

AMENDMENTS TO THE INTERNATIONAL CONVENTION
FOR THE SAFETY OF LIFE AT SEA, 1974

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CHAPTER II-1. CONSTRUCTION – SUBDIVISION AND STABILITY, MACHINERY AND ELECTRICAL INSTALLATIONS

The existing text of chapter II-1 is replaced by the following:

PART A. GENERAL

Regulation 1. APPLICATION

1.1. Unless expressly provided otherwise, this chapter shall apply to ships the keels of which are laid or which are at a similar stage of construction on or after 1 September 1984.

1.2. For the purpose of this Chapter, the term “a similar stage of construction” means the stage at which:

1. Construction identifiable with a specific ship begins; and
2. Assembly of that ship has commenced comprising at least 50 tonnes or one per cent of the estimated mass of all structural material, whichever is less.

1.3. For the purpose of this Chapter:

1. The expression “ships constructed” means “ships the keels of which are laid or which are at a similar stage of construction”;

2. The expression “all ships” means “ships constructed before, on or after 1 September 1984”;

3. A cargo ship, whenever built, which is converted to a passenger ship shall be treated as a passenger ship constructed on the date on which such a conversion commences.

2. Unless expressly provided otherwise:
 1. For ships constructed before 1 September 1984, the Administration shall ensure that subject to the provisions of paragraph 2.2 the requirements which are applicable under chapter 11-1 of the International Convention for the Safety of Life at Sea, 1974* to new or existing ships as defined in that chapter are complied with;
 2. For tankers constructed before 1 September 1984, the Administration shall ensure that the requirements which are applicable [under] chapter 11-1 of the annex to the Protocol of 1978¹ relating to the International Convention for the Safety of Life at Sea, 1974, as amended in 1981 to new or existing ships as defined in that chapter are complied with.
 3. All ships which undergo repairs, alterations, modifications and outfitting related thereto shall continue to comply with at least the requirements previously applicable to these ships. Such ships if constructed before 1 September 1984 shall, as a rule, comply with the requirements for ships constructed on or after that date to at least the same extent as they did before undergoing such repairs, alterations, modifications or outfitting. Repairs, alterations and modifications of a major character and outfitting related thereto shall meet the requirements for ships constructed on or after 1 September 1984 in so far as the Administration deems reasonable and practicable.
 4. The Administration of a State may, if it considers that the sheltered nature and conditions of the voyage are such as to render the application of any specific requirements of this chapter unreasonable or unnecessary, exempt from those requirements individual ships or classes of ships entitled to fly the flag of that State which, in the course of their voyage, do not proceed more than 20 miles from the nearest land.
 5. Any passenger ship which is permitted under regulation III/27(c) to carry a number of persons in excess of the lifeboat capacity provided, shall comply with the special standards of subdivision set out in regulation 6.5, and the associated special provisions regarding permeability in Regulation 5.4, unless the Administration is satisfied that, having regard to the nature and conditions of the voyage, compliance with the other provisions of the Regulations of this chapter and chapter II-2 is sufficient.
 6. In the case of passenger ships which are employed in special trades for the carriage of large numbers of special trade passengers, such as the pilgrim trade, the Administration of the State whose flag such ships are entitled to fly, if satisfied that it is impracticable to enforce compliance with the requirements of this Chapter, may exempt such ships from those requirements, provided that they comply fully with the provisions of:
 1. The Rules annexed to the Special Trade Passenger Ships Agreement, 1971; and
 2. The Rules annexed to the Protocol of Space Requirements for Special Trade Passenger Ships, 1973.

Regulation 2. DEFINITIONS

For the purpose of this chapter, unless expressly provided otherwise:

- 1.1. "Subdivision load line" is a water-line used in determining the subdivision of the ship.
- 1.2. "Deepest subdivision load line" is the water-line which corresponds to the greatest draught permitted by the subdivision requirements which are applicable.
2. "Length of the ship" is the length measured between perpendiculars taken at the extremities of the deepest subdivision load line.

* The text as adopted by the International Conference on Safety of Life at Sea, 1974.

