midpoint of the length; (*milieu*)

"new vessel" means

- (a) a vessel, the keel of which was laid on or after the date of issue of this Standard;
- (b) a vessel that is converted to a passenger vessel or undergone major modifications on or after the date of issue of this Standard;
- (c) a vessel that is transferred to registry in Canada after the date of issue of this Standard; (*nouveau bateau*)

"non-combustible material" means a material as defined in TP 439E, "Structural Fire Protection Standards: Testing and Approval Procedures" or is labelled by Underwriters' Laboratories of Canada or Underwriter'Laboratories Inc.(U.S.A.) as being non-combustible; (*matériau non combustible*)

"not readily ignitable" means, in respect of a deck covering material that the material complies with the requirements of TP 439E, "Structural fire Protection Standards: Testing and Approval Procedures"; (*non facilement inflammable*)

"passenger" means any person carried on a vessel, but does not include:

- (a) a person carried on a vessel who is
 - (i) the master or a member of the crew, or a person employed or engaged in any capacity on board the vessel on the business of that vessel,
 - (ii) the owner or charterer of the vessel, a member of his family or a servant connected with his household,
 - (iii) a guest of the owner or charterer of the vessel if it is used exclusively for pleasure and the guest is carried on the vessel without remuneration or any object of profit, or
 - (iv) under 1 year of age, or
- (b) a person carried on any vessel in pursuance of the obligation laid upon the master to carry shipwrecked, distressed or other persons or by reason of any circumstances that neither the master nor the owner nor the charterer, if any, could have prevented or forestalled; (*passager*)

"primary deck covering" means the first layer of floor construction which is applied directly on top of the deck plating and is inclusive of any primary coat, anti-corrosive compound or adhesive which is necessary to provide protection or adhesion to the deck plating; (*revêtement primaire de pont*)

"public space" includes any dining room, lounge, bar, and similar permanently enclosed spaces allocated to passengers and crew; (*local de réunion*)

"Regional Director" means the officer of Department of Transport in charge of a Ship Safety Region; (*gestionnaire régionale*)

"rules or codes" means rules, regulations or codes relating to the construction, installation and inspection of marine machinery, issued by an approved classification society; (*règles ou codes*)

"sailing ship" means

- (a) a ship capable of being propelled wholly by sails whether or not fitted with an auxiliary engine, and
- (b) a ship principally employed in the passenger trade not more than 150 tons, gross tonnage, provided with masts, sails and rigging sufficient to allow it to make voyages; (*bateau à voile*)

"service space" includes any galley, pantry containing cooking appliances, laundry, drying room, locker and store room, and any other similar space and any trunk to such space; (*local de service*)

"standard fire test" means a test in which a specimen of the relevant 'A' Class or 'B' Class division, having an exposed surface area of not less than 4.65 square meters and a bulkhead height or deck length of 2.44 meters, resembling as closely as possible the intended construction and including where appropriate at least one joint, is exposed in a test furnace to a series of time temperature relationships defined by a smooth curve drawn through the following temperature points measured above the initial furnace temperature:

at the end of the first 5 minutes - 576°C
at the end of the first 10 minutes - 679°C
at the end of the first 15 minutes - 738°C
at the end of the first 30 minutes - 841°C
at the end of the first 60 minutes - 945°C;
(*essai normalisé de tenue au feu*)

"steel or other equivalent material" Where the words "steel or other equivalent material" occur, "equivalent material" means any material which, by itself or due to insulation provided, has structural and integrity properties equivalent to steel at the end of the applicable fire exposure to the standard fire test, (e.g., aluminum with appropriate insulation); (*acier ou autre matériau équivalent*)

"suitable harbour" means any harbour situated along the route of a voyage, whether designated a scheduled stop or not, that has suitable permanent shore facilities for landing passengers safely, other than by transferring passengers to another vessel; (*port approprié*)

"vessel" means a small passenger vessel; (*bateau*)

"watertight", in relation to a structure, means the structure is capable of preventing the passage of water through it in any direction, under a head of water up to the vessel's margin line; (*étanche*)

"weathertight", in relation to a structure, means the structure is capable of preventing the passage of sea water through it in ordinary sea conditions. (*étanche aux intempéries*)

4. SUBMISSION AND APPROVAL OF PLANS AND DATA

- 4.1. Subject to section 4.2, the owner or his representative shall submit to the Regional Director for approval, in quadruplicate, the plans and data as set out in Schedule I.
- 4.2 Plans of the following are not required to be submitted:
- (a) heating boilers having a pressure not over 103 kPa;
 - (b) diesel engines not exceeding 112 kW brake power, continuous rating, unless of unusual design;
 - (c) gearing for main engines and electric propulsion motors not over 224 kW brake power, continuous rating; or
 - (d) parts that are found by an inspector to agree with plans already approved by the Regional Director.
- 4.3 Notwithstanding section 4.2, the Regional Director may require that plans and data of parts not listed in Schedule I shall be submitted.
- 4.4 One copy of each submission approved by the Regional Director shall be forwarded to the Chairman.

SCHEDULE I

Plans and Data

The following plans and data shall be submitted to the Regional Director for approval:

1. Hulls

- 1.1 general arrangement,
- 1.2 construction sections including W.T. bulkheads,
- 1.3 profile and deck plan,
- 1.4 structural fire protection arrangements,
- 1.5 arrangement, type and size of anchors and cables, and
- 1.6 subdivision calculations.

2. Stability and Associated Seaworthiness

- 2.1 draft mark locations,
- 2.2 lines plan, where required,
- 2.3 hydrostatic curves,
- 2.4 cross curves of stability,
- 2.5 curves of righting levers for each of the applicable conditions specified in Part 6, Subsection 6.1.6,
- 2.6 a capacity plan indicating the capacities and centres of gravity of all tanks and other storage spaces, and
- 2.7 tank sounding tables, including free surface effects.

3. Machinery-Propulsion, Steering and Ship Service Engine

3.1 Engines Data

- (a) number of engines and whether propulsion or ship service,
- (b) type of fuel,
- (c) manufacturer's name, model, serial number and year of build, and Ship Safety registration or approval certificate number, if in excess of 112 kW,
- (d) maximum continuous brake power and corresponding revolutions per minute, and
- (e) type of propulsion control.

3.2 Gearing Data

- (a) number of gearing sets,
- (b) type of gearing (reverse-reduction) and whether integral with engine,
- (c) manufacturer's name, model, serial number and year of build, and Ship Safety registration or approval certificate number, if in excess of 225 kW., and
- (d) maximum continuous input torque, the corresponding revolutions per minute and reduction ratio.

3.3 Propulsion Shafts, Bearings and Glands Data

- (a) diameter and material of shafts,
- (b) details of screw shaft liners,
- (c) number and position of intermediate shaft bearings,
- (d) type of stern glands and bearings, and
- (e) details of coupling devices.

3.4 Propeller Data

- (a) number of propellers,
- (b) principal dimensions, material and number of blades, and
- (c) type of shaft attachments (e.g. keyed taper).

3.5 Steering Systems Data

- (a) number of rudders and main steering gears,
- (b) diameter of rudder stocks,
- (c) type of steering gear,
- (d) manufacturer's name, model, serial number and year of build,
- (e) maximum designed torque, angle of rudder movement and timing,
- (f) type of steering control,
- (g) auxiliary steering system data, and
- (h) emergency steering arrangements where required.

3.6 Engine Room Data

- (a) machinery arrangement plan,
- (b) plans conforming to the Marine Machinery Regulations for engines in excess of 112 kW, if not previously registered or approved, and
- (c) plans conforming to the Marine Machinery Regulations for gearing in excess of 225 kW, if not previously registered or approved.

4. Machinery - Ship Service

4.1 Steam and Hot Water Heating Systems

- (a) manufacturer's documentation certifying the boiler was constructed in accordance with the American Society of Mechanical Engineers Codes, except for steam boilers having a working pressure in excess of 103 kPa in which case boiler design drawings and data shall be submitted in accordance with the Marine Machinery Regulations, and
- (b) data and plans in accordance with the Marine Machinery Regulations indicating materials, sizes and working pressures and temperatures of systems, including safety and reducing valves.

4.2 Compressed Air Systems

- (a) manufacturer's documentation for each air receiver certifying that it was constructed in accordance with rules or codes or Canadian Standards Association or the American Society of Mechanical Engineers Codes,
- (b) data and plans in accordance with the Marine Machinery Regulations indicating principal dimensions including shell and head thickness of each air receiver, openings and strength compensation, the working pressure, the type and size of pressure relieving devices, and
- (c) data and plans in accordance with the Marine Machinery Regulations indicating materials, sizes, and working pressures of systems, including safety and reducing valves.

4.3 Fresh and Sea Water Systems

- (a) data for non-structural tanks except where the pressure head will exceed 2 m from the top of the tank or where the capacity will exceed 800 litres, in which case design drawings and data shall be submitted, and
- (b) data and plans in accordance with the Marine Machinery Regulations indicating piping and flexible hose materials, sizes and types of connections.

4.4 Liquid Fuel Systems

- (a) data for non-structural tanks except where the pressure head will exceed 2 m from the top of the tank or where the capacity will exceed 800 litres, in which case design drawings and data shall be submitted,
- (b) data indicating type of fuel to be carried,
- (c) data and plans in accordance with the Marine Machinery Regulations indicating piping and flexible hose materials, sizes and types of connections,
- (d) data indicating types and location of liquid level checking arrangements, and
- (e) data indicating number and storage location of small portable fuel containers.

4.5 Lubricating Oil and Hydraulic Power Oil Systems

- (a) data for non-structural tanks except where the pressure head will exceed 2 m from the top of the tank or where the capacity will exceed 800 litres, in which case design drawings and data shall be submitted,
- (b) for non-structural tanks exceeding 50 litres capacity, data indicating type of oil that will be carried,
- (c) data and plans in accordance with the Marine Machinery Regulations indicating piping and hose materials, sizes and types of connections, and
- (d) data indicating characteristics of hydraulic power oil fluid, including its flash point.

4.6 Ventilation Air Systems

- (a) data indicating location and sizes of inlet and exhaust ducts and capacity of any mechanical blower.

4.7 Exhaust Gas Systems

- (a) data indicating machines and appliances having exhaust gas piping, and
- (b) data indicating location and details of exhaust gas outlets.

4.8 Bilge Pumping Systems

4.8.1 Data and plans in accordance with the Marine Machinery Regulations detailing the:

- (a) number and power source of pumps, (e.g. propulsion engine, electric motor or manual),
- (b) location, capacity of power pumps and inlet and outlet diameters of pumps,
- (c) materials, connection types and diameters of main suction and discharge pipes and components, and
- (d) locations and diameters of branch bilge suctions and their number in all watertight compartments.

5. Electrical Systems

5.1 Electrical Systems Less than 55 Volts

- (a) Single line diagram indicating:
 - (i) size and type of cable for each circuit,
 - (ii) rating of each generator or alternator,
 - (iii) capacity of batteries, and
 - (iv) rating of each protective device.
- (b) Fire Detection System
 - (i) block diagram and bill of material.
- (c) Essential Alarm System
 - (i) block diagram.

- (d) Load Analysis.

5.2 Electrical Systems of 55 Volts or Over

- (a) Plans and data in accordance with Ship Safety Electrical Standard TP127.

6. Fire Protection Equipment

6.1 Fire protection arrangements and appliances plans shall indicate:

- (a) that all fire protection systems and appliances comply with Part 20 and the Electrical Standard TP 127, as applicable,
- (b) details of fixed detection systems including their operation, maintenance and testing procedures,
- (c) details of fixed fire extinguishing systems including the quantity and type of extinguishing medium and the volume of the space to be protected,
- (d) number and capacities of fire pumps together with size and length of hose, and
- (e) number, types, capacities and locations of portable fire extinguishers.

7. Life Saving Equipment

7.1 The lifesaving arrangement plan shall show:

- (a) the stowage location, type and capacity of emergency boats, liferafts or platforms, if applicable,
- (b) the location and type of launching devices, if applicable,
- (c) other lifesaving appliances, and
- (d) the location and size of passengers' muster and embarkation areas.

8. Navigation Lights

8.1 Arrangement of navigation lights.

CHAPTER II

CONSTRUCTION - SUBDIVISION AND STABILITY

5. CONSTRUCTION OF HULLS

5.1 Standard of Subdivision

- 5.1.1 Vessels carrying more than 12 berthed passengers on any voyage, and vessels carrying more than 50 unberthed passengers on home-trade Class III or inland waters Class II voyages shall be so divided by transverse watertight bulkheads that with any one main compartment flooded, the margin line will not be submerged.
- 5.1.2 Vessels carrying not more than 12 berthed passengers or not more than 100 unberthed passengers on home-trade Class IV, minor waters Class I or II voyages, or not more than 50 unberthed passengers on home-trade Class III or inland waters Class II voyages shall be so constructed that with any one main compartment flooded, the margin line will not be submerged.
- 5.1.3 To provide the required buoyancy, vessels subject to subsection 5.1.2 may be fitted with a suitable closed-cell buoyant material, or subdivided into watertight compartments.
- 5.1.4 Subdivision calculations shall be performed in accordance with a recognized method taking into account the form, draught and other characteristics of the vessel. The factor of subdivision shall be unity.
- 5.1.5 For the purpose of subsection 5.1.1, the watertight bulkheads to be considered effective, shall be spaced between the collision and the afterpeak bulkheads not less than 10 per cent of the maximum load water line length.
- 5.1.6 Watertight bulkheads required by subsection 5.1.1 shall not be stepped unless additional subdivision is provided in way of the step to maintain the same measure of safety as that obtained by a plane bulkhead; where a ship can withstand flooding of the two adjacent compartments separated by a stepped bulkhead and no part of such bulkhead is nearer to either of the other bulkheads bounding the adjacent compartments than is permitted by subsection 5.1.5, the step will be acceptable.

- 5.1.7 If a watertight bulkhead is recessed, the recess shall be inboard from the ship's side by at least one-fifth the beam amidships measured at right angles to the centre line at the level of the load water line; otherwise, the bulkhead shall comply with the requirements for a stepped bulkhead.
- 5.1.8 In the case of vessels where the maximum moulded beam at the deck and at the load water line differ appreciably, the inboard damage penetration may be assumed at a mean position between that corresponding to one-fifth of the maximum moulded beam at the deck, measured inboard at the deck, and that corresponding to one-fifth the maximum moulded beam at the load water line measured inboard at the load water line.
- 5.1.9 Where a main transverse bulkhead is stepped or recessed, an equivalent plane bulkhead shall be used in determining the subdivision.
- 5.1.10 Where a main transverse watertight compartment contains local subdivision and it can be shown to the satisfaction of the Regional Director that, after any assumed side damage, the whole volume of the main compartment will not be flooded, a proportionate allowance may be made in the subdivision calculations. In such a case the volume of effective buoyancy assumed on the undamaged side shall not be greater than that assumed on the damaged side.
- 5.1.11 Means should be provided for verifying the watertight integrity of the vessel and for periodic inspection of the internal structure.

5.2 Peak and Machinery Space Bulkheads

- 5.2.1 Every vessel must have a collision bulkhead.
- 5.2.2 Each collision bulkhead required by subsection 5.2.1, must be constructed in accordance with section 5.3, and
- (a) if the vessel has a long forward superstructure it must extend weathertight to the deck above the bulkhead deck for service on other than home-trade Class IV and minor waters Class I or II. The extension need not be fitted directly above the bulkhead below provided it is located within the limits specified in paragraph 5.2.3.(a) and the part of the deck which forms the step is made effectively weathertight;

- (b) shall not be fitted with any type of penetration or opening except as allowed elsewhere in these Standards.

5.2.3 The collision bulkhead shall be:

- (a) located at least 5 per cent but not more than 8 per cent of the maximum load water line length from the forward perpendicular; and
- (b) installed in a single plane, with no recess or step, and shall be watertight up to the bulkhead deck.

5.2.4 Every vessel shall be provided with watertight bulkheads dividing the space appropriated to the main machinery from other spaces.

5.2.5 Compartments forward of the collision bulkhead are not to be arranged for the carriage of fuel oil or other liquid substances that are flammable.

5.2.6 The tail shaft and the rudder stock shall be fitted with approved watertight glands.

5.3 Construction of Watertight Bulkheads

5.3.1 Each watertight subdivision bulkhead, whether transverse or longitudinal, shall be designed in accordance with the rules of an approved classification society, and at least to be capable of remaining watertight with a head of water to the top of the bulkhead.

5.3.2 Each part of the structure of the vessel, forming tanks which are intended to hold liquids, shall be of a design and construction adequate for that purpose.

5.3.3 Each watertight bulkhead must extend to the bulkhead deck and be installed in one plane without steps or recesses insofar as is reasonable and practicable. Any steps or recesses permitted must comply with the section 5.1.

5.4 Openings in Watertight Bulkheads

5.4.1 The number of openings in watertight bulkheads shall be reduced to the minimum compatible with the design and proper working of the vessel; satisfactory means shall be provided for closing these openings.

- 5.4.2 Where pipes, scuppers, electric cables, etc., are carried through watertight subdivision bulkheads, arrangements shall be made to ensure the watertight integrity of the bulkheads.
- 5.4.3 Valves and cocks not forming part of a piping system shall not be fitted in any bulkhead required to be watertight.
- 5.4.4 Sluice valves are not permitted in watertight bulkheads.
- 5.4.5 Heat sensitive materials shall not be used in systems which penetrate watertight subdivision bulkheads, where deterioration of such systems in the event of fire would impair the watertight integrity of the bulkheads.
- 5.4.6 No doors, manholes, or access openings are permitted in the collision bulkhead below the bulkhead deck.
- 5.4.7 The collision bulkhead may be pierced below the bulkhead deck by not more than one pipe for dealing with fluid in the forepeak tank, provided that the pipe is fitted with a screwdown valve capable of being operated from above the bulkhead deck, the valve chest being secured inside the forepeak to the collision bulkhead, or 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.
- 5.4.8 Not more than one doorway shall pierce a watertight bulkhead in the machinery space; if any such bulkhead is pierced by a doorway, the doorway shall be placed so as to have the sill as high as possible and the outboard vertical edge of such doorway shall be situated at a distance from the vessel's shell plating which is not less than one fifth of the breadth of the vessel.