3. "Breadth of the ship" is the extreme width from outside of frame to outside of frame at or below the deepest subdivision load line.
4. "Draught" is the vertical distance from the moulded base line amidships to the subdivision load line in question.
5. "Bulkhead deck" is the uppermost deck up to which the transverse watertight bulkheads are carried.
6. "Margin line" is a line drawn at least 76 mm below the upper surface of the bulkhead deck at side.
7. "Permeability of a space" is the percentage of that space which can be occupied by water. The volume of a space which extends above the margin line shall be measured only to the height of that line.
8. "Machinery space" is to be taken as extending from the moulded base line to the margin line and between the extreme main transverse watertight bulkheads, bounding the spaces containing the main and auxiliary propulsion machinery, boilers serving the needs of propulsion, and all permanent coal bunkers. In the case of unusual arrangements, the Administration may define the limits of the machinery spaces.
9. "Passenger spaces" are those spaces which are provided for the accommodation and use of passengers, excluding baggage, store, provision and mail rooms. For the purposes of regulations 5 and 6, spaces provided below the margin line for the accommodation and use of the crew shall be regarded as passenger spaces.
10. In all cases volumes and areas shall be calculated to moulded lines.
11. "Weathertight" means that in any sea conditions water will not penetrate into the ship.

Regulation 3. DEFINITIONS RELATING TO PARTS C, D AND E

For the purpose of parts C, D and E, unless expressly provided otherwise:

1. "Steering gear control system" is the equipment by which orders are transmitted from the navigating bridge to the steering gear power units. Steering gear control systems comprise transmitters, receivers, hydraulic control pumps and their associated motors, motor controllers, piping and cables.
2. "Main steering gear" is the machinery, rudder actuators, steering gear power units, if any, and ancillary equipment and the means of applying torque to the rudder stock (e.g., tiller or quadrant) necessary for effecting movement of the rudder for the purpose of steering the ship under normal service conditions.
3. "Steering gear power unit" is:
 1. In the case of electric steering gear, an electric motor and its associated electrical equipment;
 2. In the case of electrohydraulic steering gear, an electric motor and its associated electrical equipment and connected pump;
 3. In the case of other hydraulic steering gear, a driving engine and connected pump.
4. "Auxiliary steering gear" is the equipment other than any part of the main steering gear necessary to steer the ship in the event of failure of the main steering gear but not including the tiller, quadrant or components serving the same purpose.
5. "Normal operational and habitable condition" is a condition under which the ship as a whole, the machinery, services, means and aids ensuring propulsion, ability to steer, safe navigation, fire and flooding safety, internal and external communications and signals, means of escape, and emergency boat winches, as well as the designed comfortable conditions of habitability are in working order and functioning normally.

6. "Emergency condition" is a condition under which any services needed for normal operational and habitable conditions are not in working order due to failure of the main source of electrical power.

7. "Main source of electrical power" is a source intended to supply electrical power to the main switchboard for distribution to all services necessary for maintaining the ship in normal operational and habitable conditions.

8. "Dead ship condition" is the condition under which the main propulsion plant, boilers and auxiliaries are not in operation due to the absence of power.

9. "Main generating station" is the space in which the main source of electrical power is situated.

10. "Main switchboard" is a switchboard which is directly supplied by the main source of electrical power and is intended to distribute electrical energy to the ship's services.

11. "Emergency switchboard" is a switchboard which in the event of failure of the main electrical power supply system is directly supplied by the emergency source of electrical power or the transitional source of emergency power and is intended to distribute electrical energy to the emergency services.

12. "Emergency source of electrical power" is a source of electrical power, intended to supply the emergency switchboard in the event of failure of the supply from the main source of electrical power.

13. "Power actuating system" is the hydraulic equipment provided for supplying power to turn the rudder stock, comprising a steering gear power unit or units, together with the associated pipes and fittings, and a rudder actuator. The power actuating systems may share common mechanical components, i.e., tiller, quadrant and rudder stock, or components serving the same purpose.

14. "Maximum ahead service speed" is the greatest speed which the ship is designed to maintain in service at sea at the deepest sea-going draught.

15. "Maximum astern speed" is the speed which it is estimated the ship can attain at the designed maximum astern power at the deepest sea-going draught.

16. "Machinery spaces" are all machinery spaces of category A and all other spaces containing propelling machinery, boilers, oil fuel units, steam and internal combustion engines, generators and major electrical machinery, oil filling stations, refrigerating, stabilizing, ventilation and air conditioning machinery, and similar spaces, and trunks to such spaces.

17. "Machinery spaces of category A" are those spaces and trunks to such spaces which contain:

1. Internal combustion machinery used for main propulsion; or
2. Internal combustion machinery used for purposes other than main propulsion where such machinery has in the aggregate a total power output of not less than 375 kW; or
3. Any oil-fired boiler or oil fuel unit.

18. "Control stations" are those spaces in which the ship's radio or main navigating equipment or the emergency source of power is located or where the fire recording or [fire] control equipment is centralized.

19. "Chemical tanker" is a cargo ship constructed or adapted and used for the carriage in bulk of any liquid product listed in the summary of minimum requirements of the Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk to be adopted by the Maritime Safety Committee under the authority of the Assembly of the Organization conferred by resolution A.490(XII) hereinafter referred to as "Bulk Chemical Code", as may be amended by the Organization, or any liquid substance listed or provisionally assessed as

category A, B or C in appendix II to annex II of the International Convention for the Prevention of Pollution from Ships¹ in force.

20. "Gas carrier" is a cargo ship constructed or adapted and used for the carriage in bulk of any liquefied gas or other substance listed in chapter XIX of the Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk adopted by the Assembly of the Organization by resolution A.328(IX)², hereinafter referred to as "Gas Carrier Code" as has been or may be amended by the Organization.

21. "Deadweight" is the difference in tonnes between the displacement of a ship in water of a specific gravity of 1.025 at the load water-line corresponding to the assigned summer freeboard and the lightweight of the ship.

22. "Lightweight" is the displacement of a ship in tonnes without cargo, fuel, lubricating oil, ballast water, fresh water and feedwater in tanks, consumable stores, and passengers and crew and their effects.

PART B. SUBDIVISION AND STABILITY*

(Part B applies to passenger ships and to cargo ships, as indicated in the regulations)

Regulation 4. FLOODABLE LENGTH IN PASSENGER SHIPS

1. The floodable length at any point of the length of a ship shall be determined by a method of calculation which takes into consideration the form, draught [and] other characteristics of the ship in question.

2. In a ship with a continuous bulkhead deck, the floodable length at a given point is the maximum portion of the length of the ship, having its centre at the point in question, which can be flooded under the definite assumptions set forth in regulation 5 without the ship being submerged beyond the margin line.

3.1. In the case of a ship not having a continuous bulkhead deck, the floodable length at any point may be determined to an assumed continuous margin line which at no point is less than 76 mm below the top of the deck (at side) to which the bulkheads concerned and the shell are carried watertight.

3.2. Where a portion of an assumed margin line is appreciably below the deck to which bulkheads are carried, the Administration may permit a limited relaxation in the watertightness of those portions of the bulkheads which are above the margin line and immediately under the higher deck.

Regulation 5. PERMEABILITY IN PASSENGER SHIPS

1.1. The definite assumptions referred to in regulation 4 relate to the permeabilities of the spaces below the margin line.

1.2. In determining the floodable length, a uniform average permeability shall be used throughout the whole length of each of the following portions of the ship below the margin line:

1. The machinery space as defined in regulation 2;
2. The portion forward of the machinery space; and
3. The portion abaft the machinery space.

* Instead of the requirements in this part, the Regulations on Subdivision and Stability of Passenger Ships as an Equivalent to part B of chapter II of the International Convention for the Safety of Life at Sea, 1960, adopted by the Organization by resolution A.265(VIII), may be used, if applied in their entirety.

2.1. The uniform average permeability throughout the machinery space shall be determined from the formula:

$$85 + 10\left(\frac{a - c}{v}\right)$$

where:

- a = the volume of the passenger spaces, as defined in regulation 2, which are situated below the margin line within the limits of the machinery space;
- c = the volume of between deck spaces below the margin line within the limits of the machinery space which are appropriated to cargo, coal or stores;
- v = the whole volume of the machinery space below the margin line.

2.2. Where it is shown to the satisfaction of the Administration that the average permeability as determined by detailed calculation is less than that given by the formula, the detailed calculated value may be used. For the purpose of such calculation, the permeability of passenger spaces, as defined in regulation 2, shall be taken as 95, that of all cargo, coal and store spaces as 60, and that of double bottom, oil fuel and other tanks at such value as may be approved in each case.

3. Except as provided in paragraph 4, the uniform average permeability throughout the portion of the ship forward of or abaft the machinery space shall be determined from the formula:

$$63 + 35 \frac{a}{v}$$

where:

- a = the volume of the passenger spaces, as defined in regulation 2, which are situated below the margin line, forward of or abaft the machinery space; and
- v = the whole volume of the portion of the ship below the margin line forward of or abaft the machinery space.