5.5 Means of Closing Openings in Watertight Bulkheads

- 5.5.1 In every vessel, efficient means shall be provided for closing and making watertight all openings in bulkheads and other structures required to be watertight.
- 5.5.2 Subject to subsection 5.5.3 watertight doors fitted to any such openings shall be sliding doors. The following rules shall apply:
- (a) where the vessel has no passenger spaces below the bulkhead deck, the doors may be hand operated;

- (b) where the vessel has passenger spaces below the bulkhead deck, the doors shall be power operated and shall be capable of being simultaneously closed from a central station situated on the navigating bridge.
- 5.5.3 Hinged doors may be fitted to any such openings which are not required to be open at sea. Such doors shall be closed before the voyage commences and shall be kept closed during navigation. Should any of the doors be accessible during the voyage, they shall be fitted with a device which prevents unauthorized opening.
- 5.5.4 Approved watertight doors may be one of the following types: hinged doors, hand operated sliding doors, and sliding doors which are power operated as well as hand operated.
- 5.5.5 Every door required by these Standards to be watertight shall be of such design, material and construction as will maintain the integrity of the watertight bulkhead in which it is fitted.
- 5.5.6 The frame of every watertight door shall be properly fitted to the bulkhead in which the door is situated, and the jointing material between the frame and the bulkhead shall be of a type that will not deteriorate or be injured by heat.
- 5.5.7 Every horizontally sliding watertight door shall be so installed as to prevent its moving if the vessel rolls, and if necessary a clip or other suitable device shall be provided for that purpose; the device shall not interfere with the closing of the door when the door is required to be closed.
- 5.5.8 The means of operation of any watertight door whether power-operated or not shall be capable of closing the door with the ship listed to 15 degrees either side.
- 5.5.9 Watertight doors shall be fitted with indicators which show at all operating stations from which the doors are not visible whether the doors are open or closed. If any watertight door is not capable of being operated from a central control, means of communication shall be provided whereby the officer of the watch may communicate with the person responsible for the closing of the door.
- 5.5.10 Hinged doors shall be fitted with quick acting locking devices, operable from each side of the bulkhead.

- 5.5.11 Hand-operated sliding doors shall have a horizontal motion. It shall be possible to operate the mechanism at the door itself from either side, and, in addition, from an accessible position above the bulkhead deck, with an all round crank motion, or some other movement providing the same guarantee of safety. Departures from this method of operation may be permitted, if this requirement is impossible owing to the layout of the spaces. When operating a hand gear the time necessary for the complete closure of the door with the vessel upright, shall not exceed 90 seconds.
- 5.5.12 Power operated sliding doors shall have a horizontal motion. If a door is required to be power operated from a central control, the gearing shall be so arranged that the door can be operated by power also at the door itself from both sides. The arrangement shall be such that the door will close automatically if opened by local control after being closed from the central control, and also such that any door can be kept closed by local systems which will prevent the door from being opened from the central control. Local control handles in connection with the power gear shall be provided each side of the bulkhead and shall be so arranged as to enable persons passing through the doorway to hold both handles in the open position without being able to set the closing mechanism in operation accidentally. Power operated sliding doors shall be provided with hand gear workable at the door itself on either side and from an accessible position above the bulkhead deck, with an all round crank motion or some other movement providing the same guarantee of safety. Provision shall be made to give warnings by sound signal that the door has begun to close and will continue to sound until it is completely closed. The door shall take a sufficient time to close to ensure safety.
- 5.5.13 Where screw gear is used for operating a watertight door, the screw shall work in a part of suitable non-corrodible metal.
- 5.5.14 Portable plates on bulkheads shall not be permitted except in machinery spaces. Such plates shall always be in place before the vessel leaves port, and shall not be removed during navigation except in case of urgent necessity. The necessary precautions shall be taken in replacing them to ensure that the joints shall be watertight.

5.6 Openings in the Shell Plating Below the Bulkhead Deck

- 5.6.1 The number of sidescuttles, scuppers, sanitary discharges and other openings in the shell below the bulkhead deck shall be the minimum compatible with the design and proper working of the vessel.

- 5.6.2 Sidescuttles shall be of a non-opening type and fitted with efficient hinged inside deadlights permanently attached so that they can be readily and effectively closed and secured watertight. The sidescuttles, together with their glasses and deadlights, shall be of substantial construction. No sidescuttle shall be fitted in a position so that its sill is below a line drawn parallel to the bulkhead deck at side and having its lowest point not less than 500 mm above the maximum load water line. Portable plates instead of deadlights may be provided on vessels operating on home-trade IV and minor waters Class I and II voyages.
- 5.6.3 All inlets and discharges in the shell plating shall be fitted with efficient and accessible arrangements for preventing the accidental admission of water into the vessel.
- 5.6.4 Each separate discharge led through the shell plating from spaces below the bulkhead deck shall be provided either with one automatic non-return valve fitted with a positive means of closing it from above the bulkhead deck, or, alternatively, with two automatic non-return valves without such means, the upper of which is so situated above the maximum load water line as to be always accessible for examination under service conditions, and is of a type which is normally closed;
- (a) where a valve with positive means of closing is fitted, the operating position above the bulkhead deck shall be readily accessible, and means shall be provided for indicating whether the valve is open or closed.
- 5.6.5 Any valve fitted in compliance with the requirements of subsection 5.6.3 that is a geared valve, or the lower of two non-geared valves, shall be secured to the vessel's shell plating.
- 5.6.6 All cocks and valves attached to inlets or discharges, or bulkhead fittings within B/5 distance from the shell plating, other than inlets or discharges connected with machinery, being cocks or valves fitted below the bulkhead deck or the failure of which may affect the subdivision of the vessel, shall be made of steel, bronze, or other equally efficient material; if made of steel they shall be protected against corrosion.

- 5.6.7 Discharge pipes led through the shell plating below the bulkhead deck shall not be fitted in a direct line between the outboard opening and the connection with the deck, water closet, or other similar fittings, but shall be arranged with bends or elbows of substantial metal other than cast iron or lead.
- 5.6.8 All discharge pipes led through the shell plating below the bulkhead deck and the valves relating thereto shall be protected from damage.
- 5.6.9 All electronic devices fitted in the bottom shell plating, such as echosounders, speed logs, etc., shall be fitted with efficient and accessible arrangements for preventing admission of water into the vessel.
- 5.6.10 Efficient means shall be provided for the drainage of all watertight decks below the bulkhead deck and any drainage pipes shall be so fitted with valves or otherwise arranged as to avoid the danger of water passing from a damaged to an undamaged compartment.

5.7 Watertight integrity above the Bulkhead Deck

- 5.7.1 All doors giving access to the main hull shall be strongly constructed and hung on substantial hinges and locking arrangements shall be such that a door can be opened from either side. The height of the sills of access openings shall be at least 300 mm above the bulkhead deck on vessels operating on home-trade Class III or inland waters Class II voyages, and 150 mm on vessels operating on any other voyages. If portable sills are fitted, they should be properly stowed in a readily accessible position.
- 5.7.2 Toughened safety glass having a thickness appropriate to the size and position of window, but not less than 6 mm, shall be fitted in wheelhouse windows.
- 5.7.3 Toughened safety glass or other material having equivalent transparency, strength, surface hardness and shatter safety properties having a thickness appropriate to the size and position of the window, but not less than 6 mm, shall be fitted in all other windows and sidescuttles.
- 5.7.4 In the case of a vessel which operates on home-trade Class III or inland waters Class II voyages, where there is no other means of preventing water from entering the main hull by way of a broken window or sidescuttle that is situated above the bulkhead deck, they shall be provided with:
- (a) storm shutters for windows;
 - (b) deadlights or portable plates for sidescuttles.
- 5.7.5 Vessels required by these standards to have a one-compartment standard of subdivision shall have all reasonable and practicable measures taken, to limit the entry and spread of water above the bulkhead deck.
- 5.7.6 Hatchway coamings shall be of substantial construction and shall be at least 450 mm above the deck on vessels operating on home-trade Class III or inland waters Class II voyages, and 300 mm on vessels operating on any other voyages. Hatchways shall be provided with efficient means for battening them down and making them weathertight.

- 5.7.7 Flush deck scuttles shall be watertight and strongly constructed of steel, bronze, aluminum or other equivalent material and shall have effectively secured covers that are retained on hinges or by a chain permanently attached to the ship's structure.
- 5.7.8 Non-ferrous deck scuttles shall be isolated from the steel structure of the vessel.
- 5.7.9 In every vessel, sidescuttles, gangway ports and other openings in the shell plating above the margin line, and their means of closing, shall be of efficient design and construction and of sufficient strength having regard to the spaces in which they are fitted and their positions relative to the maximum load water line, and to the intended service of the vessel.
- 5.7.10 In every vessel, the bulkhead deck or a deck above it shall be weathertight in the sense that in ordinary sea conditions water will not penetrate in a downward direction. All openings in a weathertight deck shall have coamings of adequate height and strength and shall be provided with efficient and rapid means of closing so as to make them weathertight; freeing ports or scuppers shall be provided for clearing such deck of water under all weather conditions.
- 5.7.11 Any funnel or machinery space ventilator that must be kept open for the essential operations of the vessel, and other openings leading below deck or to enclosed superstructure which cannot be closed weathertight at sea shall have coamings of adequate height above the bulkhead deck.
- 5.7.12 Where air pipes extend above the bulkhead or superstructure deck, the height from the deck to the point where water may have access below shall be at least 600 mm on the bulkhead deck and 300 mm on superstructure decks. Satisfactory means, permanently attached, shall be provided for closing the openings of the air pipes.
- 5.7.13 Ventilators to spaces below bulkhead or superstructure decks shall have coamings substantially constructed, and their height shall be at least 750 mm above the bulkhead deck and 600 mm above the superstructure decks.

5.8 Rails, Stanchions, Bulwarks and Freeing Ports

- 5.8.1 Subject to subsections 5.8.2 and 5.8.3, bulwarks, rails, chains, wire rope or any combination of these shall be fitted around the weatherdeck of the vessel at least 1000 mm in height above the weatherdeck, and the distance between the rails should be not more than 230 mm, unless strong netting is provided.
- 5.8.2 An inspector may allow the bulwarks, rails, chains and wire rope referred to in subsection 5.8.1 to be portable at places where they would interfere with the operations of the vessel.
- 5.8.3 The bulwarks, rails, chains or wire rope referred to in subsection 5.8.1 may be less than 1000 mm in height in areas where passengers have no access.
- 5.8.4 Subject to subsection 5.8.5 and 5.8.6, where bulwarks fitted on the weather deck of the vessel form wells, the minimum freeing port area, expressed in square metres, in respect of each bulwark shall be not less than

$$0.7 + 0.035 l$$

where l , expressed in metres, is the lesser of the length of bulwark in the well or 70 percent of the length of the vessel.

- 5.8.5 Where the height of the bulwark in a well on the deck is more than 1200 mm, the minimum freeing port area shall be increased, for each 100 mm in excess of 1200 mm, by 0.004 m² per metre of length of the well.
- 5.8.6 Where the height of the bulwark in a well on the deck is less than 900 mm, the minimum freeing port area may be decreased, for each 100 mm less than 900 mm, by 0.004 m² per metre of length of well.
- 5.8.7 The freeing ports of every vessel shall be arranged along the length of bulwarks so as to provide rapid and effective freeing of water from the deck of the vessel, and the lower edges of the freeing ports shall be as close to the deck as possible.
- 5.8.8 Every freeing port over 300 mm in depth shall be fitted with bars spaced not more than 230 mm apart, or with other suitable protective devices.

5.9 Subdivision Letter

- 5.9.1 A letter stating the maximum load draft at which the vessel is permitted to operate will be issued and shall be posted in the wheelhouse, under glass, adjacent to the Inspection Certificate.

6. INTACT AND DAMAGE STABILITY

6.1 Stability in Undamaged Condition

- 6.1.1 The provisions of this section regarding an inclining experiment in the undamaged condition apply to all vessels.
- 6.1.2 All inclining experiments shall be conducted in the presence of and to the satisfaction of an inspector.
- 6.1.3 Subject to subsections 6.1.4 and 6.1.5, the inclining experiment requirements of this section shall also apply to vessels which have been:
- (a) transferred to registry in Canada;
 - (b) modified or converted in such manner as to affect the vessel's stability.
- 6.1.4 The inclining experiment may be dispensed with if basic data is available from the inclining experiment of a sister vessel and it is shown to the satisfaction of the Regional Director that reliable stability information can be obtained from such basic data.
- 6.1.5 The Regional Director may allow the inclining experiment to be dispensed with in exceptional circumstances if it can be shown to the Regional Director's satisfaction that owing to the form, construction and arrangement of the vessel, stability calculations can safely be made without the inclining experiment being conducted.
- 6.1.6 Subject to subsection 6.1.7 the results obtained from an inclining experiment referred to in subsection 6.1.2 shall be developed in accordance with the requirements of the "Stability, Subdivision, and Load Line Standards", TP 7301E to indicate the stability of the vessel in the following conditions:
- (a) lightship;

- (b) light operating condition;
- (c) departure condition;
- (d) arrival condition;
- (e) worst designed operating condition that will be experienced having regard to the service in which the vessel will be engaged.

6.1.7 For vessels operating on voyages other than home-trade III and inland waters Class II, superstructures and deckhouses not regarded as enclosed can be taken into account in stability calculations up to the angle at which their openings are flooded (at this angle, the static stability curve should show one or more steps, and in subsequent computations the flooded space should be considered non-existent).

6.1.8 The owner of a vessel shall provide a document to be placed on board the vessel, containing the results of the inclining experiment required by subsection 6.1.2 and other relevant information for the use of the master, and it shall be the responsibility of the owner and master to ensure that a proper measure of stability is maintained for all conditions of loading and ballasting. In general, this information shall contain:

- (a) stability characteristics of the vessel;
- (b) appropriate information relative to loading conditions specified in this section;
- (c) any operating condition that shall be maintained to assure the safety of the vessel.

6.2 Stability in Damaged Condition

- 6.2.1 This section applies to every vessel carrying more than 12 berthed passengers on any voyage, and vessels carrying more than 50 unberthed passengers on home-trade Class III or inland waters Class II voyages.
- 6.2.2 Every vessel shall be so constructed so as to provide sufficient intact stability in all service conditions to enable the vessel to withstand the final flooding of any one of the main compartments into which the vessel is subdivided.
- 6.2.3 Every vessel shall be so constructed as to keep unsymmetrical flooding to the minimum when the vessel is in a damaged condition.
- 6.2.4 For the purposes of this section, the sufficiency of the stability of every such vessel shall be determined in accordance with the provisions of the "Ship Safety Passenger Ship Operations and Damaged Stability Standards (Non-convention Ships)" TP10943E, with the exception that the minimum assumed longitudinal extent of damage may be 10 per cent of the maximum load water line length.
- 6.2.5 Relaxations from the requirements for damage stability shall be permitted only in exceptional cases and subject to the condition that the Board is to be satisfied that the proportions, arrangements and other characteristics of the vessel are the most favourable to stability after damage which can practically and reasonably be adopted in the particular circumstances.
- 6.2.6 No relaxation from the requirements for damage stability may be considered by the Board unless it is shown that the intact metacentric height in any service condition necessary to meet these requirements is excessive for the service intended.

6.3 Survivability Criteria

- 6.3.1 This section applies to vessels carrying not more than 12 berthed passengers or not more than 100 unberthed passengers on home-trade Class IV, minor waters Class I or II voyages, or not more than 50 unberthed passengers on home-trade Class III or inland waters Class II voyages.

6.3.2 The stability of every vessel shall be deemed to be sufficient, if the calculation shows that, after the assumed damage, the final condition of the vessel is as follows:

- (a) in the event of symmetrical flooding, the metacentric height is positive, but not less than 0.05 metre;
- (b) in the event of unsymmetrical flooding, the heel does not exceed seven degrees; and
- (c) the bulkhead deck is not submerged.

6.4 Stability in Swamped Condition

6.4.1 This section applies to all vessels which may be subject to swamping.

6.4.2 The stability of the swamped vessel shall be deemed to be sufficient, if the calculation shows that, after open wells or cockpits have been flooded, the final condition of the vessel is as follows:

- (a) the metacentric height is positive, but not less than 0.05 metre, and
- (b) the minimum freeboard to the top of the well or cockpit is 150 mm.

CHAPTER III

MACHINERY AND ELECTRICAL INSTALLATIONS

7. BILGE PUMPING ARRANGEMENTS

- 7.1 An effective pumping system shall be fitted with bilge suction pipes leading to drainage levels that permit all water within any compartment, or any watertight section of any compartment, to be pumped out through at least one suction pipe when the vessel is on an even keel and is upright, or is listing by not more than 5°.
- 7.2 In vessels certified to carry more than 12 passengers, bilge water drainage in the machinery spaces and watertight compartments shall be such that the spaces and compartments, where practicable, can be pumped out after a casualty when the vessel is upright or listing.
- 7.3 The arrangement of the pumping system shall be such as to prevent the possibility of water passing from the sea to any compartment or from one watertight compartment to another, and for that purpose the bilge suction valves shall be of the screw-down non-return type, or adjacent stop and check valves, in a readily accessible location.
- 7.4 Bilge suction pipes shall lead from easily accessible mud boxes fitted with straight tailpipes to the bilge, except that mud boxes are not required to be fitted if the tailpipes lead to easily accessible strainers that have:
- (a) perforations not more than 10mm diameter with a total perforated area of;
 - (i) not less than twice the area of the suction pipe in compartments outside the machinery space;
 - (ii) not less than three times the area of the suction pipe in the machinery space; and
 - (b) can be cleared without breaking any of the joints of the suction pipe.
- 7.5 Subject to section 7.2, where a ship is not in excess of 11 m in length, one machinery space bilge suction pipe only is required to be fitted.

- 7.6 Sea suction, overboard discharge and bilge valves shall be in easily accessible locations and readily visible.
- 7.7 Pipes shall be made in readily removable lengths with flanged joints or other connections of a type offering security equivalent to that of flanged joints.
- 7.8 The number and capacity of bilge pumps and bilge pipe internal diameters shall conform to the requirements set out in the table of Part 25, Schedule IV.
- 7.9 Except as specified in sections 7.10 and 7.11, pipes shall be made of steel or other suitable metallic material.
- 7.10 Piping and components of rigid plastic or reinforced plastic may be used, provided that:
- (a) they are not used in accommodation spaces, service spaces and control locations;
 - (b) they are not used in fire extinguishing piping systems or where a bilge pump may be used as a fire pump;
 - (c) they are protected from vibration;
 - (d) they are clearly visible and accessible at all times;
 - (e) they are not installed outboard of the sea inlet and overboard discharge valves;
 - (f) when passing through a steel watertight or fire control bulkhead, a steel spool piece shall be attached to the bulkhead or deck and, at a watertight bulkhead or deck a metallic shut off valve shall be installed immediately adjacent to the spool-piece except that no valve is required on ballast or fresh water piping located within ballast or fresh water tanks;
 - (g) remote controls operable from above the bulkhead deck are fitted to the shut-off valve except where:
 - (i) the piping on one side of the bulkhead or deck is completely metallic and the valve is fitted to the metallic piping and easily accessible; or

- (ii) two readily accessible valves are installed, one on either side of the bulkhead or deck; and
 - (h) when passing through a bulkhead or deck material other than steel, the installation is such that the fire, watertight and structural integrity of the bulkhead or deck is not diminished due to the penetration;
- 7.11 Short flexible hoses may be used to absorb vibration and expansion provided that:
- (a) they are not used to correct misalignment;
 - (b) they be clearly visible and accessible at all times; and
 - (c) they are of adequate strength to withstand the working pressure or collapse due to suction.
- 7.12 A submersible electric bilge pump may only be used on a vessel provided that:
- (a) the pump is listed by Underwriters Laboratories Inc. or other recognised authority;
 - (b) the pump is used to dewater not more than one watertight compartment;
 - (c) the pump is securely attached to the adjacent structure;
 - (d) the pump is equipped with a strainer which can be readily inspected and cleaned;
 - (e) the pump discharge line is suitably supported, looped as high as possible above the hull opening, and fitted with an anti-siphon device; if a flexible hose is used, the hose shall not penetrate any watertight bulkheads;
 - (f) the opening in the hull for the pump discharge is placed as high above the waterline as practical;
 - (g) a screw down non-return valve is installed at the hull penetration; and

- (h) a means to indicate the automatic operation of the pump shall be provided at all control stations.
- 7.13 A flexible tube or hose may be used instead of fixed pipe for the discharge line of a submersible electric bilge pump provided the hose or tube does not penetrate any required watertight bulkheads and is:
- (a) of substantial construction suitable for the intended use; and
 - (b) highly resistant to salt water, petroleum oil, heat vibration
- 7.14 A visual and audible alarm system approved by the Regional Director shall be provided at the operating station to indicate high bilge level in all normally unattended machinery spaces located below the deepest load waterline.
- 7.15 A visual indicator must be provided at the operating station to indicate when any automatic bilge pump is operating.
- 7.16 Subject to section 7.17, bilge pumps on the vessel may be used as fire pumps by using them to pump sea water on deck.
- 7.17 Where two bilge pumps are required on the vessel, neither pump shall be used as a fire pump or to pump sea water on deck unless it is possible for one bilge pump to simultaneously pump bilge water overboard while the other pumps sea water on deck.

8. FUEL AND OIL STORAGE SYSTEMS

8.1 General

- 8.1.1 Fuel oil for all fixed installations shall have a flash-point of not less than 60° C (closed cup test) except that it may have a flash-point of not less than 43° C (closed cup test) where the measures are taken so that the ambient temperature of the spaces in which the fuel is stored or used does not rise to within 10° C below the flash point of the fuel.

8.2 Fuel Oil Tanks

- 8.2.1 Where practicable, the use of non-structural fuel oil tanks shall be avoided.

- 8.2.2 Non-structural tanks of 4,500 litres or less capacity shall:
- (a) be made of steel or other material suitable for the liquid contents, the intended use and location of the tanks in the ship
 - (b) where carbon steel shell plate is used, be of the following minimum thickness:
 - 2 mm for capacity not exceeding 100 litre
 - 3 mm for capacity not exceeding 1,300 litres; and
 - 5 mm for capacity not exceeding 4,500 litres.
 - (c) be fitted with stiffeners so that any unsupported flat surface area does not exceed:
 - 0.28 m² where plate thickness does not exceed 3 mm, and
 - 0.56 m² where plate thickness does not exceed 5 mm.
 - (d) be fitted with a suitable clean-out door, where capacity exceeds 1,300 litres; and
 - (e) have welded or brazed seams, except that where the capacity is not more than 100 litres a solder having a melting point of not less than 425° C may be used.
- 8.2.3 Unsupported flat surface areas for different thickness plates of non-structural tanks shall be determined by interpolation or extrapolation.
- 8.2.4 Depending on the size and configuration of a non-structural tank, the tank may be required to be fitted with baffles.
- 8.2.5 A fuel tank that is not separate from the hull shall be considered as part of the hull, taking into consideration the strength requirements of the vessel and the possibility of contamination of oil fuel with water, but the standards of construction and testing shall not be less than those set out in this section for a fuel tank that is separate from the hull.
- 8.2.6 All the metal components of the fuel system shall have low resistance electrical continuity of ground. Where nonconducting materials are used, a bonding jumper shall be installed across the break and bonded to the engine. Electrical continuity shall be maintained from the fill plate on deck to the engine.

8.3 Aluminum Fuel and Oil Tanks and Fittings

8.3.1 Aluminum fuel tanks of suitable design, stiffened and baffled as necessary, may be constructed of one of the following wrought alloys:

ASTM Alloy No.

5052

5083

5086

8.3.2 Aluminum piping of a suitable grade (eg. 6061-T6) may be used for fuel oil piping systems.

8.3.3 If aluminum piping is used for fuel oil piping systems, rate of temperature rise alarms shall be fitted in the machinery spaces as defined in Part 20, section 20.1.

8.3.4 Bodies of the valves on aluminum oil tanks shall be made of stainless steel of a grade which is compatible with aluminum.

8.4 Pipes and Fittings

Where the capacity of a fuel tank exceeds 120 litres, the following shall apply:

8.4.1 Fill pipes shall not be less than 35 mm internal diameter.

8.4.2 There shall be a means of accurately determining the amount of fuel in each fuel tank either by sounding, through a separate sounding pipe or a fill pipe, or by an approved marine type fuel gauge system.

8.4.3 Where sounding pipes are used, their openings shall be at least as high as the opening of the fill pipe and they shall be kept closed at all times except during sounding.

8.4.4 Fill pipes and sounding pipes shall be so arranged that overflow of liquid or vapour cannot escape to the inside of the vessel.

- 8.4.5 Fill pipes and sounding pipes shall run as directly as possible, preferably in a straight line, from the deck connection to the top of the tank. Such pipes shall terminate on the weather deck and shall be fitted with shutoff valves, watertight deck plates, or screw caps, suitably marked for identification. Fill pipes and sounding pipes may terminate at the top of the tank.
- 8.4.6 Where a flexible fill pipe section is necessary, suitable flexible tubing or hose having high resistance to salt water, oils, heat and vibration may be used. Such hose shall overlap the metallic pipe ends at least 1 1/2 times the pipe diameter and shall be secured at each end by two clamps of corrosion resistant metal. Clamps depending solely on the spring tension of the metal shall not be used. The flexible section shall be accessible and as near the upper end of the fill pipe as practicable. When the flexible section is a nonconductor of electricity, the metallic sections of the fill pipe separated thereby shall be joined by a conductor for protection against static spark when filling.
- 8.4.7 Each fuel tank shall be fitted with a vent pipe connected to the highest point of the tank.
- 8.4.8 The minimum diameter of the vent pipe for fuel tanks shall be as follows:
- (a) not less than 12 mm internal diameter for a tank with a capacity not in excess of 120 litres;
 - (b) not less than 20 mm internal diameter for a tank with a capacity in excess of 120 litres; and
 - (c) not less than the minimum internal diameter of the fill pipe if provision is made to fill the tank under pressure or through a dispensing nozzle or similar component.
- 8.4.9 The discharge ends of fuel tank vent pipes shall terminate above the weather deck remote from any hull opening into any enclosed spaces. Vent pipes terminating on the hull exterior shall be installed or equipped to prevent the accidental contamination of the fuel by water under normal operating conditions.

- 8.4.10 The discharge ends of fuel tank vent pipes shall be fitted with removable flame screens or flame arresters. The flame screens shall consist of one or more screens of corrosion resistant wire of at least 30 x 30 mesh. The flame screens or flame arresters shall be of such size and design as to prevent reduction in the net cross-sectional area of the vent pipe and permit cleaning or renewal of the flame screens or arrester elements.
- 8.4.11 Where a flexible vent pipe section is necessary, suitable flexible tubing or hose having high resistance to salt water, petroleum oils, heat and vibration, may be used. Such hose shall overlap metallic pipe ends at least 1 1/2 times the pipe diameter and shall be secured at each end by two clamps of corrosion resistant metal. Clamps depending solely on the spring tension of the metal shall not be used. The flexible section shall be accessible and as near the upper end of the vent pipe as practicable.
- 8.4.12 Where a drain valve or cock is provided on a fuel tank it shall have a standard screwed outlet that shall be kept plugged with a screwed plug, permanently attached by a chain, whenever the cock or valve is not in use.
- 8.4.13 The piping from any fuel tank shall be fitted at the tank with a valve or cock that is capable of being operated from outside the compartment in which the tank is situated.
- 8.4.14 The means of control of a valve or cock referred to in subsection 8.4.13 shall consist of:
- (a) an extended spindle;
 - (b) a self-closing valve actuated by a trip wire; or
 - (c) any other suitable device satisfactory to an inspector.
- 8.4.15 Where the fuel tank is aluminum, all valves, fittings and piping fitted to the fuel tank shall be of a material compatible with aluminum.
- 8.4.16 Fuel oil pipes shall be of steel or similar fire and pressure resistant materials except that short flexible hoses of an approved fuel line material and appropriate approved hose fittings may be used where expansion and vibration may be encountered.

- 8.4.17 Every non-structural fuel tank shall be securely chocked, fastened in place and electrically bonded to the vessel's ground plate or to the engine.
- 8.4.18 Every fuel tank shall be situated remote from heating surfaces.
- 8.4.19 Gasoline shall not be stored in bulk.
- 8.4.20 Small approved portable containers holding fuel with a flash point lower than 43°C may be used providing they:
- (a) meet the Canadian Standards Association standard, "Portable Containers for Gasoline and Other Petroleum Fuels" as amended from time to time;
 - (b) be stored outside machinery and accommodation spaces; and
 - (c) have a total capacity of not more than 88 litres.

9. EXHAUST PIPES

- 9.1 Exhaust Pipes from the main engines and from auxiliary engines of the vessel shall be permanently mounted and shall lead to the open air outside the vessel through the uppermost deck or canopy or through the hull.
- 9.2 Where the exhaust pipes referred to in section 9.1 pass through the uppermost deck or canopy, they shall be of sufficient height to ensure that exhaust gases are prevented from entering into the vessel.
- 9.3 Where the exhaust pipes referred to in section 9.1 pass through the hull of the vessel, the connection shall be watertight and provision shall be made to prevent the engine from being flooded.
- 9.4 All exhaust pipes on the vessel shall be well secured and be clear of all woodwork and other combustible materials and, where considered necessary by an inspector, they shall be covered with lagging.

- 9.5 Where an exhaust pipe passes through a watertight bulkhead, the watertight integrity of the bulkhead must be maintained. Noncombustible packing must be used in bulkhead penetration glands for dry exhaust systems. A wet exhaust pipe may be welded to a steel bulkhead in way of a penetration and a fibreglass wet exhaust pipe may be fibreglassed to a fibreglass reinforced plastic bulkhead if suitable arrangements are provided to relieve the stresses resulting from the expansion of the exhaust piping.

10. MACHINERY CONTROLS

- 10.1 Means of stopping the propulsion machinery of the vessel, other than by shutting off a valve or cock fitted to the fuel tank, shall be provided outside the space where the machinery is located and such means shall be fire resistant.

11. MAIN AND AUXILIARY STEERING GEAR

- 11.1 The main steering gear shall be designed for when the vessel is at its deepest sea-going draft and:
- (a) running ahead at maximum service speed, to put the rudder over
 - (i) from 35° on one side to 35° on the other side, and
 - (ii) from 35° on either side to 30° on the other side in not more than 28 seconds; and
 - (b) running astern at maximum astern speed, for maximum rudder angle operation.
- 11.2 A main steering gear shall be power operated where necessary to meet the requirements of section 11.1.
- 11.3 The auxiliary steering gear shall be designed, and demonstrated when the vessel is at its deepest sea-going draft and running ahead at one-half its maximum service speed or 7 knots, whichever is the greater, to put the rudder over from 15° on one side to 15° on the other side in not more than 60 seconds.
- 11.4 A suitable hand tiller may be acceptable as the auxiliary means of steering.

11.5 An auxiliary means of steering shall be provided unless:

- (a) the main steering gear and its controls are provided in duplicate;
- (b) multiple screw propulsion, with independent wheelhouse control for each screw, is provided, and the vessel is capable of being steered using wheelhouse control of the propulsion units;
- (c) no regular rudder is fitted and steering action is obtained by a change of setting of the propelling unit; or
- (d) a rudder and hand tiller are the main steering gear.

12. RUDDER STOCKS

12.1 The diameter of rudder stocks for rudders fitted with bottom pintles shall not be less than:

- (a) as shown in the following table;

Length of ship in metres	Diameter of rudder stock in millimetres
12	50
15	56
18	62
21	72
24	82

or

- (b) as that calculated by the following formula:

$$D = 16.67x^{\frac{3}{2}}\sqrt{AxRx} V^2$$

where

D = diameter of rudder stock in millimetres

A = total area of one face of rudder in square metres

R = average horizontal distance in metres between the trailing edge of rudder and the centre line of stock, and

V = maximum speed of vessel in knots, or 8 knots, whichever is the greater.

12.2 Rudder stocks may also be in accordance with the rules of an approved classification society.

13. SHAFTING

13.1 Subject to section 13.2 the intermediate shaft shall:

- (a) be made of material having a tensile strength of not less than 370 MPa; and
- (b) have a diameter not less than that obtained by the following formula;

$$d = 106.41 \times \sqrt[3]{\frac{H}{R}} \times \left[\sqrt[3]{\frac{414}{S}} \text{ or } 0.85, \text{ whichever is the greater} \right] \dots$$

where

d = diameter of the intermediate shaft in millimetres,

H = total maximum continuous brake power transmitted by the shaft in kW,

R = revolutions per minute of the intermediate shaft at continuous rating,

S = tensile strength of the intermediate shaft material in Megapascals.

13.2 Where the vessel is operated exclusively in fresh water, the diameter of the intermediate shaft may be 1.75 percent less than the diameter obtained by the formula set out in section 13.1.

13.3 The tailshaft of the vessel shall:

- (a) be made of material having a tensile strength of not less than 370 MPa; and
- (b) have a diameter not less than that obtained by the following formula, but in no case less than 32 mm;

$$D = 106.41 x \sqrt[3]{\frac{H}{R}} x \left[\sqrt[3]{\frac{414}{S}} \text{ or } 0.85, \text{ whichever is the greater} \right] + \frac{KxP}{C}$$

where

D = diameter of the tailshaft in mm,

H = total maximum continuous brake power transmitted by the shaft in kW,

R = revolutions per minute of the intermediate shaft at continuous rating,

S = tensile strength of the tailshaft material in MPa.,

P = diameter of propeller in mm,

K = 0.0008 P or 1, whichever is the smaller,

C = 100 for a carbon steel shaft, and 144 for a shaft

(a) fitted with a continuous liner,

(b) running in oil,

(c) made of bronze, monel, stainless steel or other corrosion-resistant alloy, or

(d) fitted with non-continuous liners, when the shaft is completely covered between such liners with a securely bonded coating of rubber, neoprene or equivalent protective material.

13.4 Where the vessel is operated exclusively in fresh water, the diameter of the tailshaft may be 1.75 percent less than the diameter obtained by the formula set out in subsection 13.3.(b).

13.5 Subject to section 13.6, a certificate of test of the material used in the making of an intermediate shaft or tailshaft for the vessel, which has been issued by the manufacturer of such material or by an inspector, shall be submitted by the owner of the vessel to the steamship inspection office for the area in which the vessel is being constructed.

- 13.6 Subject to section 13.7, section 13.1 does not apply to the owner of the vessel that is engine driven with an engine that does not exceed 373 brake KW continuous rating.
- 13.7 When a certificate of material test is not supplied under section 13.6 calculations shall be based upon ultimate tensile strengths of:
- (a) 615 MPa for stainless steel or monel, and
 - (b) 370 MPa for carbon steel or bronze.
- 13.8 Shafting may also be in accordance with the rules of an approved classification society.

14. STERN BEARINGS

- 14.1 Stern bearing assemblies of the vessel shall consist of:
- (a) a stern bearing not less than 3 1/2 shaft diameters in length;
 - (b) a gland situated inside the vessel; and
 - (c) a watertight tube fitted between the bearing and the gland, if required.

15. UNDERWATER FITTINGS

- 15.1 All suction and discharges passing through the hull below the weather deck shall be fitted with valves or cocks, and where non-return action is required they shall be either:
- (a) a screwdown non-return valve; or
 - (b) a screwdown stop-valve and a non-return valve; or
 - (c) to be operable from above the bulkhead deck.
- 15.2 Section 15.1 does not apply to:
- (a) keel cooling systems; or

- (b) scuppers that pass from the weatherdeck to the ship's side above the load water line.
- 15.3 The cocks or valves required by section 15.1 shall be fitted as close to the hull of the vessel as possible.
- 15.4 All shipside valves or cocks shall be of metal compatible with the hull material and be connected directly to:
 - (a) and spigotted through the hull;
 - (b) a shipside seabox; or
 - (c) a short stub pipe attached to and having a strength not less than the hull.
- 15.5 Shipside valves or cocks directly connected to a metal hull or seabox shall be attached by studs screwed into metal pads welded to the hull or seabox plating without the studs penetrating into the plating.
- 15.6 Suction and discharge valves and cocks on a wooden or FRP vessel shall be attached to the hull by a recognized method.

16. ELECTRICAL INSTALLATIONS - GENERAL REQUIREMENTS

16.1 General Design, Installation and Maintenance Requirements

- 16.1.1 Electrical equipment on the vessel must be installed and maintained to:
 - (a) provide services necessary for safety under normal and emergency conditions;
 - (b) protect passengers, crew, other persons and the vessel from electrical hazards, including fire, caused by or originating in electrical equipment, and electrical shock;
 - (c) minimize accidental personnel contact with energized parts; and
 - (d) prevent electrical ignition of flammable vapours.

16.2 Protection from Wet and Corrosive Environments

16.2.1 Electrical equipment used in one of the following locations must be drip-proof:

- (a) a machinery space;
- (b) a location normally exposed to splashing, water washdown, or other wet conditions within a galley, a laundry, or a public washroom or toilet room that has a bath or shower; or
- (c) another space with a similar moisture level.

16.2.2 Electrical equipment exposed to the weather must be watertight.

16.2.3 Electrical equipment exposed to salt water must be corrosion-resistant.

16.3 General Safety Provisions

16.3.1 Electrical equipment and installations must be suitable for the roll, pitch and vibration of the vessel underway.

16.3.2 All equipment, including switches, fuses, lampholders, etc. must be suitable for the voltage utilized.

17. ELECTRICAL INSTALLATIONS - POWER SOURCES AND DISTRIBUTION SYSTEMS

17.1 Power Sources

17.1.1 Each vessel that relies on electricity to power the following loads must have at least two sources of electricity to power these loads:

- (a) fuel system;
- (b) interior lighting except for decorative lights;
- (c) steering systems;
- (d) navigating equipment, navigation lights and radiotelephones;
- (e) fire protection equipment;

- (f) bilge pumps;
- (g) fire main, CO₂ and Halon systems; and
- (h) propulsion systems.