4.1. In the case of a ship which is permitted under regulation III/27(c) to carry a number of persons on board in excess of the lifeboat capacity provided, and is required under regulation 1.5 to comply with special provisions, the uniform average permeability throughout the portion of the ship forward of or abaft the machinery space shall be determined from the formula:

$$95 - 35 \frac{b}{v}$$

where:

- b = the volume of the spaces below the margin line and above the tops of floors, inner bottom, or peak tanks, as the case may be, which are appropriated to and used as cargo spaces, coal or oil fuel bunkers, store-rooms, baggage and mail rooms, chain lockers and fresh water tanks, forward of or abaft the machinery space; and
- v = the whole volume of the portion of the ship below the margin line forward of or abaft the machinery space.

4.2. In the case of ships engaged on services where the cargo holds are not generally occupied by any substantial quantities of cargo, no part of the cargo spaces is to be included in calculating "b".

5. In the case of unusual arrangements the Administration may allow, or require, a detailed calculation of average permeability for the portions forward of or abaft the machinery space. For the purpose of such calculation, the permeability of passenger spaces as defined in regulation 2 shall be taken as 95, that of spaces containing machinery as 85, that of all cargo,

coal and store spaces as 60, and that of double bottom, oil fuel and other tanks at such value as may be approved in each case.

6. Where a between deck compartment between two watertight transverse bulkheads contains any passenger or crew space, the whole of that compartment, less any space completely enclosed within permanent steel bulkheads and appropriated to other purposes, shall be regarded as passenger space. Where, however, the passenger or crew space in question is completely enclosed within permanent steel bulkheads, only the space so enclosed need be considered as passenger space.

Regulation 6. PERMISSIBLE LENGTH OF COMPARTMENTS IN PASSENGER SHIPS

1. Ships shall be as efficiently subdivided as is possible having regard to the nature of the service for which they are intended. The degree of subdivision shall vary with the length of the ship and with the service, in such manner that the highest degree of subdivision corresponds with the ships of greatest length, primarily engaged in the carriage of passengers.

2. Factor of subdivision

2.1. The maximum permissible length of a compartment having its centre at any point in the ship's length is obtained from the floodable length by multiplying the latter by an appropriate factor called the factor of subdivision.

2.2. The factor of subdivision shall depend on the length of the ship, and for a given length shall vary according to the nature of the [service] for which the ship is intended. It shall decrease in a regular and continuous manner:

1. As the length of the ship increases, and
2. From a factor A, applicable to ships primarily engaged in the carriage of cargo, to a factor B, applicable to ships primarily engaged in the carriage of passengers.

2.3. The variations of the factors A and B shall be expressed by the following formulae (1) and (2) where L is the length of the ship as defined in regulation 2:

$$A = \frac{58.2}{L - 60} + .18 \text{ (L = 131 m and upwards)} \dots\dots\dots (1)$$

$$B = \frac{30.3}{L - 42} + .18 \text{ (L = 79 m and upwards)} \dots\dots\dots (2)$$

3. Criterion of service

3.1. For a ship of given length the appropriate factor of subdivision shall be determined by the criterion of service numeral (hereinafter called the criterion numeral) as given by the following formulae (3) and (4) where:

C_s = the criterion numeral;

L = the length of the ship (metres), as defined in regulation 2;

M = the volume of the machinery space (cubic metres), as defined in regulation 2; with the addition thereto of the volume of any permanent oil fuel bunkers which may be situated above the inner bottom and forward or abaft the machinery space;

P = the whole volume of the passenger spaces below the margin line (cubic metres), as defined in regulation 2;

V = the whole volume of the ship below the margin line (cubic metres);

P₁ = KN where:

N = the number of passengers for which the ship is to be certified, and

K = 0.056L

3.2. Where the value of KN is greater than the sum of P and the whole volume of the actual passenger spaces above the margin line, the figure to be taken as P_1 is that sum or two-thirds KN, whichever is the greater.

When P_1 is greater than P:

$$C_s = 72 \frac{M + 2P_1}{V + P_1 - P} \dots\dots\dots (3)$$

and in other cases:

$$C_s = 72 \frac{M + 2P}{V} \dots\dots\dots (4)$$

3.3. For ships not having a continuous bulkhead deck the volumes are to be taken up to the actual margin lines used in determining the floodable lengths.