17.2 Radiotelephone Installations

17.2.1 A separate circuit, with overcurrent protection at the main distribution panel, must be provided for each radiotelephone installation. The reserve source of energy for the radiotelephone installation is to comply with the Ship Station Technical Regulations as amended from time to time.

17.3 Emergency Lighting

17.3.1 A vessel of more than 20 m in length must have adequate emergency lighting fitted along the line of escape to the main deck from all passenger accommodation spaces located below the main deck.

17.3.2 A vessel of more than 20 m in length must have adequate emergency lighting for passageways, stairways, and escape trunks in passenger accommodation spaces, crew accommodation spaces, machinery spaces and all other spaces which may be routinely occupied by persons. The emergency lighting must be sufficient to allow passengers and crew to find their way to open decks.

17.3.3 The emergency lighting required by subsections 17.3.1 and 17.3.2 must automatically actuate upon failure of the main lighting system. If a vessel is not equipped with a single source of power for emergency lighting, it must have individual battery powered lights which:

- (a) are automatically actuated upon loss of normal power;
- (b) are not readily portable;
- (c) are connected to an automatic battery charger; and
- (d) have sufficient capacity for at least three hours of continuous operation.

17.4 Boat and Liferaft Floodlights on Vessels more than 20 M in Length with more than 50 Passengers

17.4.1 Each vessel must have floodlights for illuminating the stowage position and embarkation station of boats and liferafts.

17.5 Emergency Electrical Lighting

17.5.1 Every vessel other than one certified to operate only between sunrise and sunset shall be fitted with permanent or portable lights that will illuminate the launching stations and stowage position of all survival craft for at least half an hour.

17.5.2 Where non-rechargeable battery operated hand lanterns are provided pursuant to subsection 17.5.1, the batteries shall be replaced on or before the expiry date marked on the battery; batteries which do not have an expiry date marked on them shall be replaced annually.

18. ELECTRICAL SYSTEMS

18.1 Electrical Systems Less Than 55 Volts

18.1.1 Types of Systems

- (a) Subject to paragraph 18.1.1.(d), all distribution systems shall be of the 2-wire type with insulated feed and return conductors in compliance with paragraphs 18.1.1.(b) and 18.1.1.(c).
- (b) Ungrounded distribution systems shall have all current-carrying conductors, including the source of power and all accessories, completely insulated from ground throughout the system.
- (c) Grounded distribution systems shall utilize the common ground part of the vessel only as a means of maintaining the return side of the system at ground potential; the grounded side of the system shall be of negative polarity.
- (d) The engine block may be used as a common ground return for electrical accessories mounted on the engine, except on metallic vessels where the engine block is not electrically isolated from the hull.

18.1.2 System Protection

- (a) Electrical systems and equipment shall be protected from the effects of overcurrent by suitably rated fuses or circuit breakers.
- (b) Circuit Breakers shall
 - (i) have a D.C. voltage rating of not less than the nominal system voltage;
 - (ii) be of a trip-free type;
 - (iii) have instantaneous short-circuit protection capable of repeatedly opening the circuit in which they are used without failure; and
 - (iv) be of a manual reset type.
- (c) Fuses of the proper rating may be used for circuit protection, but shall be used in conjunction with a switch located between the fuse and source of power; fuse holders shall be suitable for use in marine atmospheres.
- (d) An approved master battery switch capable of carrying the maximum current of the system, including starter circuits, shall be provided in each ungrounded conductor as close to the battery terminal as practicable; the switch shall be so located as to be readily accessible in case of an emergency; battery switches in systems using diode rectified alternators or third brush generators shall incorporate means for breaking the field circuit when the battery load is removed from the system.
- (e) The intermittent rating of the master battery switch shall be not less than the maximum cranking current of the engine cranking motor that it serves; the continuous rating of the battery switch shall be not less than the total of the ratings of the main overcurrent protection devices connected to the master battery switch.
- (f) A fuse or manual-reset type circuit breaker shall be provided in each ungrounded feeder to the power distribution panel, except for the battery cable from the battery to the starter.
- (g) A fuse or manual-reset type circuit breaker shall be provided at the main distribution panel for each separate electrical circuit.

- (h) Each ungrounded conductor of circuits supplying lights, motors or electrical accessories shall be protected against overload at the distribution panel or switchboard serving as the source of power; the navigation light circuit shall be protected by a separate over-current device.
- (j) Where the cable size is reduced at a junction box, the rating of the circuit overload protective device shall be based on the current-carrying capacity of the smallest conductor in the circuit.
- (k) The conductors supplying motors and motor-operated appliances shall be protected by an over-current device which is designed to handle the inrush current; the motor protective overload device shall be rated or set at not more than 115 per cent of the motor full-load current rating for enclosed motors and not more than 125 per cent of the rating for open motors.

18.1.3 Equipment Grounding

- (a) In steel and aluminum vessels, non-conducting exposed metal parts of electrical equipment that requires to be grounded shall be effectively grounded to the hull.
- (b) On wood, fibre reinforced plastic and composite vessels, a continuous ground conductor shall be installed to facilitate the grounding of non-conducting exposed metal parts of electrical, electronic and communication equipment that requires to be grounded; the ground conductor shall terminate at a point on the main engine or at a copper plate of area not less than 0.2 m² fixed to the keel below the light waterline so as to be fully immersed under all conditions of heel.
- (c) Every grounding conductor shall be of copper or other corrosion-resistant material and shall be securely installed and protected, where necessary, against damage and electrolytic corrosion.
- (d) Every ground connection to the vessel's structure, or on wood, fibre reinforced plastic and composite vessels, to the continuous ground conductor, shall be made in an accessible position and shall be secured by a screw or connect or of brass or other corrosion resistant material used solely for that purpose.

18.1.4 Lightning Conductors

- (a) Lightning conductors shall be fitted to each mast of all wooden, fibre reinforced plastic and composite vessels and to each wooden mast of steel or aluminum vessels except where the height of any antenna exceeds that of the masts.
- (b) Lightning conductors shall be composed of continuous tape or wire having a section of not less than #4 AWG which shall be attached by copper rivets or clamps to a copper spike not less than 13 mm in diameter, projecting at least 150 mm above the top of the mast; the copper tape or wire shall be run to terminate at a lightning conductor plate of area not less than 0.2 m², fixed to the keel below the light water line so as to be fully immersed under all conditions of heel.
- (c) No grounding conductor shall be attached to the lightning conductor plate.
- (d) The lightning conductor plate shall be separate from and in addition to the copper plate for terminating the grounding conductor.

18.1.5 Electrical Equipment

- (a) Electrical appliances, accessories and fittings shall comply with the relevant requirements of rules or codes or the Canadian Standards Association.
- (b) Electrical equipment shall be of a type suitable for the location and the environment and shall be positioned so as not to be unnecessarily exposed to mechanical damage; light fixtures are to have globes or guards.
- (c) Electrical apparatus shall not be installed where explosive or flammable gases or flammable vapours are liable to accumulate or where risk of explosion might arise unless the apparatus is of the certified safe type.
- (d) Electrical distribution panels and electrical equipment shall be located in accessible well ventilated locations protected from rain and spray; where necessary, drip-proof equipment shall be provided.

18.1.6 Batteries

- (a) Batteries shall be located in a compartment, locker or box reserved solely for that purpose; they shall not be located in accommodation spaces.
- (b) Batteries shall not be tapped for voltage other than the total voltage of all the cells comprising the battery.
- (c) Batteries shall be so located that gas generated in charging will be readily dissipated by natural or mechanical ventilation.
- (d) Batteries shall be accessibly located, provided with suitable supports, and secured against movement arising from the motion of the vessel.
- (e) Alkaline and lead-acid batteries shall not be installed in the same compartment.
- (f) Batteries shall be located in a liquid-tight tray or liquid-tight box of adequate capacity to retain normal spillage or boilover of the electrolyte; the liquid-tight tray or box shall be constructed of, or lined with materials resistant to deterioration by the electrolyte.
- (g) A non-conductive, perforated cover or other suitable means shall be provided to prevent accidental shorting of battery terminals.
- (h) Batteries with metal cell containers shall be assembled in non-conductive trays having suitable insulating cell supports; provision shall be made to prevent other conductive materials that could cause a short-circuit from coming in contact with the cell containers.
- (j) Where batteries are used as the primary power source, the battery capacity shall be at least 50 per cent greater than the essential load on a 10-hour discharge rate.
- (k) Indication shall be provided that the battery is being maintained in a state of charge.

18.1.7 Cables

- (a) All cables shall have stranded copper conductors, a protective covering of either watertight metallic sheath or impervious nonmetallic sheath, compatible with the insulation and be rated for at least 75°C service.
- (b) Portable cords or portable cables shall not be used for fixed wiring.
- (c) Cables shall be effectively supported and secured in order to prevent chafing or other damage; on wood, fibre reinforced plastic or composite vessels the cables shall be run in metal trays, or shall be secured by clips or straps of non-ferrous, heat resistant material; staples shall not be used for this purpose.
- (d) Cables shall be routed as high as possible above the bilge with prime consideration given to the protection of the wiring from mechanical and heat damage.
- (e) Exposed wiring subject to mechanical damage shall be protected by conduit or other equivalent means.
- (f) Cables terminating in equipment capable of generating high temperatures such as lighting fixtures, shall be suitable for operation at the temperature of the equipment.

18.1.8 Switchboards and Distribution Panels

- (a) Switchboards and electrical distribution panels shall be located in accessible well-ventilated locations protected from rain and spray; where necessary, panels shall be provided with a drip shield.
- (b) Switchboards and other electrical panels or junction boxes located adjacent to weather decks or in open cockpits shall be enclosed or protected from deck wash.
- (c) Switchboards shall be so installed that no pipes or tanks are above them within the same space; where piping is unavoidable, pipes shall be without joints in such positions.

- (d) Switchboard bus-bar supports shall be of substantial and durable construction and shall be capable of withstanding electromechanical stresses which may arise from short-circuit faults; all panels shall be of substantial construction to withstand vibration and hinged panels and doors of dead front switchboards shall be provide with positioners and stops.
- (e) Bus-bars and their connections shall be of copper, all connections being made so as to inhibit corrosion; aluminum bus shall be submitted to the Regional Director for special consideration.

18.1.9 Distribution

- (a) Joints and connections in all electrical conductors shall be mechanically and electrically secure and made only in conjunction or outlet boxes.
- (b) Joints shall be capable of withstanding the vibration and movement encountered in normal service.
- (c) Metal alloys used shall be corrosion-resistant and galvanically compatible with copper conductors.
- (d) With the exception of the thread cutting type of connector, twist-on type connectors shall not be used for making joints in cables.
- (e) Lampholders shall be constructed wholly of flame-retardant and non-hydroscopic material and supports of live parts should be noncombustible material.
- (f) Lamps which are exposed to the weather, spray and drip shall be enclosed in weatherproof fittings.
- (g) Navigation lights control, supply and protection shall be as follows:
 - (i) sidelights, masthead, anchor and stern lights shall be controlled by an indicator panel located in an accessible position under control of the officer of the watch;

- (ii) each light shall be controlled and protected in each insulated pole by a switch and fuse or circuit breaker mounted on the indicator panel referred to in subparagraph (i);
- (iii) each such light shall be provided with an automatic indicator which gives aural or visual warning, or both, in the event of extinction of the light and if,
 - an aural device alone is used, it shall be connected to a separate source of supply, or
 - a visual signal is used which is connected in series with the light, means shall be provided to prevent the extinction of the light due to the failure of the visual signal;
- (iv) provision shall be made on the indicator panel for navigation lights to be transferred to the respective alternate lamp by means of a suitable selector switch;
- (v) provision shall be made on the bridge to select an alternative main supply circuit by means of a transfer switch located at the indicator panel;
- (vi) the alternate supply to the navigation lights control panel shall be connected directly to an emergency source of supply, the primary supply shall be connected to the main distribution panel.
- (h) On vessels where the condition of the navigation lights can be observed from the manoeuvring position, automatic indication of light failure need not be provided.
- (j) The emergency source of supply for the navigation lights shall have a capacity for at least 3 hours illumination.
- (k) The drop in voltage from the switchboard to every point on the installation when the conductors are carrying the maximum service shall not exceed:
 - (i) for lighting circuits, 5 per cent of the nominal voltage; and

- (ii) for mains and power circuits; 2 per cent of the nominal voltage.

18.2 Electrical Systems of 55 Volts or Over

- 18.2.1 Electrical systems of 55 volts or over shall conform to the "Ship Safety Electrical Standard" TP 127E.

CHAPTER IV

STRUCTURAL FIRE PROTECTION, FIRE DETECTION AND FIRE EXTINCTION

19. STRUCTURAL FIRE PROTECTION

19.1 Vessels Constructed of Steel or Other Equivalent Material (100 Unberthed Passengers within Limited Voyages)

19.1.1 This section applies to vessels, constructed of steel or other equivalent material, carrying not more than 100 unberthed passengers within Limited Voyages.

19.1.2 Structure

- (a) The hull, superstructure, structural bulkheads, decks and deckhouses shall be constructed of steel or other equivalent material.
- (b) Boundaries of machinery spaces shall be gastight and constructed of steel or equivalent material.
- (c) Boundaries of galleys, and storerooms containing flammable material shall be gastight and constructed of steel or other equivalent material.
- (d) Where berthed accommodation is provided for the crew, the divisional bulkheads shall be constructed of steel or other equivalent material, or Class B-15 divisions.
- (e) The wheelhouse shall be separated from the remainder of the ship by bulkheads and decks constructed of 'C' Class divisions.
- (f) All openings in the bulkheads and decks referred to in paragraphs 19.1.2.(b), 19.1.2.(c), 19.1.2.(d) and 19.1.2.(e) shall, as far as is practicable prevent the passage of smoke and flame.
- (g) Where any part of the structure is of aluminum alloy, the following additional requirements shall apply:

- (i) the deckhead, boundary bulkheads, pillars and the hull structure in every machinery space, shall be insulated with a material that will provide structural integrity for at least 30 minutes;
- (ii) Structure in way of lifeboat and liferaft, stowage, launching, muster, and embarkation areas, which may be exposed to fire shall be insulated with a material that will provide structural integrity for at least 30 minutes;
- (iii) the insulation material referred to in sub-paragraphs 19.1.2.(g).(i) and 19.1.2.(g).(ii) shall extend down to at least the light waterline;
- (iv) where in paragraphs 19.1.2.(b), 19.1.2.(c) and 19.1.2.(d), bulkheads and decks are to be constructed of steel or other equivalent material, aluminum alloy insulated with a material that will provide structural integrity for at least 30 minutes shall be considered equivalent to steel.

19.1.3 Restriction of Combustible Materials

- (a) All insulation including pipe and duct lagging shall be of approved non-combustible materials.
- (b) The use of polyurethane foam as insulation material is not permitted.
- (c) Where linings and ceilings are fitted in accommodation spaces, their exposed surfaces shall have low flame spread characteristics.
- (d) The surface of any insulation fitted to the interior surfaces of a machinery space shall be impervious to oil and oil vapours.
- (e) Spaces containing flammable stores shall be situated so as to minimize the dangers to passengers and crew in the event of fire.

19.1.4 Means of Escape

- (a) Stairways, ladders and doors shall be arranged to provide ready means of escape from all passenger and crew spaces, to lifesaving equipment embarkation stations, such that:
 - (i) except where it is considered impracticable, two means of escape including the main entrance shall be provided from each general area accessible to passengers and crew;
 - (ii) where two means of escape are fitted, they shall be as remote from each other as possible to prevent one incident blocking both escapes;
 - (iii) doors that give direct access into an accommodation space from a machinery space shall be gastight, constructed of steel or other equivalent material, and be of the self-closing type;
 - (iv) there shall be no direct access from a machinery space to berthed crew accommodation.
- (b) Any public space that has a deck area greater than 28 square metres shall have at least two exits and, where practicable, the exits shall have egress to different spaces so as to minimize the possibility that both exits could be blocked at the same time as a result of one incident.
- (c) When in any public room, subdued lighting is used, the exits shall be clearly marked with illuminated signs, and any doors shall be constructed to open outwards.
- (d) Vertical ladders and deck scuttles shall not generally be considered satisfactory as one of the means of escape, except that in areas occupied only by crew members, or where it is demonstrated that the installation of a stairway would be impractical, a vertical ladder may be used as a second means of escape.

19.1.5 Arrangement of Stairways

- (a) For all stairways, the sum of the riser height and tread depth shall be at least 430mm and not more than 460mm, and all stairways, other than exterior stairways, having treads of less than 260mm in depth, shall have a nosing of not less than 25mm or such other means that shall provide additional depth on the tread.
- (b) For all stairways, handrails shall be fitted on both sides of the stairs, the handrails shall have a height measured vertically above the tread of not less than 840mm and not more than 910mm.
- (c) Except where it is considered impracticable, at the top and bottom of each flight of stairs there shall be a clear landing having an area at least equal to the square of the actual tread width.
- (d) The clear width of doors to stairways shall be at least equal to the actual stair width.
- (e) The width of all stairways and inclined ladders shall be 760mm minimum.
- (f) Stairways and inclined ladders primarily for the use of passengers shall have a maximum angle of inclination from the horizontal of 45 degrees.
- (g) Stairways and inclined ladders for the use of the crew only shall have a maximum angle of inclination from the horizontal of 55 degrees.
- (h) If the distance between handrails is less than the width of the treads the minimum stair width shall be measured between the handrails.

19.1.6 Public Address System

- (a) A public address system in accordance with TP 127E, "Ship Safety Electrical Standards" shall be fitted throughout all accommodation spaces.

19.1.7 Fire Detection and Alarm System

- (a) Every vessel shall be fitted with a fire detection and alarm system in accordance with Part 20, Sections 20.1 to 20.4.

19.1.8 Location and Arrangement of Oil Fuel Tanks

- (a) As far as is practicable, oil fuel tanks shall be located outside of machinery spaces and shall be constructed of steel or other equivalent material.
- (b) Where oil fuel tanks constructed of aluminum alloy are located in a machinery space, or are located in, or adjacent to any space containing flammable material the exposed surfaces of the tanks shall be insulated with a material that will provide structural integrity for 30 minutes.

19.1.9 Ventilation Systems

- (a) A ventilation duct serving an accommodation space, service space, or wheelhouse shall not pass through a machinery space.
- (b) A ventilation duct serving a machinery space or galley which passes through an accommodation space, service space or wheelhouse shall be gastight and constructed of steel or aluminum alloy insulated with a material that will provide structural integrity for at least 30 minutes.
- (c) An exhaust ventilation duct from a galley range shall be provided with a grease trap and be constructed of steel.
- (d) Means shall be provided for closing the main inlets and outlets of ventilation systems from a position outside the spaces served by the systems.

19.2 Vessels Constructed of Wood (100 Unberthed Passengers within Limited Voyages)

19.2.1 This sub-section applies to vessels, of wood construction, carrying not more than 100 unberthed passengers within Limited Voyages.

19.2.2 Machinery Spaces

- (a) Exposed wood surfaces including the hull, deckhead, boundary bulkheads, casings and uptake trunks, shall be coated with an approved fire retardant coating of the intumescent type.
- (b) Machinery space boundaries shall as far as is practicable be gastight.

19.2.3 Other Spaces

- (a) Galleys, and storerooms containing flammable material shall be separated from the remainder of the ship by bulkheads and decks constructed of B-15 Class or 'F' Class divisions.
- (b) Where berthed accommodation is provided for the crew, the divisional bulkheads shall be constructed of B-15 or 'F' Class divisions.
- (c) The wheelhouse shall be separated from the remainder of the ship by bulkheads and decks constructed of 'C' Class divisions.
- (d) All openings in the bulkheads and decks referred to in paragraphs 19.2.3.(a), 19.2.3.(b) and 19.2.3.(c) shall, as far as is practicable prevent the passage of smoke and flame.

19.2.4 Restriction of Combustible Materials

- (a) All insulation including pipe and duct lagging shall be of approved non-combustible materials.
- (b) The use of polyurethane foam as insulation material is not permitted.
- (c) All exposed surfaces other than decks, in accommodation spaces, including linings and ceilings if fitted, shall have low flame spread characteristics.

- (d) Spaces containing flammable material shall be situated so as to minimize the dangers to passengers and crew in the event of fire.

19.2.5 Means of Escape

- (a) Stairways, ladders and doors, shall be arranged to provide ready means of escape from all passenger and crew spaces, to lifesaving equipment embarkation stations, such that:
 - (i) except where it is considered impracticable, two means of escape including the main entrance shall be provided from each general area accessible to passengers and crew;
 - (ii) where two means of escape are fitted, they shall be as remote from each other as possible to prevent one incident blocking both escapes;
 - (iii) doors that give direct access into an accommodation space from a machinery space shall be gastight, constructed of steel or equivalent material, and be of the self-closing type;
 - (iv) there shall be no direct access from a machinery space to berthed crew accommodation.
- (b) Any public space that has a deck area greater than 28 square metres shall have at least two exits and, where practicable, the exits shall have egress to different spaces so as to minimize the possibility that both exits could be blocked at the same time as a result of one incident.
- (c) When in any public room, subdued lighting is used, the exits shall be clearly marked with illuminated signs, and any doors shall be constructed to open outwards.
- (d) Vertical ladders and deck scuttles shall not generally be considered satisfactory as one of the means of escape, except that in areas occupied only by crew members, or where it is demonstrated that the installation of a stairway would be impractical, a vertical ladder may be used as a second means of escape.

19.2.6 Arrangement of Stairways

- (a) For all stairways, the sum of the riser height and tread depth shall be at least 430mm and not more than 460mm, and all stairways, other than exterior stairways, having treads of less than 260mm in depth, shall have a nosing of not less than 25mm or such other means that shall provide additional depth on the tread.
- (b) For all stairways, handrails shall be fitted on both sides of the stairs, the handrails shall have a height measured vertically above the tread of not less than 840mm and not more than 910mm.
- (c) Except where it is considered impracticable, at the top and bottom of each flight of stairs there shall be a clear landing having an area at least equal to the square of the actual tread width.
- (d) The clear width of doors to stairways shall be at least equal to the actual stair width.
- (e) The width of all stairways and inclined ladders shall be 760mm minimum.
- (f) Stairways and inclined ladders primarily for the use of passengers shall have a maximum angle of inclination from the horizontal of 45 degrees.
- (g) Stairways and inclined ladders for the use of the crew only shall have a maximum angle of inclination from the horizontal of 55 degrees.
- (h) If the distance between handrails is less than the width of the treads the minimum stair width shall be measured between the handrails.

19.2.7 Public Address System

- (a) A public address system in accordance with TP 127E, "Ship Safety Electrical Standards", shall be fitted throughout all accommodation spaces.

19.2.8 Fire Detection and Alarm System

- (a) Every vessel shall be fitted with a fire detection and alarm system in accordance with Part 20, Sections 20.1 to 20.4.

19.2.9 Location and Arrangement of Oil Fuel Tanks

- (a) As far as is practicable, oil fuel tanks shall be located outside of machinery spaces and shall be constructed of steel or other equivalent material.
- (b) Where oil fuel tanks constructed of aluminum alloy are located in a machinery space, or are located in, or adjacent to any space containing flammable stores the exposed surfaces of the tanks shall be insulated with a material that will provide structural integrity for 30 minutes.

19.2.10 Ventilation Systems

- (a) A ventilation duct serving an accommodation space, service space, or wheelhouse shall not pass through a machinery space;
- (b) A ventilation duct serving a machinery space or galley which passes through an accommodation space, service space or wheelhouse shall be gastight and constructed of steel or aluminum alloy insulated with a material that will provide structural integrity for at least 30 minutes.
- (c) An exhaust ventilation duct from a galley range shall be provided with a grease trap and be constructed of steel.
- (d) Means shall be provided for closing the main inlets and outlets of ventilation systems from a position outside the spaces served by the systems.

19.3 Vessels Constructed of Fibre Reinforced Plastic (100 Unberthed Passengers within Limited Voyages)

19.3.1 This sub-section applies to vessels, of fibre reinforced plastic construction, carrying not more than 100 unberthed passengers within Limited Voyages.

19.3.2 General

- (a) The hull, superstructure, structural bulkheads and deckhouses when constructed of fibre reinforced plastic shall have a final layer of fire-retardant resin.

19.3.3 Machinery Spaces

- (a) Exposed fibre reinforced plastic surfaces including the hull, deckhead, boundary bulkheads, casings and any trunks serving such spaces, shall be coated with an approved fire retardant coating of the intumescent type or be insulated with a material that will provide structural integrity for 30 minutes.
- (b) Machinery space boundaries shall as far as is practicable be gastight.

19.3.4 Other Spaces

- (a) Galleys, and storerooms containing flammable stores shall be separated from the remainder of the ship by bulkheads and decks constructed of B-15 Class or 'F' Class divisions.
- (b) Where berthed accommodation is provided for the crew, the divisional bulkheads shall be constructed of B-15 or 'F' Class divisions.
- (c) The wheelhouse shall be separated from the remainder of the ship by bulkheads and decks constructed of 'C' Class divisions.
- (d) All openings in the bulkheads and decks referred to in paragraphs 19.3.4.(a), 19.3.4.(b) and 19.3.4.(c) shall, as far as is practicable prevent the passage of smoke and flame.

19.3.5 Restriction of Combustible Materials

- (a) All insulation including pipe and duct lagging shall be of approved non-combustible materials.
- (b) The use of polyurethane foam as insulation material is not permitted.
- (c) All exposed surfaces in accommodation spaces other than decks, including linings and ceilings if fitted, shall have low flame spread characteristics.
- (d) Spaces containing flammable stores shall be situated so as to minimize the dangers to passengers and crew in the event of fire.

19.3.6 Means of Escape

- (a) Stairways, ladders and doors, shall be arranged to provide ready means of escape from all passenger and crew spaces, to lifesaving equipment embarkation stations, such that:
 - (i) except where it is considered impracticable, two means of escape including the main entrance shall be provided from each general area accessible to passengers and crew;
 - (ii) where two means of escape are fitted, they shall be as remote from each other as possible to prevent one incident blocking both escapes;
 - (iii) doors that give direct access into an accommodation space from a machinery space shall be gastight, constructed of steel or equivalent material, and be of the self-closing type;
 - (iv) there shall be no direct access from a machinery space to berthed crew accommodation.
- (b) Any public space that has a deck area greater than 28 square metres shall have at least two exits and, where practicable, the exits shall have egress to different spaces so as to minimize the possibility that both exits could be blocked at the same time as a result of one incident.
- (c) When in any public room, subdued lighting is used, the exits shall be clearly marked with illuminated signs, and any doors shall be constructed to open outwards.
- (d) Vertical ladders and deck scuttles shall not generally be considered satisfactory as one of the means of escape, except that in areas occupied only by crew members, or where it is demonstrated that the installation of a stairway would be impractical, a vertical ladder may be used as a second means of escape.

19.3.7 Arrangement of Stairways

- (a) For all stairways, the sum of the riser height and tread depth shall be at least 430mm and not more than 460mm, and all stairways, other than exterior stairways, having treads of less than 260mm in depth, shall have a nosing of not less than 25mm or such other means that shall provide additional depth on the tread.
- (b) For all stairways, handrails shall be fitted on both sides of the stairs, the handrails shall have a height measured vertically above the tread of not less than 840mm and not more than 910mm.
- (c) Except where it is considered impracticable, at the top and bottom of each flight of stairs there shall be a clear landing having an area at least equal to the square of the actual tread width.
- (d) The clear width of doors to stairways shall be at least equal to the actual stair width.
- (e) The width of all stairways and inclined ladders shall be 760mm minimum.
- (f) Stairways and inclined ladders primarily for the use of passengers shall have a maximum angle of inclination from the horizontal of 45 degrees.
- (g) Stairways and inclined ladders for the use of the crew only shall have a maximum angle of inclination from the horizontal of 55 degrees.
- (h) If the distance between handrails is less than the width of the treads the minimum stair width shall be measured between the handrails.

19.3.8 Public Address System

- (a) A public address system in accordance with TP 127E, "Ship Safety Electrical Standards", shall be fitted throughout all accommodation spaces.

19.3.9 Fire Detection and Alarm System

- (a) Every vessel shall be fitted with a fire detection and alarm system in accordance with Part 20, Sections 20.1 to 20.4.

19.3.10 Location and Arrangement of Oil Fuel Tanks

- (a) As far as is practicable, oil fuel tanks shall be located outside of machinery spaces and be constructed of steel or other equivalent material.
- (b) Where oil fuel tanks constructed of aluminum alloy are located in a machinery space, or are located in, or adjacent to any space containing flammable material, the exposed surfaces of the tanks shall be insulated with a material that will provide structural integrity for 30 minutes.
- (c) Oil fuel tanks constructed of fibre reinforced plastic, integral with the hull, shall have a final layer of fire retardant resin and the exposed surfaces of the tanks insulated with a material that will provide structural integrity for 30 minutes.

19.3.11 Ventilation Systems

- (a) A ventilation duct serving an accommodation space, service space, or wheelhouse shall not pass through a machinery space.
- (b) A ventilation duct serving a machinery space or galley which passes through an accommodation space, service space or wheelhouse shall be gastight and constructed of steel or aluminum alloy insulated with a material that will provide structural integrity for at least 30 minutes.
- (c) If the ventilation duct serving the machinery space is an integral part of the structure the internal surfaces shall be coated with an approved fire retardant coating of the intumescent type or be insulated with a material that will provide structural integrity for 30 minutes.
- (d) An exhaust ventilation duct from a galley range shall be provided with a grease trap and be constructed of steel.
- (e) Means shall be provided for closing the main inlets and outlets of ventilation systems from a position outside the spaces served by the systems.

19.4 Vessels Constructed of Steel or Other Equivalent Material (100 Unberthed Passengers on HT III or IW II Voyages)

19.4.1 This sub-section applies to vessels, constructed of steel or other equivalent material, carrying not more than 100 unberthed passengers on voyages not more exposed than Home Trade Class III or Inland Waters Class II.

19.4.2 Structure

- (a) The hull, superstructure, structural bulkheads, decks and deckhouses shall be constructed of steel or other equivalent material.
- (b) Boundaries of machinery spaces shall be gastight and constructed of steel or other equivalent material.
- (c) Boundaries of galleys, and storerooms containing flammable materials shall be gastight and constructed of steel or equivalent material.
- (d) Where berthed accommodation is provided for the crew, the divisional bulkheads shall be constructed of steel or other equivalent material, or Class B-15 divisions.
- (e) The wheelhouse shall be separated from the remainder of the ship by bulkheads and decks constructed of steel or equivalent material.
- (f) Where any part of the structure is of aluminum alloy, the following additional requirements shall apply:
 - (i) the deckhead, boundary bulkheads, pillars and the hull structure in every machinery space, shall be insulated with a material that will provide structural integrity for at least 30 minutes;
 - (ii) structure in way of lifeboat and liferaft, stowage launching, muster, and embarkation areas, which may be exposed to fire shall be insulated with a material that will provide structural integrity for at least 30 minutes;

- (iii) the insulation material referred to in sub-paragraphs 19.4.2.(f).(i) and 19.4.2.(f).(ii) shall extend down to the light waterline.
- (iv) where in paragraphs 19.4.2.(b), 19.4.2.(c), 19.4.2.(d) and 19.4.2.(e), bulkheads and decks are to be constructed of steel or other equivalent material, aluminum alloy insulated with a material that will provide structural integrity for at least 30 minutes shall be considered equivalent to steel.

19.4.3 Restriction of Combustible Materials

- (a) All insulation including pipe and duct lagging shall be of approved non-combustible materials.
- (b) The use of polyurethane foam as insulation material is not permitted.
- (c) All linings and ceilings shall be of non-combustible materials.
- (d) The exposed surfaces of linings and ceilings in accommodation spaces shall have low flame spread characteristics.
- (e) The surface of any insulation fitted to the interior surfaces of a machinery space shall be impervious to oil and oil vapours.
- (f) Spaces containing flammable material shall be situated so as to minimize the dangers to passengers and crew in the event of a fire.

19.4.4 Means of Escape

- (a) Stairways, ladders and doors, shall be arranged to provide ready means of escape from all passenger and crew spaces, to lifesaving equipment embarkation stations, such that:
 - (i) except where it is considered impracticable, two means of escape including the main entrance shall be provided from each general area accessible to passengers, crew accommodation and crew working areas;
 - (ii) where two means of escape are fitted, they shall be as remote from each other as possible to prevent one incident blocking both escapes;

- (iii) doors that give direct access into an accommodation space from a machinery space shall be gastight, constructed of steel or equivalent material, and be of the self-closing type;
 - (iv) there shall be no direct access from a machinery space to berthed crew accommodation.
- (b) Any public space that has a deck area greater than 28 square metres shall have at least two exits and, where practicable, the exits shall have egress to different spaces so as to minimize the possibility that both exits could be blocked at the same time as a result of one incident.
 - (c) When in any public room, subdued lighting is used, the exits shall be clearly marked with illuminated signs, and any doors shall be constructed to open outwards.
 - (d) Vertical ladders and deck scuttles shall not generally be considered satisfactory as one of the means of escape, except that in areas occupied only by crew members, or where it is demonstrated that the installation of a stairway would be impractical, a vertical ladder may be used as a second means of escape.

19.4.5 Arrangement of Stairways

- (a) For all stairways, the sum of the riser height and tread depth shall be at least 430mm and not more than 460mm, and all stairways, other than exterior stairways, having treads of less than 260mm in depth, shall have a nosing of not less than 25mm or such other means that shall provide additional depth on the tread.
- (b) For all stairways, handrails shall be fitted on both sides of the stairs, the handrails shall have a height measured vertically above the tread of not less than 840mm and not more than 910mm.
- (c) Except where it is considered impracticable, at the top and bottom of each flight of stairs there shall be a clear landing having an area at least equal to the square of the actual tread width.
- (d) The clear width of doors to stairways shall be at least equal to the actual stair width.

- (e) The width of all stairways and inclined ladders shall be 760mm minimum.
- (f) Stairways and inclined ladders primarily for the use of passengers shall have a maximum angle of inclination from the horizontal of 45 degrees.
- (g) Stairways and inclined ladders for the use of the crew only shall have a maximum angle of inclination from the horizontal of 55 degrees.
- (h) If the distance between handrails is less than the width of the treads the minimum stair width shall be measured between the handrails.

19.4.6 Public Address System

- (a) A public address system in accordance with TP 127E, "Ship Safety Electrical Standards", shall be fitted throughout all accommodation spaces.

19.4.7 Location and Arrangement of Oil Fuel Tanks

- (a) As far as is practicable, oil fuel tanks shall be located outside of machinery spaces and shall be constructed of steel or other equivalent material.
- (b) Where oil fuel tanks constructed of aluminum alloy are located in a machinery space, or are located in, or adjacent to any space containing flammable material the exposed surfaces of the tanks shall be insulated with a material that will provide structural integrity for 30 minutes.

19.4.8 Fire Detection and Alarm System

- (a) Every vessel shall be fitted with a fire detection and alarm system in accordance with Part 20, Sections 20.1 to 20.4.

19.4.9 Ventilation Systems

- (a) A ventilation duct serving an accommodation space, service space, or wheelhouse shall not pass through a machinery space;
- (b) A ventilation duct serving a machinery space or galley which passes through an accommodation space, service space or wheelhouse shall be gastight and constructed of steel or aluminum alloy insulated with a material that will provide structural integrity for at least 30 minutes.
- (c) An exhaust ventilation duct from a galley range shall be provided with a grease trap and be constructed of steel;
- (d) Means shall be provided for closing the main inlets and outlets of ventilation systems from a position outside the spaces served by the systems.

19.5 Vessels Constructed of Fibre Reinforced Plastic (100 Unberthed Passengers on HT III or IW II Voyages)

19.5.1 This section applies to vessels of fibre reinforced plastic construction, carrying not more than 100 unberthed passengers on voyages not more exposed than Home Trade Class III or Inland Waters Class II.

19.5.2 General

- (a) The hull, superstructure, structural bulkheads and deckhouses when constructed of fibre reinforced plastic shall have a final layer of fire-retardant resin.

19.5.3 Machinery Spaces

- (a) Exposed fibre reinforced plastic surfaces including the hull, deckhead, boundary bulkheads, casings and any trunks servicing such a space, shall be coated with an approved fire retardant coating of the intumescent type or be insulated with a material that will provide structural integrity for 30 minutes.
- (b) Machinery space boundaries shall as far as is practicable be gastight.

19.5.4 Other Spaces

- (a) Galleys, and storerooms containing flammable stores shall be separated from the remainder of the ship by bulkheads and decks constructed of B-15 Class or 'F' Class divisions.
- (b) Where berthed accommodation is provided for the crew, the divisional bulkheads shall be constructed of B-15 or 'F' Class divisions.
- (c) The wheelhouse shall be separated from the remainder of the ship by bulkheads and decks constructed of B-15 or 'F' Class divisions.
- (d) All openings in the bulkheads and decks referred to in paragraphs 19.5.4.(a), 19.5.4.(b) and 19.5.4.(c) shall, as far as is practicable prevent the passage of smoke and flame.

19.5.5 Restriction of Combustible Materials

- (a) All insulation including pipe and duct lagging shall be of approved non-combustible materials.
- (b) The use of polyurethane foam as insulation material is not permitted.
- (c) All linings and ceilings shall be of non-combustible materials.
- (d) All exposed surfaces in accommodation spaces other than decks, including linings and ceilings if fitted, shall have low flame spread characteristics.