4. *Rules for subdivision of ships other than those covered by paragraph 5*

4.1. The subdivision abaft the forepeak of ships of 131 m in length and upwards having a criterion numeral of 23 or less shall be governed by the factor A given by formula (1); of those having a criterion numeral of 123 or more by the factor B given by formula (2); and of those having a criterion numeral between 23 and 123 by the factor F obtained by linear interpolation between the factors A and B, using the formula:

$$F = A - \frac{(A - B)(C_s - 23)}{100} \dots\dots\dots (5)$$

Nevertheless, where the criterion numeral is equal to 45 or more and simultaneously the computed factor of subdivision as given by formula (5) is .65 or less, but more than .50, the subdivision abaft the forepeak shall be governed by the factor .50.

4.2. Where the factor F is less than .40 and it is shown to the satisfaction of the Administration to be impracticable to comply with the factor F in a machinery compartment of the ship, the subdivision of such compartment may be governed by an increased factor, which, however, shall not exceed .40.

4.3. The subdivision abaft the forepeak of ships of less than 131 m but not less than 79 m in length having a criterion numeral equal to S, where:

$$S = \frac{3,574 - 25L}{13}$$

shall be governed by the factor unity; of those having a criterion numeral of 123 or more by the factor B given by the formula (2); of those having a criterion numeral between S and 123 by the factor F obtained by linear interpolation between unity and the factor B using the formula:

$$F = 1 - \frac{(1 - B)(C_s - S)}{123 - S} \dots\dots\dots (6)$$

4.4. The subdivision abaft the forepeak of ships of less than 131 m but not less than 79 m in length and having a criterion numeral less than S, and of ships of less than 79 m in length shall be governed by the factor unity, unless, in either case, it is shown to the satisfaction of the Administration to be impracticable to comply with this factor in any part of the ship, in which case the Administration may allow such relaxation as may appear to be justified, having regard to all the circumstances.

4.5. The provisions of paragraph 4.4 shall apply also to ships of whatever length, which are to be certified to carry a number of passengers exceeding 12 but not exceeding:

$$\frac{L_2}{650}, \text{ or } 50, \text{ whichever is the less.}$$

5. *Special standards of subdivision for ships which are permitted under regulation III/27(c) to carry a number of persons on board in excess of the lifeboat capacity provided and are required under regulation 1.5 to comply with special provisions*

5.1.1. In the case of ships primarily engaged in the carriage of passengers, the subdivision abaft the forepeak shall be governed by a factor of .50 or by the factor determined according to paragraphs 3 and 4, if less than .50.

5.1.2. In the case of such ships of less than 91.5 m in length, if the Administration is satisfied that compliance with such factor would be impracticable in a compartment, it may allow the length of that compartment to be governed by a higher factor provided the factor used is the lowest that is practicable and reasonable in the circumstances.

5.2. Where, in the case of any ship whether of less than 91.5 m or not, the necessity of carrying appreciable quantities of cargo makes it impracticable to require the subdivision abaft the forepeak to be governed by a factor not exceeding .50, the standard of subdivision to be applied shall be determined in accordance with the following sub-paragraphs 1 to 5, subject to the condition that where the Administration is satisfied that insistence on strict compliance in any respect would be unreasonable, it may allow such alternative arrangement of the watertight bulkheads as appears to be justified on merits and will not diminish the general effectiveness of the subdivision.

1. The provisions of paragraph 3 relating to the criterion numeral shall apply with the exception that in calculating the value of P_1 for berthed passengers K is to have the value defined in paragraph 3, or 3.5 m^3 , whichever is the greater, and for unberthed passengers K is to have the value 3.5 m^3 .
2. The factor B in paragraph 2 shall be replaced by the factor BB determined by the following formula:

$$BB = \frac{17.6}{L - 33} + .20 \quad (L = 55 \text{ and upwards})$$

3. The subdivision abaft the forepeak of ships of 131 m in length and upwards having a criterion numeral of 23 or less shall be governed by the factor A given by formula (1) in paragraph 2.3; of those having a criterion numeral of 123 or more by the factor BB given by the formula in paragraph 5.2.2; and of those having a criterion numeral between 23 and 123 by the factor F obtained by linear interpolation between the factors A and BB , using the formula:

$$F = A - \frac{(A - BB)(C_s - 23)}{100}$$

except that if the factor F so obtained is less than .50 the factor to be used shall be either .50 or the factor calculated according to the provisions of paragraph 4.1, whichever is the smaller.