- (e) Spaces containing flammable stores shall be situated so as to minimize the dangers to passengers and crew in the event of fire.

19.5.6 Means of Escape

- (a) Stairways, ladders and doors, shall be arranged to provide ready means of escape from all passenger and crew spaces, to lifesaving equipment embarkation stations, such that:
 - (i) except where it is considered impracticable, two means of escape including the main entrance shall be provided from each general area accessible to passengers and crew, crew accommodation and crew working areas;
 - (ii) where two means of escape are fitted, they shall be as remote from each other as possible to prevent one incident blocking both escapes;
 - (iii) doors that give direct access into an accommodation space from a machinery space shall be gastight, constructed of steel or equivalent material, gas-tight construction, and be of the self-closing type;
 - (iv) there shall be no direct access from a machinery space to berthed crew accommodation.
- (b) Any public space that has a deck area greater than 28 square metres shall have at least two exits and, where practicable, the exits shall have egress to different spaces so as to minimize the possibility that both exits could be blocked at the same time as a result of one incident.
- (c) When in any public room, subdued lighting is used, the exits shall be clearly marked with illuminated signs, and any doors shall be constructed to open outwards.
- (d) Vertical ladders and deck scuttles shall not generally be considered satisfactory as one of the means of escape, except that in areas occupied only by crew members, or where it is demonstrated that the installation of a stairway would be impractical, a vertical ladder may be used as a second means of escape.

19.5.7 Arrangement of Stairways

- (a) For all stairways, the sum of the riser height and tread depth shall be at least 430mm and not more than 460mm, and all stairways, other than exterior stairways, having treads of less than 260mm in depth, shall have a nosing of not less than 25mm or such other means that shall provide additional depth on the tread.
- (b) For all stairways, handrails shall be fitted on both sides of the stairs, the handrails shall have a height measured vertically above the tread of not less than 840mm and not more than 910mm.
- (c) Except where it is considered impracticable, for all stairways, at the top and bottom of each flight of stairs there shall be a clear landing having an area at least equal to the square of the actual tread width.
- (d) The clear width of doors to stairways shall be at least equal to the actual stair width.
- (e) The width of all stairways and inclined ladders shall be 760mm minimum.
- (f) Stairways and inclined ladders primarily for the use of passengers shall have a maximum angle of inclination from the horizontal of 45 degrees.
- (g) Stairways and inclined ladders for the use of the crew only shall have a maximum angle of inclination from the horizontal of 55 degrees.
- (h) If the distance between handrails is less than the width of the treads the minimum stair width shall be measured between the handrails.

19.5.8 Public Address System

- (a) A public address system in accordance with TP 127E, "Ship Safety Electrical Standards", shall be fitted throughout all accommodation spaces.

19.5.9 Fire Detection and Alarm System

- (a) Every vessel shall be fitted with a fire detection and alarm accordance with Part 20, Sections 20.1 to 20.4. Where berthed accommodation is provided for the crew a fixed automatic system to detect an abnormal concentration of smoke in accordance with TP 127E, "Ship Safety Electrical Standards", shall be fitted throughout the accommodation spaces.

19.5.10 Location and Arrangement of Oil Fuel Tanks

- (a) As far as is practicable, oil fuel tanks shall be located outside of machinery spaces and be constructed of steel or other equivalent material.
- (b) Where oil fuel tanks constructed of aluminum alloy are located in a machinery space, or are located in, or adjacent to any space containing flammable material, stores the exposed surfaces of the tanks shall be insulated with a material that will provide structural integrity for 30 minutes.
- (c) Oil fuel tanks constructed of fibre reinforced plastic, integral with the hull, shall have a final layer of fire retardant resin and the exposed surfaces of the tanks insulated with a material that will provide structural integrity for 30 minutes.

19.5.11 Ventilation Systems

- (a) A ventilation duct serving an accommodation space, service space, or wheelhouse shall not pass through a machinery space.
- (b) A ventilation duct serving a machinery space or galley which passes through an accommodation space, service space or wheelhouse shall be gastight and constructed of steel or aluminum alloy insulated with a material that will provide structural integrity for at least 30 minutes.
- (c) If the ventilation duct serving the machinery space is an integral part of the structure the internal surfaces shall be coated with an approved fire retardant coating of the intumescent type or be insulated with a material that will provide structural integrity for 30 minutes.
- (d) An exhaust ventilation duct from a galley range shall be provided with a grease trap and be constructed of steel.

- (e) Means shall be provided for closing the main inlets and outlets of ventilation systems from a position outside the spaces served by the systems.

19.6 Vessels Constructed of Steel or Other Equivalent Material (25 Berthed Passengers on HT III or IW II Voyages)

19.6.1 This sub-section applies to vessels, constructed of steel or other equivalent material, carrying not more than 25 berthed passengers on voyages not more exposed than Home Trade Class III or Inland Waters Class II.

19.6.2 Structure

- (a) The hull, superstructure, structural bulkheads, decks and deckhouses shall be constructed of steel or other equivalent material.
- (b) Machinery spaces shall be separated from the remainder of the ship by Class A-30 bulkheads and decks.
- (c) Boundaries of galleys, and storerooms containing flammable material shall be gastight and constructed of steel or other equivalent material.
- (d) The wheelhouse shall be separated from the remainder of the ship by bulkheads and decks constructed of steel or other equivalent material.
- (e) Divisional bulkheads including corridor bulkheads, in sleeping accommodation provided for passengers and crew, shall be constructed of steel or other equivalent material, or Class B-15 divisions.
- (f) Where any part of the structure is of aluminum alloy, the following additional requirements shall apply:
 - (i) the deckhead, boundary bulkheads, pillars and the hull structure in every machinery space, shall be insulated with a material that will provide structural integrity for at least 30 minutes.

- (ii) structure in way of lifeboat and liferaft, stowage launching, muster, and embarkation areas, which may be exposed to fire shall be insulated with a material that will provide structural integrity for at least 30 minutes.
- (iii) the insulation material referred to in sub-paragraphs 19.6.2.(f).(i) and 19.6.2.(f).(ii) shall extend down to the light waterline;
- (iv) where in paragraphs 19.6.2.(b), 19.6.2.(c), 19.6.2.(d) and 19.6.2.(e), bulkheads and decks are to be constructed of steel or other equivalent material, aluminum alloy insulated with a material that will provide structural integrity for at least 30 minutes shall be considered equivalent to steel.

19.6.3 Restriction of Combustible Materials

- (a) All insulation including pipe and duct lagging shall be of approved non-combustible materials.
- (b) The use of polyurethane foam as insulation material is not permitted.
- (c) All linings and ceilings shall be of non-combustible materials.
- (d) The exposed surfaces of linings and ceilings in accommodation spaces shall have low flame spread characteristics.
- (e) The surface of any insulation fitted to the interior surfaces of machinery spaces shall be impervious to oil and oil vapours.
- (f) All primary deck coverings in accommodation spaces, service spaces and wheelhouse shall be of a type that is not readily ignitable.
- (g) Spaces containing flammable stores shall be situated so as to minimize the dangers to passengers and crew in the event of fire.

19.6.4 Means of Escape

- (a) Stairways, ladders, corridors, and doors, shall be arranged to provide ready means of escape to lifesaving equipment embarkation stations, from all passenger and crew spaces, such that:
 - (i) except where considered impracticable, two means of escape including the main entrance shall be provided from each general area accessible to passengers, crew accommodation and crew working areas;
 - (ii) where two means of escape are fitted, they shall be as remote from each other as possible to prevent one incident blocking both escapes;
 - (iii) doors that give direct access into an accommodation space from a machinery space shall be of steel gas-tight construction, and be of the self-closing type;
 - (iv) there shall be no direct access from a machinery space to berthed accommodation.
- (b) Any public space that has a deck area greater than 28 square metres shall have at least two exits and, where practicable, the exits shall have egress to different spaces so as to minimize the possibility that both exits could be blocked at the same time as a result of one incident.
- (c) When in any public room, subdued lighting is used, the exits shall be clearly marked with illuminated signs, and any doors shall be constructed to open outwards.
- (d) Vertical ladders and deck scuttles shall not generally be considered satisfactory as one of the means of escape, except that in areas occupied only by crew members, or where it is demonstrated that the installation of a stairway would be impractical, a vertical ladder may be used as a second means of escape.

19.6.5 Arrangement of Stairways

- (a) All stairways, including stringers, treads and risers, shall be constructed of steel and shall be within enclosures constructed to a Class A-0 standard with self-closing fire doors of the same standard fitted at all levels.
- (b) A stairway connecting only two decks need only be enclosed at one level.
- (c) For all stairways, the sum of the riser height and tread depth shall be at least 430mm and not more than 460mm, and all stairways, other than exterior stairways, having treads of less than 260mm in depth, shall have a nosing of not less than 25mm or such other means that shall provide additional depth on the tread.
- (d) For all stairways, handrails shall be fitted on both sides of the stairs, the handrails shall have a height measured vertically above the tread of not less than 840mm and not more than 910mm.
- (e) Except where it is considered impracticable, at the top and bottom of each flight of stairs there shall be a clear landing having an area at least equal to the square of the actual tread width.
- (f) The clear width of doors to stairways shall be at least equal to the actual stair width.
- (g) The width of all stairways and inclined ladders shall be 760mm minimum.
- (h) Stairways and inclined ladders primarily for the use of passengers shall have a maximum angle of inclination from the horizontal of 45 degrees.
- (j) Stairways and inclined ladders for the use of the crew only shall have a maximum angle of inclination from the horizontal of 55 degrees.
- (k) If the distance between handrails is less than the width of the treads the minimum stair width shall be measured between the handrails.

19.6.6 Location and Arrangement of Oil Fuel Tanks

- (a) As far as is practicable, oil fuel tanks shall be located outside of machinery spaces and shall be constructed of steel or other equivalent material.

- (b) Where oil fuel tanks constructed of aluminum alloy are located in a machinery space, or are located in, or adjacent to any space containing flammable material, the exposed surfaces of the tanks shall be insulated with a material that will provide structural integrity for at least 30 minutes.

19.6.7 Public Address System

- (a) A public address system in accordance with TP127E, shall be fitted throughout all accommodation spaces.

19.6.8 Fire Detection and Alarm System

- (a) Every vessel shall be fitted with a fire detection and alarm system in accordance with Part 20, Sections 20.1 to 20.4.

19.6.9 Ventilation Systems

- (a) A ventilation duct serving an accommodation space, service space, or wheelhouse shall not pass through a machinery space;
- (b) A ventilation duct serving a machinery space or galley which passes through an accommodation space, service space or wheelhouse shall be gastight and constructed of steel or aluminum alloy insulated with a material that will provide structural integrity for at least 30 minutes.
- (c) An exhaust ventilation duct from a galley range shall be provided with a grease trap, be constructed of steel;
- (d) Means shall be provided for closing the main inlets and outlets of ventilation systems from a position outside the spaces served by the systems.

19.7 Vessels Constructed of Fibre Reinforced Plastic (25 Berthed Passengers on HT III or IW II Voyages)

- 19.7.1 This sub-section applies to vessels, of fibre reinforced plastic construction, carrying not more than 25 berthed passengers on voyages not more exposed than Home Trade Class III or Inland Waters Class II voyages.

19.7.2 General

- (a) The hull, superstructure, structural bulkheads and deckhouses when constructed of fibre reinforced plastic shall have a final layer of fire-retardant resin.

19.7.3 Machinery Spaces

- (a) Exposed fibre reinforced plastic surfaces including the hull, deckhead, boundary bulkheads, casings and any trunks serving such spaces, shall be insulated with approved B-15 or 'F' Class panels or a material that will provide structural integrity for 30 minutes.
- (b) Machinery space boundaries shall as far as is practicable be gastight.

19.7.4 Other Spaces

- (a) Galleys, and storerooms containing flammable stores shall be separated from the remainder of the ship by bulkheads and decks constructed of B-15 Class or 'F' Class divisions.
- (b) Divisional bulkheads, including corridor bulkheads in sleeping accommodation provided for passengers and crew, shall be B-15 or 'F' Class divisions.
- (c) The wheelhouse shall be separated from the remainder of the ship by bulkheads and decks constructed of B-15 or 'F' Class divisions.
- (d) All openings in the bulkheads and decks referred to in paragraphs 19.7.4.(a), 19.7.4.(b) and 19.7.4.(c) shall, as far as is practicable prevent the passage of smoke and flame.

19.7.5 Restriction of Combustible Materials

- (a) All insulation including pipe and duct lagging shall be of approved non-combustible materials.
- (b) The use of polyurethane foam as insulation material is not permitted.

- (c) All linings and ceilings shall be of non-combustible materials.
- (d) The exposed surfaces of linings and ceilings in accommodation spaces shall have low flame spread characteristics.
- (e) The surface of any insulation fitted to the interior surfaces of machinery spaces shall be impervious to oil and oil vapours.
- (f) All primary deck coverings in accommodation spaces, service spaces and wheelhouse shall be of a type that is not readily ignitable.
- (g) Spaces containing flammable stores shall be situated so as to minimize the dangers to passengers and crew in the event of fire.

19.7.6 Means of Escape

- (a) Stairways, ladders and doors, shall be arranged to provide ready means of escape from all passenger and crew spaces, to lifesaving equipment embarkation stations, such that:
 - (i) except where considered impracticable, two means of escape including the main entrance shall be provided from each general area accessible to passengers, crew accommodation and crew working areas;
 - (ii) where two means of escape are fitted, they shall be as remote from each other as possible to prevent one incident blocking both escapes;
 - (iii) doors that give direct access into an accommodation space from a machinery space shall be of steel gas-tight construction, and be of the self-closing type;
 - (iv) there shall be no direct access from a machinery space to berthed crew or passenger accommodation.
- (b) Any public space that has a deck area greater than 28 square metres shall have at least two exits and, where practicable, the exits shall have egress to different spaces so as to minimize the possibility that both exits could be blocked at the same time as a result of one incident.

- (c) When in any public room, subdued lighting is used, the exits shall be clearly marked with illuminated signs, and any doors shall be constructed to open outwards.
- (d) Vertical ladders and deck scuttles shall not generally be considered satisfactory as one of the means of escape, except that in areas occupied only by crew members, or where it is demonstrated that the installation of a stairway would be impractical, a vertical ladder may be used as a second means of escape.

19.7.7 Arrangement of Stairways

- (a) All stairways, including stringers treads and risers, shall be constructed of steel and shall be within enclosures constructed of B-15 or 'F' Class divisions.
- (b) A stairway connecting only two decks need only be enclosed at one level.
- (c) For all stairways, the sum of the riser height and tread depth shall be at least 430mm and not more than 460mm, and all stairways, other than exterior stairways, having treads of less than 260mm in depth, shall have a nosing of not less than 25mm or such other means that shall provide additional depth on the tread.
- (d) For all stairways, handrails shall be fitted on both sides of the stairs, the handrails shall have a height measured vertically above the tread of not less than 840mm and not more than 910mm.
- (e) Except where it is considered impracticable, at the top and bottom of each flight of stairs there shall be a clear landing having an area at least equal to the square of the actual tread width.
- (f) The clear width of doors to stairways shall be at least equal to the actual stair width.
- (g) The width of all stairways and inclined ladders shall be 760mm minimum.
- (h) Stairways and inclined ladders primarily for the use of passengers shall have a maximum angle of inclination from the horizontal of 45 degrees.

- (j) Stairways and inclined ladders for the use of the crew only shall have a maximum angle of inclination from the horizontal of 55 degrees.
- (k) If the distance between handrails is less than the width of the treads the minimum stair width shall be measured between the handrails.

19.7.8 Public Address System

- (a) A public address system in accordance with TP 127E, "Ship Safety Electrical Standards", shall be fitted throughout all accommodation spaces.

19.7.9 Fire Detection and Alarm System

- (a) Every vessel shall be fitted with a fire detection and alarm system in accordance with Part 20, Sections 20.1 to 20.4.

19.7.10 Location and Arrangement of Oil Fuel Tanks

- (a) As far as is practicable, oil fuel tanks shall be located outside of machinery spaces and be constructed of steel or other equivalent material.
- (b) Where oil fuel tanks constructed of aluminum alloy are located in a machinery space, or are located in, or adjacent to any space containing flammable stores the exposed surfaces of the tanks shall be insulated with a material that will provide structural integrity for at least 30 minutes.
- (c) Oil fuel tanks constructed of fibre reinforced plastic, integral with the hull, shall have a final layer of fire retardant resin and the exposed surfaces of the tanks insulated with a material that will provide structural integrity for at least 30 minutes.

19.7.11 Ventilation Systems

- (a) A ventilation duct serving an accommodation space, service space, or wheelhouse shall not pass through a machinery space;
- (b) A ventilation duct serving a machinery space or galley which passes through an accommodation space, service space or wheelhouse shall be gastight and constructed of steel or aluminum alloy insulated with a material that will provide structural integrity for at least 30 minutes.
- (c) If the ventilation duct serving the machinery space is an integral part of the structure the internal surfaces shall be coated with an approved fire retardant coating of the intumescent type or be insulated with a material that will provide structural integrity for 30 minutes.
- (d) An exhaust ventilation duct from a galley range shall be provided with a grease trap, be constructed of steel.
- (e) Means shall be provided for closing the main inlets and outlets of ventilation systems from a position outside the spaces served by the systems.

20. FIRE PROTECTION EQUIPMENT

20.1 Every vessel shall be fitted with a fire detection and alarm system complying with the requirements of the "Ship Safety Electrical Standard", TP 127E, in accordance with subsections 20.1.(a) and 20.1.(b) as follows:

- (a) the accommodation and wheelhouse space shall be fitted with re-setable type detectors operated by an abnormal concentration of smoke, except where these spaces are in such close proximity to heating or cooking appliances that the detectors may be subject to false alarms;
- (b) the propulsion machinery space, galley and other spaces containing heating or cooking appliances shall be fitted with re-setable type detectors operated by an abnormal temperature, together with an excess rate of temperature rise.

- 20.2 The alarm for warning of operation of the fire detection and alarm system shall be distinctive from other signals or alarms in the protected space.
- 20.3 Alarms sound levels shall be such that they can be heard above all shipboard noise when the vessel is operating at full power.
- 20.4 Alarm and detection systems shall have audio and visual indicators fitted at the command stations.
- 20.5 Subject to subsection 20.5.1, the propulsion machinery space shall be protected by a fixed gas fire extinguishing system complying with the Fire Detection and Extinguishing Equipment Regulations.
- 20.5.1 The system shall be manually operated; however, a change-over switch may be incorporated to allow automatic operation when the vessel is in port and the propulsion machinery is not operating. The switch shall be suitably identified to show mode of operation of system.
- 20.6 Where the vessel is constructed of wood, fibre reinforced plastic or aluminum, the system shall be provided with two complete and independent charges of gas.
- 20.7 In addition to the fixed gas fire extinguishing system required in section 20.5 every vessel shall be provided with portable fire extinguishers as prescribed in Table I, suitably located for immediate use in the event of a fire.
- 20.7.1 Fire extinguishers shall be permanently mounted with a quick release mechanism near the entrance to the space in which they are to be used.
- 20.7.2 Every vessel fitted with combustion fired cooking or heating appliances shall, in addition to any other portable fire extinguishers, be provided with one portable 1 kilogram multipurpose dry chemical extinguisher, mounted near each of the appliances.
- 20.7.3 CO₂ fire extinguishers shall not be located in accommodation spaces.
- 20.7.4 Fire extinguishers shall be kept fully charged at all times; fixed gas containers and portable gas fire extinguishers shall be recharged whenever the loss of medium exceeds 10 per cent of rated capacity.

- 20.7.5 Every fire extinguisher shall be of a type approved by:
- (a) Underwriters Laboratories of Canada;
 - (b) Underwriters Laboratory Inc.;
 - (c) The United Kingdom Department of Transport, Marine Division;
 - (d) The United States Coast Guard; or
 - (e) any other agency approved by the Regional Director.
- 20.8 Every vessel shall have a power pumping system for fire fighting together with a hose and dual-purpose jet/spray nozzle such that a sustained jet of water can be directed to any part of the vessel and the pumping arrangement and capacity shall be in accordance with Part 25, Schedule IV.
- 20.8.1 The internal diameter of pipes and hoses for fire fighting purposes shall not be less than 25 mm.
- 20.8.2 Where a bilge pump is used as a fire pump, a non-return valve or swing check valve shall be fitted between the sea connection and the bilge suction to positively prevent the accidental discharge or leakage of water into the bilge compartments.
- 20.8.3 Subject to subsection 20.8.4 sea suction and fire service piping and components connected to a fire pump shall be of rigid corrosion resistant material that shall not be readily rendered ineffective by heat, with a screwed or flanged connection.
- 20.8.4 Where it is necessary to reduce the effects of vibration, short lengths of fire resistant rubber may be installed and shall:
- (a) be clearly visible at all times;
 - (b) be of sufficient strength to withstand collapsing due to suction.
- 20.9 Every vessel shall be equipped with two (2) fire buckets each complete with a 3 metre line, stowed in a readily accessible position.
- 20.10 Appliances that burn liquid fuel shall be so fitted that any leakage will be caught and retained in a drip tray.

20.10.1 There shall be free circulation of air all around and below all fuel burning appliances.

TABLE I

Space protected	Minimum Required	Medium	Min. Size	Class
Wheel House	1	Dry Chemical	2 kg	B-1, C-1
Machinery Space	1	Foam CO ₂ Dry Chemical	9 litres 7 kg 4.5 kg	B-1
Accommodation	1 for each 70 m ³ or fraction thereof	Dry Chemical	4.5 kg	A-11
Galley, Pantry Concession Stand	1	Foam Dry Chemical	9 litres 4.5 kg	B-11

21. HEATING AND COOKING INSTALLATIONS

21.1 Genera

21.1.1 Heating and cooking installations shall be electrically operated except where the installed generator capacity is inadequate.

21.1.2 Accommodation and service spaces containing any fuel burning appliance shall be ventilated to ensure that when all appliances are in full operation in adverse weather conditions, a supply of air is being maintained to the spaces for the safety and comfort of personnel and the operation of the appliances.

21.2 Electric Appliances

21.2.1 Electric heating units, cooking appliances, water heaters and all other electrical appliances shall be installed in accordance with Ship Safety Electrical Standards, TP 127, be fixed in place and positioned so as to reduce fire risks to a minimum.

21.3 Fuel Burning Appliances

21.3.1 Fuel burning appliances shall be specifically designed for the fuel used, approved for marine use by a recognised agency and maintained in accordance with the manufacturers recommendations and instructions.

21.3.2 Fuel burning heating appliances shall be of enclosed construction and shut down automatically on detection of high temperature or flame failure.

21.3.3 Fuel burning appliances shall be firmly secured in place, positioned and insulated to reduce fire risks to a minimum.

21.3.4 Uptakes shall be so constructed and arranged as to minimize the possibility of their becoming blocked by combustion products and have a ready means of cleaning.

21.3.5 Uptake dampers, where fitted, shall maintain a safe minimum opening when in the closed position.

21.3.6 Fuel burning appliances shall have printed instructions for installation, operation and maintenance permanently mounted and readily visible in a location adjacent to the appliance.

21.3.7 In addition to the requirement of subsection 21.3.6 the following safety instructions shall be prominently mounted in any space where a fuel burning appliance is installed.

WARNING

ENSURE ADEQUATE FRESH AIR VENTILATION WHEN USING FUEL BURNING APPLIANCE

**If leakage of fuel is detected or suspected,
the following action should be taken immediately:**

- (1) Shut off fuel supply.**
- (2) Extinguish all naked flame and sources of ignition, e.g. heaters, cookers, cigarettes.**
- (3) Ventilate by creating a through draft of fresh air.**

21.4 Liquefied Petroleum Gas Systems

- 21.4.1 Liquefied Petroleum Gas systems, including appliances, installations and warning notices shall comply with the Marine Machinery Regulations, Schedule XIII and conform to provincial gas enforcing authority standards.
- 21.4.2 Liquefied Petroleum Gas (LPG) shall be used solely for domestic gas fuel burning ranges, domestic gas fuel refrigerators, gas fuel space heaters and gas fuel water heaters.
- 21.4.3 Appliances and components shall be designed for use with LPG and be certified as suitable for marine use by the Canadian Gas Association, the Compressed Gas Association, the Underwriters' Laboratories of Canada or the Underwriters' Laboratories Inc.
- 21.4.4 Liquefied Petroleum Gas systems shall be inspected by a technician, trained to the appropriate provincial standard, at the time of installation, if significant alterations are made and at regular intervals coinciding with the re-certification of the vessel.
- 21.4.5 The maximum quantity of Liquefied Petroleum Gas carried on board the vessel shall not exceed the contents of two 10 kilogram containers.

CHAPTER V

LIFE SAVING EQUIPMENT AND ARRANGEMENTS AND SAFETY OF NAVIGATION

22. LIFE SAVING EQUIPMENT

- 22.1 Every vessel not exceeding 15 m in length shall carry
- 22.1.1 one approved life-jacket for:
- (a) each person on board; and
 - (b) children, equal in number to 10% of the complement, or such greater number as may be required to provide a lifejacket for each child, but this subparagraph does not apply where the lifejackets required under paragraph 22.1.1.(a) are suitable for children.
- 22.1.2 two approved lifebuoys, one fitted with 27 m of line and one with an approved lifebuoy light;
- 22.1.3 subject to paragraph 22.1.3.a) an inflatable life raft(s) capable of accommodating all persons on board; or
- (a) if making home-trade voyages, Class IV, or minor waters voyages, Class II, inflatable life raft(s) or platform(s) capable of accommodating all persons on board.
- 22.2 Every vessel 15 m or greater in length shall carry
- 22.2.1 one approved life-jacket for;
- (a) each person on board; and
 - (b) children, equal in number to 10 per cent of the complement, or such greater number as may be required to provide a lifejacket for each child, but this subparagraph does not apply where the lifejackets required under subparagraph (i) are suitable for children.

- 22.2.2 four approved lifebuoys, two fitted with 27 m of line and the other two with an approved lifebuoy light;
- (a) subject to paragraph 22.2.2.b) one or more approved inflatable life rafts of aggregate capacity such as to accommodate all persons on board.
 - (b) if making home-trade voyages, Class IV, or minor waters voyages, Class II, approved inflatable platforms may be carried in lieu of the life rafts required by paragraph (c).
 - (c) one approved emergency boat fitted with an outboard motor under a suitable launching arrangement but this paragraph does not apply to a vessel that;
 - (i) has a freeboard of less than 1.5 metres; or
 - (ii) is fitted with a boarding platform.
- 22.3 The types of distress signals referred to in this section are the types of distress signals described in Schedule III of the Life Saving Equipment Regulations.
- 22.4 Every vessel shall carry 12 distress signals consisting of 6 Type A or B and 6 Type A,B,C or D.

23. NAVIGATION AND RADIOCOMMUNICATIONS

23.1 Collision Regulations

- 23.1.1 Every vessel shall comply with the Collision Regulations, as amended from time to time.

23.2 Navigating Appliances and Equipment Regulations

- 23.2.1 Every vessel shall carry navigating appliances and equipment in accordance with the Navigating Appliances and Equipment Regulations, as amended from time to time.
- 23.2.2 In addition, the following vessels must be fitted with a marine radar that is located in the position from which the vessel is normally navigated:
- (a) a vessel more than 20 m in length;

- (b) a vessel making a home-trade voyage, Class III or an inland voyage, Class II; or
 - (c) any vessel carrying more than 50 passengers.
- 23.2.3 In addition, every vessel more than 20 m in length must be fitted with a depth sounder.
- 23.3 Charts and Publications Regulation
- 23.3.1 Every vessel shall carry charts and publications in accordance with the Charts and Publications Regulations, as amended from time to time.
- 23.4 Ship Station Radio Regulations and Ship Station Technical Regulations**
- 23.4.1 Every vessel shall comply with the Ship Station Radio Regulations and the Ship Station Technical Regulations, as amended from time to time.

24. MOORING AND ANCHORING EQUIPMENT

- 24.1 All vessels shall have at least two anchors, subject to the provision in section 24.3.
- 24.2 For vessels in excess of 15 T the main anchors shall be not less than 2/3 of the anchor weight (W_a) specified in section 24.4 where T is half the arithmetic sum of the gross tonnage and the displacement in tonnes.
- 24.3 For vessels not exceeding 15 T the main anchor shall be of the weight specified in section 24.4 and the second anchor may be a sea anchor (floating) of a proven design. If the vessel operates inside of home-trade IV or minor waters a second anchor is not required.
- 24.4 The total anchor weight given by the following formula assumes a high holding power (HHP) anchor of typical dimensions:

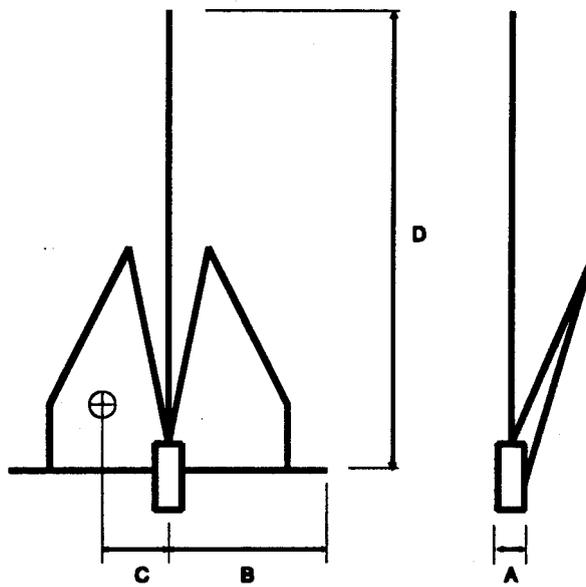
$$W_a = 1.55 \times \frac{\Delta + GT}{2} + 2.25 \text{ kg}$$

where W_a = total anchor weight in kg;
 = displacement of the vessel in tonnes;

GT = gross tonnage as calculated under the Tonnage Measurement Regulation or Schedule I of the Small Vessel Regulations.

- 24.5 If any other type of anchor other than an HHP anchor is used, W_a shall be increased by 25% and if a weight block, a fishing door or like device is used as an anchor W_a shall be increased by 100%.
- 24.6 All vessels shall carry not less than 50m of cable and at least 10 per cent of that cable shall be a chain.
- 24.7 For the purpose of this section the holding power of the HHP anchor shall be deemed to equal 35 times of its weight.
- 24.8 The working load of closed link chain shall not be less than 75 per cent of the prescribed theoretical holding power as calculated in sections 24.4 and 24.7 but in no case should the chain link be less than 8mm.
- 24.9 If a combination cable is used, the wire or rope working load shall be 2.0 times the working load of the chain.
- 24.10 If nylon rope is used, it shall be of a braided non-twist type and maintained in an unchaffed condition.
- 24.11 Unstabilized polypropylene and natural fibre rope shall not be used for anchor cable.
- 24.12 All vessels subject to the carriage of an anchor exceeding 25 kg shall be fitted with a winch mechanically or manually powered.
- 24.13 An appropriate locking device shall be provided and be of sufficient structural strength to hold a load twice the value prescribed as maximum holding power.
- 24.14 If the winch brake is used for the purpose of section 24.13 the structural foundation of the winch shall be designed accordingly.
- 24.15 In no case shall the rated working power of the winch be less than the combined load of 25 metres of the prescribed chain size added to the prescribed anchor weight or the actual anchor weight if a HHP anchor is not used.

- 24.16 Proper stowage and securing arrangement for the anchor(s) shall be provided in the anchor working area and the chain locker shall be of sufficient size and fitted with appropriate ventilation and drainage.
- 24.17 Anchors and cables may also be in accordance with the rules of an approved classification society.



DANFORTH TYPE HHP ANCHOR CAST OR
FABRICATED

Ratio of W_a versus A, B, C and D
to be provided

CHAPTER VI

INSPECTIONS AND CERTIFICATES

25. INSPECTION STANDARDS

25.1 First Inspection of New Construction

25.1.1 Subject to subsection 25.1.4, new vessels shall be constructed in accordance with plans that have been approved as set for in Part 4, Schedule I.

25.1.2 Every vessel shall be inspected at suitable intervals during construction according to Schedule I to ensure that the construction is in accordance with the approved plans.

25.1.3 Where a vessel built outside Canada is brought under Canadian registry and is

(a) in class with an approved classification society, or

(b) certified by any other approved authority,

the Regional Director shall determine the extent to which the vessel shall be inspected before an inspection certificate may be issued in respect of it.

25.1.4 Vessel transferred from registry elsewhere than in Canada to Canadian registry, and vessel entering passenger service for the first time is deemed to be "new vessel" and is the subject to inspection in accordance with Schedule I, section 1.9.

25.1.5 Every vessel shall be subject to dock and sea trials, which shall be held in the presence of an inspector. At that time the bilge and fire pumps and the steering and stopping powers of the vessel shall be tested, the launching arrangements for the life boats shall be carried out, an inclining experiment shall be conducted, and any further tests shall be carried out that the inspector considers necessary to satisfy himself that the vessel is safe and suitable for the purpose for which it is intended.

25.1.6 An inspector may, during inspection of the new construction of a vessel, accept any machinery or any electrical installation, equipment or appliance, without requiring it to be opened for inspection, if:

- (a) plans in respect of the machinery or the electrical installation, equipment or appliance are not required to be submitted for approval under these regulations; and
- (b) the inspector is satisfied that the machinery or electrical installation, equipment or appliance is safe and suitable for the purpose for which it is intended.

25.2 Periodical Inspections - Annual, Quadrennial and Quinquennial

- 25.2.1 Subject to subsection 25.2.2 every vessel shall be inspected annually in accordance with Schedule II, and quadrennially in accordance with Schedule III.
- 25.2.2 Where a vessel is making voyages other than home-trade III for a period of at least three consecutive months annually in fresh water it shall be inspected annually in accordance with Schedule II, and quinquennially in accordance with Schedule III.
- 25.2.3 Where an owner is unable to fulfil all the requirements of a periodical inspection referred to in Schedule II or Schedule III at the due date, the Regional Director may allow postponement of certain parts of the inspection of the vessel.
- 25.2.4 Where postponement is allowed under subsection 25.2.3, the periodical inspection shall be completed within a time determined by the Regional Director in accordance with the requirements of the appropriate Schedule, as if the vessel had been inspected on the original due date.
- 25.2.5 An owner may submit a proposal to the Regional Director for a system of continuous inspection and testing of the hull of the vessel whereby all compartments of the hull are opened for inspection and testing in regular rotation within a four or five-year period.

25.3 Out of Water Inspections

- 25.3.1 Vessels shall be inspected out of water as prescribed in subsection 25.3.3, except that where an owner cannot comply with the requirements of subsection 25.3.3 the Regional Director may allow postponement of out of water inspection and, the succeeding out of water inspection shall become due within the inspection interval prescribed in subsection 25.3.3 from the original due date.

- 25.3.2 At the out of water inspection adequate facilities shall be provided, so the inspector can properly determine the condition of the outside of the hull and its appendages.
- 25.3.3 The interval between the out of water inspections of the hull and appendages of a vessel shall be:
- (a) in the case of a vessel engaged in home-trade III voyages and spending less than 3 consecutive months annually in fresh water - two years, and if spending 3 or more consecutive months annually in fresh water - four years;
 - (b) in the case of a vessel engaged in inland, minor waters and home-trade IV voyages and spending less than 3 consecutive months annually in fresh water - four years, and if spending 3 or more consecutive months annually in fresh water - five years.
- 25.3.4 For the purpose of section 25.3.3, the St. Lawrence River west of the eastern end of the Ile d'Orleans, is deemed to be fresh water.

25.4 Issue and Extension of Short Term Certificates

- 25.4.1 Notwithstanding subsections 25.2.1 and 25.3.3, where an inspector is satisfied from such inspection as is possible while a vessel is afloat, and without opening all compartments, that the hull and equipment are in a seaworthy condition, the inspector may issue or extend a short term inspection certificate for a period not exceeding one month beyond the due date of periodic inspection.
- 25.4.2 A short term inspection certificate issued or extended up to the maximum period allowed under subsection 25.4.1 shall not be renewed or further extended unless
- (a) the periodic inspection is completed; or
 - (b) permission is granted by the Regional Director.

25.5 Building Facilities, Materials, Workmanship and Quality Control

- 25.5.1 Building facilities shall be appropriate to the material and method of construction of the vessel.

- (a) Building facilities for steel vessels shall be such that the steel plates and shapes to be used for construction are to be stored in such a way that corrosion or undue stresses or deformation are avoided.

- (b) Aluminium vessels shall be built in such conditions that all welding will be carried out under dry conditions at a temperature above 0mC, in still air conditions. If welding at temperatures below 0mC is unavoidable, there shall be prior submission of preheating methods and temperature control.

- (c) Wooden vessels may be built in the open provided that the moisture content of the wood is controlled while the vessel is being built.

- (d) Fibre reinforced plastic vessels shall be built in facilities so equipped and arranged that the supplier's instructions for material handling and storage, the laminating processes and curing control, can be complied with.

25.5.2 Material specifications shall be made available to the Inspector.

25.5.3 Workmanship shall be in accordance with the recognized practises applicable for every particular method of construction.