4. The subdivision abaft the forepeak of ships of less than 131 m but not less than 55 m in length having a criterion numeral equal to S_1 where:

$$S_1 = \frac{3,712 - 25L}{19}$$

shall be governed by the factor unity; of those having a criterion numeral of 123 or more by the factor BB given by the formula in paragraph 5.2.2; of those having a criterion numeral between S_1 and 123 by the factor F obtained by linear interpolation between unity and the factor BB using the formula:

$$F = 1 - \frac{(1 - BB)(C_s - S_1)}{123 - S_1}$$

except that in either of the two latter cases if the factor so obtained is less than .50 the subdivision may be governed by a factor not exceeding .50.

5. The subdivision abaft the forepeak of ships of less than 131 m but not less than 55 m in length and having a criterion numeral less than S_1 and of ships of less than 55 m in length shall be governed by the factor unity, unless it is shown to the satisfaction of the Administration to be impracticable to comply with this factor in particular compartments, in which event the Administration may allow such relaxations in respect of those compartments as appear to be justified, having regard to all the circumstances, provided that the aftermost compartment and as many as possible of the forward compartments (between the forepeak and the after end of the machinery space) shall be kept within the floodable length.

Regulation 7. SPECIAL REQUIREMENTS CONCERNING PASSENGER SHIP SUBDIVISION

1. Where in a portion or portions of a ship the watertight bulkheads are carried to a higher deck than in the remainder of the ship and it is desired to take advantage of this higher extension of the bulkheads in calculating the floodable length, separate margin lines may be used for each such portion of the ship provided that:

1. The sides of the ship are extended throughout the ship's length to the deck corresponding to the upper margin line and all openings in the shell plating below this deck throughout the length of the ship are treated as being below a margin line, for the purposes of regulation 17; and
2. The two compartments adjacent to the "step" in the bulkhead deck are each within the permissible length corresponding to their respective margin lines, and, in addition, their combined length does not exceed twice the permissible length based on the lower margin line.

2.1. A compartment may exceed the permissible length determined by the rules of regulation 6 provided the combined length of each pair of adjacent compartments to which the compartment in question is common does not exceed either the floodable length or twice the permissible length, whichever is the less.

2.2. If one of the two adjacent compartments is situated inside the machinery space, and the second is situated outside the machinery space, and the average permeability of the portion of the ship in which the second is situated differs from that of the machinery space, the combined length of the two compartments shall be adjusted to the mean average permeability of the two portions of the ship in which the compartments are situated.

2.3. Where the two adjacent compartments have different factors of subdivision, the combined length of the two compartments shall be determined proportionately.

3. In ships of 100 m in length and upwards, one of the main transverse bulkheads abaft the forepeak shall be fitted at a distance from the forward perpendicular which is not greater than the permissible length.

4. A main transverse bulkhead may be recessed provided that all parts of the recess lie in-board of vertical surfaces on both sides of the ship, situated at a distance from the shell plating equal to one-fifth the breadth of the ship, as defined in regulation 2, and measured at right angles to the centre line at the level of the deepest subdivision load line. Any part of a recess which lies outside these limits shall be dealt with as a step in accordance with paragraph 5.

5. A main transverse bulkhead may be stepped provided that it meets one of the following conditions:

1. The combined length of the two compartments, separated by the bulkhead in question, does not exceed either 90 per cent of the floodable length or twice the permissible length, except that, in ships having a factor of subdivision greater than .9, the combined length of the two compartments in question shall not exceed the permissible length;
2. Additional subdivision is provided in way of the step to maintain the same measure of safety as that secured by a plane bulkhead;
3. The compartment over which the step extends does not exceed the permissible length corresponding to a margin line taken 76 mm below the step.

6. Where a main transverse bulkhead is recessed or stepped, an equivalent plane bulkhead shall be used in determining the subdivision.

7. If the distance between two adjacent main transverse bulkheads, or their equivalent plane bulkheads, or the distance between the transverse planes passing through the nearest stepped portions of the bulkheads, is less than 3.0 m plus 3 per cent of the length of the ship, or 11.0 m whichever is the less, only one of these bulkheads shall be regarded as forming part of the subdivision of the ship in accordance with the provisions of regulation 6.

8. Where a main transverse watertight compartment contains local subdivision and it can be shown to the satisfaction of the Administration that, after any assumed side damage extending over a length of 3.0 m plus 3 per cent of the length of the ship, or 11.0 m whichever is the less, the whole volume of the main compartment will not be flooded, a proportionate allowance may be made in the permissible length otherwise required for such compartment. 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.

9. Where the required factor of subdivision is .50 or less, the combined length of any two adjacent compartments shall not exceed the floodable length.

Regulation 8. STABILITY OF PASSENGER SHIPS IN DAMAGED CONDITION

1.1. Sufficient intact stability shall be provided in all service conditions so as to enable the ship to withstand the final stage of flooding of any one main compartment which is required to be within the floodable length.

1.2. Where two adjacent main compartments are separated by a bulkhead which is stepped under the conditions of regulation 7.5.1 the intact stability shall be adequate to withstand the flooding of those two adjacent main compartments.

1.3. Where the required factor of subdivision is .50 or less but more than .33 intact stability shall be adequate to withstand the flooding of any two adjacent main compartments.

1.4. Where the required factor of subdivision is .33 or less the intact stability shall be adequate to withstand the flooding of any three adjacent main compartments.

2.1. The requirements of paragraph 1 shall be determined by calculations which are in accordance with paragraphs 3, 4 and 6 and which take into consideration the proportions and design characteristics of the ship and the arrangement and configuration of the damaged compartments. In making these calculations the ship is to be assumed in the worst anticipated service condition as regards stability.

2.2. Where it is proposed to fit decks, inner skins or longitudinal bulkheads of sufficient tightness to seriously restrict the flow of water the Administration shall be satisfied that proper consideration is given to such restrictions in the calculations.

2.3. In cases where the Administration considers the range of stability in the damaged condition to be doubtful, it may require investigation thereof.

3. For the purpose of making damage stability calculations the volume and surface permeabilities shall be in general as follows:

<i>Spaces</i>	<i>Permeability</i>
Appropriated to cargo, coal or stores	60
Occupied by accommodation	95
Occupied by machinery	85
Intended for liquids	0 or 95*

*Whichever results in the more severe requirements.

Higher surface permeabilities are to be assumed in respect of spaces which, in the vicinity of the damage waterplane, contain no substantial quantity of accommodation or machinery and spaces which are not generally occupied by any substantial quantity of cargo or stores.

4. Assumed extent of damage shall be as follows:

1. Longitudinal extent: 3.0 m plus 3 per cent of the length of the ship, or 11.0 m whichever is the less. Where the required factor of subdivision is .33 or less the assumed longitudinal extent of damage shall be increased as necessary so as to include any two consecutive main transverse watertight bulkheads;
2. Transverse extent (measured inboard from the ship's side, at right angles to the centre line at the level of the deepest subdivision load line): a distance of one-fifth of the breadth of the ship, as defined in regulation 2; and
3. Vertical extent: from the base line upwards without limit;
4. If any damage of lesser extent than that indicated in paragraphs 4.1, 4.2 and 4.3 would result in a more severe condition regarding heel or loss of metacentric height, such damage shall be assumed in the calculations.

5. Unsymmetrical flooding is to be kept to a minimum consistent with efficient arrangements. Where it is necessary to correct large angles of heel, the means adopted shall, where practicable, be self-acting, but in any case where controls to cross-flooding fittings are provided they shall be operable from above the bulkhead deck. These fittings together with their controls as well as the maximum heel before equalization shall be acceptable to the Administration. Where cross-flooding fittings are required the time for equalization shall not exceed 15 minutes. Suitable information concerning the use of cross-flooding fittings shall be supplied to the master of the ship.*

6. The final conditions of the ship after damage and, in the case of unsymmetrical flooding, after equalization measures have been taken shall be as follows:

1. In the case of symmetrical flooding there shall be a positive residual metacentric height of at least 50 mm as calculated by the constant displacement method;
2. In the case of unsymmetrical flooding the total heel shall not exceed 7°, except that, in special cases, the Administration may allow additional heel due to the unsymmetrical moment, but in no case shall the final heel exceed 15°;
3. In no case shall the margin line be submerged in the final stage of flooding. If it is considered that the margin line may become submerged during an intermediate stage of flooding, the Administration may require such investigations and arrangements as it considers necessary for the safety of the ship.

7. The master of the ship shall be supplied with the data necessary to maintain sufficient intact stability under service conditions to enable the ship to withstand the critical damage. In the case of ships requiring cross-flooding the master of the ship shall be informed of the conditions of stability on which the calculations of heel are based and be warned that excessive heeling might result should the ship sustain damage when in a less favourable condition.