SCHEDULE I

1. First Inspection

1.1 General

1.1.1 The owner of a vessel shall notify the inspector at least one week in advance of:

- (a) the construction, and
 - (i) in the case of vessels constructed of steel, aluminium or wood,
 - the commencement of framing,
 - the commencement of plating or planking,
 - installation of the power plant, and
 - installation of the deck and superstructure;
 - (ii) in the case of vessels constructed of fibreglass or other materials which are moulded,
 - the commencement of lay-up,
 - the hull being removed from the mould,
 - the installation of the power plant, and
 - installation of the deck and superstructure;
- (b) the launching;
- (c) the inclining experiment; and
- (d) the dock and sea trials.

1.2 Hulls

1.2.1 Before the new vessel is launched, the compartments within the main hull shall be subjected to hose or pressure tests as follows:

- (a) tanks and peak tanks used for the carriage of water, and tanks arranged for the carriage of fuel oil: a head of water equal to the maximum head to which the tanks can be subjected in service but not less than 0.9 m above the crown of the tanks;

- (b) peak bulkheads, which do not form the boundaries of tanks, shall be tested by filling the peaks with water to the level of the load waterline;
- (c) watertight bulkheads and weather decks, shall be hose tested; the pressure of water in the hose shall be not less than 207 kPa;
- (d) tanks which are intended to hold liquids, and which form part of the subdivision of the vessel, shall be tested for tightness with water to a head up to the deepest subdivision load line or to a head corresponding to two-thirds of the depth from the top of keel to the margin line in way of the tanks, whichever is the greater; provided that in no case shall the test head be less than 0.9 m above the top of tank.

- 1.2.2 Inspection of the underwater portion of the vessel, shall be completed and the draught marks verified before the vessel is floated.
- 1.2.3 Scupper and sanitary discharge valves and other appliances intended to prevent the admission of water into the hull shall be inspected.
- 1.2.4 The means for closing openings in the hull, decks and superstructures shall be inspected before the vessel goes into service, and where such openings are required to close watertight, they shall be hose-tested; the pressure of the water in the hose shall be not less than 207 kPa.
- 1.2.5 Structural fire protection arrangements shall be inspected.
- 1.2.6 All watertight doors within the hull shall be inspected, tried under working conditions and hose-tested; the pressure of the water in the hose shall not be less than 207 kPa.
- 1.2.7 The means for pumping bilges shall be tested before the inspection is completed.
- 1.2.8 The steering arrangements shall be inspected during construction and tried under working conditions.
- 1.2.9 The masts and rigging shall be inspected during construction.
- 1.2.10 The anchors and cables shall be inspected and tested under normal working conditions to demonstrate satisfactory operation.

1.3 Stability and Associated Seaworthiness

1.3.1 Verify that approved stability data conforming to Part 6 is held on board the vessel.

1.4 Machinery-Propulsion, Steering and Ship Service

1.4.1 Inspection during construction of machinery is not required except for boilers and air receivers which shall be inspected in accordance with the Marine Machinery Regulations.

1.4.2 Required installation inspection of machinery components:

- (a) identification of major components from manufacturers documents, as applicable;
- (b) verification that the following items are in operational condition and correct adjustment:
 - (i) propulsion, steering and essential ship service machinery,
 - (ii) machinery controls, monitors and alarms, and
 - (iii) systems safety, relief, vent and exhaust devices, and
- (c) verification and recording of screw shaft clearance in stern bearing;
- (d) inspection of guards and drip trays for correct location and installation;
- (e) witnessing of hydrostatic pressure tests of boilers and air receivers in accordance with rules or codes;
- (f) subject to paragraph (g) witnessing of hydrostatic test of all non-structural fuel tanks and non-structural tanks for other liquids in excess of 200 litres to a pressure head of water equal to the maximum head to which the tanks can be subjected in service but not less than 0.9 m above the crown of the tanks;

- (g) for non-structural tanks designed to operate at a pressure head in excess of 2 m and for which detailed plans are required to be submitted, the hydrostatic test pressure head shall not be less than the design pressure head plus 1 m;
- (h) verification that safety and operating instructions are posted in accordance with these Standards;
- (j) witnessing of dock trials of all systems up to full power and under normal working conditions for a suitable endurance period of not less than 1 hour, taking into account the size and complexity of the various machinery systems; and
- (k) monitoring and recording propulsion and manoeuvring performance during sea trials to ensure conformity with these Standards.

1.5 Electrical Systems

1.5.1 Electrical Systems Less than 55 Volts

- (a) inspection in respect of correct installation of equipment and systems in accordance with the approved drawings; and
- (b) inspection in respect of correct function of the installation.

1.5.2 Electrical Systems of 55 Volts and Over

- (a) inspection in accordance with Ship Safety Electrical Standards TP 127.

1.6 Fire Protection Equipment

1.6.1 Construction inspection not required.

1.6.2 Installation inspection for all fire protection equipment:

- (a) identification of equipment from manufacturer's documents, as applicable;
- (b) verification that all equipment is in operational condition;

- (c) inspection of securing and release devices in respect of correct installation;
- (d) verification of validity of equipment testing and servicing dates; and
- (e) verification that safety and operating instructions are posted.

1.7 Lifesaving

1.7.1 Construction inspection of lifesaving appliances shall be in accordance with the Life Saving Equipment Regulations.

1.7.2 Installation inspection for all lifesaving appliances:

- (a) identification of all appliances from manufacturers documents as applicable;
- (b) verification that all appliances are in an operational condition and in accordance with design specifications;
- (c) inspection of securing and release devices in respect of correct installation;
- (d) verification of equipment testing and validity of certificates; and
- (e) verification that safety and operating instructions are posted.

1.8 Navigation and Radiocommunications

1.8.1 Construction inspection not required.

1.8.2 Installation inspection:

- (a) verify that all navigation and radiocommunications appliances and equipment, including navigation lights, are in accordance with the Navigating Appliances and Equipment Regulations, the Collision Regulations, the Charts and Publications Regulations and the Ship Station Radio and Ship Station Technical Regulations; and
- (b) verify that necessary operating instructions and manuals are provided.

1.9 Transferred Vessels

1.9.1 Vessels transferred from registry elsewhere than in Canada to Canadian registry, and the vessels entering passenger service for the first time are deemed to be "new vessels" and are subject to inspection as follows:

- (a) they shall be completely inspected out of water and checked against plans showing the vessel's construction; provided that where plans are not obtainable the matter shall be referred to the Regional Director. Full particulars of the vessel's stability, including a copy of the hydrostatic curves, shall be submitted, but if this information is not available an inclining experiment shall be conducted in the presence of and to the satisfaction of the inspector and the owners shall also provide a set of hydrostatic curves;
- (b) after checking the vessel against the plans, the inspector shall forward to the Regional Director a report, with a copy of the plans, stating whether or not the vessel is constructed in accordance with the plans; if any difference exists between the vessel and the plans the condition of the vessel and any defects that may be discovered shall be noted;
- (c) the suitability of the vessel for the proposed service shall also be considered by the inspector, who will state his views thereon in his report;
- (d) after examination of the plans and the report the Regional Director shall determine the suitability of the vessel for the proposed service and shall issue instructions regarding any alterations or renewals it may consider necessary before the vessel is accepted;
- (e) after approval of the plans, the inspection shall proceed in the same manner as for a new vessel and a complete inspection of the vessel, including machinery, electrical systems, hulls, stability, navigation and communication appliances and equipment, lifesaving equipment and fire safety, shall be made as prescribed in this schedule;

- (f) for the inspections required by paragraphs (a), (b), (c), (d) and (e), the hull shall be cleaned inside and outside, all compartments being opened for access, and facilities provided by the owner so that complete inspection may be made; the vessel shall not be floated until inspection of all underwater portions has been completed.

SCHEDULE II

1. Annual Inspection

1.1 Hulls

- 1.1.1 The vessel shall be inspected externally and internally as far as may be possible without extensive opening up, and tests, if found necessary, shall be conducted to ensure that conditions are satisfactory. Where a definite standard of subdivision has been approved, inspection shall be made to ensure that the watertight compartments and all arrangements and details connected with the subdivision are in order and that no changes affecting them have been made.
- 1.1.2 Alterations in approved subdivision arrangements and details, including watertight and non-watertight longitudinal bulkheads if fitted, appropriation of space below the bulkhead deck, and other alterations that have been made since the previous inspection shall be reported in detail; special attention shall be given to parts in deterioration from such causes as chafing or lying on the ground.
- 1.1.3 All sidescuttles shall be examined, and where they are required to have special locking arrangements, the locking arrangements shall be tested and the inspector shall take such steps as are necessary to ensure that proper instructions with regard to these arrangements are posted in the wheelhouse.
- 1.1.4 Scupper and sanitary discharge valves and other appliances intended to prevent the admission of water into the hull, except valves and cocks connected with the machinery, shall be inspected.
- 1.1.5 All watertight doors and other means for closing openings in the watertight subdivision shall be inspected and their condition and efficiency ascertained, the doors shall be tried by hand, and also by power, if operated by power.
- 1.1.6 Warning signals, hand gear indicators showing when watertight doors are closed, and indicators at central closing stations shall be inspected and tested.
- 1.1.7 Hinged watertight doors shall be inspected and operated to ensure that lever-operated clips are in good order and that all joints are watertight.

1.1.8 When a watertight door is removed for repairs it shall be hose-tested upon replacement.

1.1.9 Structural fire protection arrangements shall be inspected.

1.1.10 Hatchways with their closing and securing appliances, ventilators and other deck openings, casings and superstructure bulkheads with their closing appliances shall be inspected.

1.1.11 Rudder, main and auxiliary steering gear shall be inspected.

1.1.12 The means for auxiliary steering shall be assembled, connected and tested.

1.1.13 Masts, spars and rigging shall be to the satisfaction of the inspector.

1.1.14 The anchors, cables and associated equipment shall be inspected.

1.2 Stability and Associated Seaworthiness

1.2.1 Verify that approved stability data is held on board of the vessel.

1.3 Machinery-Propulsion, Steering and Ship Service

1.3.1 All machinery spaces shall be visually inspected for general condition of the space and all fitted equipment.

1.3.2 Safety devices and alarms shall be tested and adjusted if necessary to the satisfaction of the inspector.

1.3.3 Remote controls for machinery operation, shall be tested and adjusted if necessary to the satisfaction of the inspector.

1.3.4 Emergency steering operation shall be tested to the satisfaction of the inspector.

1.3.5 Any emergency exit from the machinery space, shall be proved free, accessible and clearly indicated.

1.3.6 Running trials shall be held on the main engine, steering gear, essential pumps and on any other part that may be requested by the inspector. Where any part is not satisfactory, the inspector may require that part to be opened up for inspection and overhaul.

1.4 Electrical Systems

1.4.1 Electrical Systems less than 55 volts

- (a) general inspection of electrical equipment and systems;
- (b) verification of current rating for each protective device;
- (c) verification of current rating for each distribution cable;
- (d) verification of each generator or alternator and battery; and
- (e) inspection in respect of correct function of the installation.

1.4.2 Electrical Systems of 55 volts and over

- (a) inspection in accordance with Ship Safety Electrical Standard TP 127.

1.5 Fire Protection Equipment

1.5.1 All fixed and portable fire extinguishing equipment shall be serviced at intervals not exceeding 12 months.

1.5.2 Inspection of all fire protection equipment shall include:

- (a) verification that all equipment is in operational condition;
- (b) verification that safety and operating instructions are posted; and
- (c) verification of validity of all equipment testing dates.

1.6 Lifesaving

1.6.1 Inspection of all lifesaving appliances shall include:

- (a) verification that all appliances are in operational condition;
- (b) verification that safety and operating instructions are posted; and
- (c) verification of validity of all equipment testing or life expectancy dates.

1.6.2 Every inflatable liferaft and inflatable platform shall be serviced at intervals not exceeding 12 months at an accredited service depot in accordance with the Life Saving Equipment Regulations but liferafts which are less than 10 years old may be serviced at intervals as determined by the Regional Director.

1.6.3 All inflatable or inflated emergency boats shall

- (a) be repaired and maintained in accordance with the manufacturer's instructions; and
- (b) have permanent repairs effected only at an approved servicing station, except that emergency repairs may be carried out onboard the vessel.

1.7 Navigation and Radiocommunications

1.7.1 Verify that all navigation and radiocommunications appliances and equipment, including navigation lights, are in operational condition and correctly adjusted.

1.7.2 Verify that necessary operating instructions are provided.

SCHEDULE III

1. Quadrennial or Quinquennial Inspection

1.1 Hulls

- 1.1.1 All hull construction material shall be exposed and cleaned to the extent required by the inspector for a proper examination, and where signs of wastage are evident in any part of a vessel's structure, drilling or non-destructive examination may be required, and if any part is found to be defective, the defect shall be replaced by material equal in scantling and quality to that of the original construction.
- 1.1.2 All watertight bulkheads, decks, and other subdivision arrangements shall be inspected to ascertain their condition, and if their watertightness has been impaired, any part found deficient shall be restored to its original condition.
- 1.1.3 Where a definite standard of subdivision has been approved, the watertight compartments and all arrangements and details connected with the subdivision shall be checked.
- 1.1.4 All sidescuttles shall be examined, and where they are required to have special locking arrangements, the locking arrangements shall be tested and the inspector shall take such steps as are necessary to ensure that proper instructions with regard to these arrangements are posted in the wheelhouse.
- 1.1.5 All scupper and sanitary discharge valves, excluding those connected to the machinery shall be opened up.
- 1.1.6 All watertight doors and other means for closing openings in the watertight subdivision shall be inspected and their condition and efficiency ascertained, the doors shall be tried by hand, and also by power, if operated by power.
- 1.1.7 Warning signals, hand gear indicators showing when doors are closed, and indicators at central closing stations shall be inspected and tested.
- 1.1.8 Hinged watertight doors shall be inspected and operated to ensure that lever-operated clips are in good order and that all joints are watertight.

- 1.1.9 When a watertight door is removed for repairs it shall be hose-tested upon replacement.
- 1.1.10 Structural fire protection arrangements shall be inspected.
- 1.1.11 Hatchways with their closing and securing appliances, ventilators and other deck openings, casings and superstructure bulkheads with their closing appliances shall be inspected.
- 1.1.12 The rudder, its means of support, and the pintles and gudgeons, shall be inspected, and, if considered necessary by the inspector for proper examination, the rudder shall be lifted.
- 1.1.13 All steering gear components shall be inspected and tested.
- 1.1.14 The means for auxiliary steering shall be assembled, connected and tested.
- 1.1.15 Masts, spars and rigging shall be to the satisfaction of the inspector.
- 1.1.16 Anchors and associated equipment shall be inspected; chain cables shall be ranged and inspected; where renewal of anchors or cables is required, a certificate shall be produced to show that the replacement has been tested; the interior of the chain locker shall be cleaned and the compartment inspected.

1.2 Stability and associated seaworthiness

- 1.2.1 Verify that approved stability data is held on board the vessel.

1.3 Machinery-Propulsion, Steering and Ship Service

- 1.3.1 Except as prescribed in subsections 1.3.3 to 1.3.6, machinery need not be opened up for internal inspection unless there is evidence of damage, improper operation or deteriorated condition.
- 1.3.2 Required periodic inspection of machinery components:
 - (a) verification that the following items are in operational condition and correct adjustment:
 - (i) propulsion, steering and essential ship service machinery,

- (ii) machinery controls, monitors and alarms, and
 - (iii) systems safety, relief, vent and exhaust devices;
- (b) inspection of machinery securing arrangements and locations where fluid leakage, material overheating or wastage may occur;
- (c) confirmation that safety and operating instructions are correctly posted.

1.3.3

Propeller shafts, stern bearings, glands and propellers:

- (a) the propeller shaft wear down in the stern bearing shall be verified and recorded;
- (b) subject to paragraphs (c) and (d) propeller shafts shall be fully withdrawn and propellers removed for inspection;
- (c) for propeller shafts which are
- (i) of corrosion resistant metal,
 - (ii) oil lubricated,
 - (iii) fitted with corrosion resistant liners and coating for protection against exposure to water in the stern tube, or
 - (iv) operated solely in fresh water,

such shafts need only be partially withdrawn at alternate inspection periods to expose the stern bearing contact area and provided the components are in satisfactory condition no further withdrawal will be necessary;

- (d) for propeller shafts with a flange or a keyless taper for propeller attachment, the propeller need not be removed provided the shaft area in way of the flange or top of the taper is specially examined, if necessary by an approved crack detection method, and found in satisfactory condition; and
- (e) controllable pitch propellers shall be inspected in accordance with the Marine Machinery Regulations.

1.3.4 Steam boilers having a working pressure in excess of 103 kPa and hot water boilers having working conditions in excess of 210 kPa pressure and 98°C temperature shall be inspected in accordance with Marine Machinery Regulations.

1.3.5 Air receivers shall be opened up for internal inspection except where

- (a) the working pressure does not exceed 103 kPa,
- (b) the internal diameter does not exceed 150mm, or
- (c) the volume does not exceed 45 litres; or 150 litres where the working pressure does not exceed 700 kPa, and
- (d) if due to air receiver construction features, an adequate internal inspection cannot be carried out, a hydrostatic pressure test of 1.25 times the working pressure shall be carried out.

1.3.6 Shipside sea inlet valves, strainers, overboard discharge valves and valves isolating machinery from internal sea bays and keel coolers, shall be opened up for inspection of internal parts.

1.4 Fire Protection Equipment

1.4.1 Inspection of all fire protection equipment shall include:

- (a) verification that all equipment is in operational condition;
- (b) verification that safety and operating instructions are posted; and
- (c) verification of validity of all equipment testing dates.

1.5 Lifesaving

1.5.1 Inspection of all lifesaving appliances shall include:

- (a) verification that all appliances are in operational condition;
- (b) verification that safety and operating instructions are posted; and
- (c) verification of validity of all equipment testing or life expectancy dates.

1.6 Navigation and Radiocommunications

1.6.1 Verify that all navigation and radiocommunications appliances and equipment, including navigation lights, are in operational condition and correctly adjusted.

1.6.2 Verify that necessary operating instructions and manuals are provided.

SCHEDULE IV

Table of Capacities & Pipe Diameter

LENGTH OF THE VESSEL (L)	NUMBER OF PUMPS	TYPE OF PUMP	CAPACITY OF EACH PUMP (l/sec)	DIAMETER OF PIPE (minimum)
Not Exceeding 15m	1	Hand (H) or Power Driven (P)	1.14+	25mm
Exceeding 15m and not exceeding 20m	2	1 - P 1 - P or H (See Note 1)	1.14 1.14	38mm
Exceeding 20m and not exceeding 24m	2	1 - P 1 - P or H (See Notes 1, 2 & 3)	2.28 2.28	38mm
<p>NOTE:</p> <ol style="list-style-type: none"> 1. Where two power driven pumps are provided, they shall not be driven by the same engine. 2. Two or more pumps of not less than 1.14 l/sec capacity each, may be used in lieu of one pump of 2.28 l/sec. 3. The pumps mentioned in Note 2 above may be driven by one engine but not the engine used to drive the mandatory power driven pump. 				