8.1. No relaxation from the requirements for damage stability may be considered by the Administration unless it is shown that the intact metacentric height in any service condition necessary to meet these requirements is excessive for the service intended.

8.2. Relaxations from the requirements for damage stability shall be permitted only in exceptional cases and subject to the condition that the Administration is to be satisfied that the proportions, arrangements and other characteristics of the ship are the most favourable to stability after damage which can practically and reasonably be adopted in the particular circumstances.

* Reference is made to the Recommendation on a Standard Method for Establishing Compliance with the Requirements for Cross-Flooding Arrangements in Passenger Ships, adopted by the Organization by resolution A.266(VIII).

Regulation 9. BALLASTING OF PASSENGER SHIPS

1. Water ballast should not in general be carried in tanks intended for oil fuel. In ships in which it is not practicable to avoid putting water in oil fuel tanks, oily-water separating equipment to the satisfaction of the Administration shall be fitted, or other alternative means, such as discharge to shore facilities, acceptable to the Administration shall be provided for disposing of the oily-water ballast.

2. The provisions of this regulation are without prejudice to the provisions of the International Convention for the Prevention of Pollution from Ships in force.

**Regulation 10. PEAK AND MACHINERY SPACE BULKHEADS, SHAFT TUNNELS, ETC.
IN PASSENGER SHIPS**

1. A forepeak or collision bulkhead shall be fitted which shall be watertight up to the bulkhead deck. This bulkhead shall be located at a distance from the forward perpendicular of not less than 5 per cent of the length of the ship and not more than 3 m plus 5 per cent of the length of the ship.

2. Where any part of the ship below the water-line extends forward of the forward perpendicular, e.g., a bulbous bow, the distances stipulated in paragraph 1 shall be measured from a point either:

1. At the mid-length of such extension; or
 2. At a distance 1.5 per cent of the length of the ship forward of the forward perpendicular; or
 3. At a distance 3 m forward of the forward perpendicular;
- whichever gives the smallest measurement.

3. Where a long forward superstructure is fitted, the forepeak or collision bulkhead shall be extended weathertight to the deck next above the bulkhead deck. The extension need not be fitted directly above the bulkhead below provided it is located within the limits specified in paragraph 1 or 2 with the exemption permitted by paragraph 4 and the part of the deck which forms the step is made effectively weathertight.

4. Where bow doors are fitted and a sloping loading ramp forms part of the extension of the collision bulkhead above the bulkhead deck the part of the ramp which is more than 2.3 m above the bulkhead deck may extend forward of the limit specified in paragraphs 1 and 2. The ramp shall be weathertight over its complete length.

5. An afterpeak bulkhead, and bulkheads dividing the machinery space, as defined in regulation 2, from the cargo and passenger spaces forward and aft, shall also be fitted and made watertight up to the bulkhead deck. The afterpeak bulkhead may, however, be stepped below the bulkhead deck, provided the degree of safety of the ship as regards subdivision is not thereby diminished.

6. In all cases stern tubes shall be enclosed in watertight spaces of moderate volume. The stern gland shall be situated in a watertight shaft tunnel or other watertight space separate from the stern tube compartment and of such volume that, if flooded by leakage through the stern gland, the margin line will not be submerged.

Regulation 11. COLLISION BULKHEADS IN CARGO SHIPS

1. For the purpose of this regulation, "freeboard deck", "length of ship" and "forward perpendicular" have the meanings as defined in the International Convention on Load Lines in force.

2. A collision bulkhead shall be fitted which shall be watertight up to the freeboard deck. This bulkhead shall be located at a distance from the forward perpendicular of not less than 5 per cent of the length of the ship or 10 m, whichever is the less, and, except as may be permitted by the Administration, not more than 8 per cent of the length of the ship.

3. Where any part of the ship below the water-line extends forward of the forward perpendicular, e.g., a bulbous bow, the distances stipulated in paragraph 2 shall be measured from a point either:

1. At the mid-length of such extension; or
 2. At a distance 1.5 per cent of the length of the ship forward of the forward perpendicular; or
 3. At a distance 3 m forward of the forward perpendicular;
- whichever gives the smallest measurement.

4. The bulkhead may have steps or recesses provided they are within the limits prescribed in paragraph 2 or 3. Pipes piercing the collision bulkhead shall be fitted with suitable valves operable from above the freeboard deck and the valve chest shall be secured at the bulkhead inside the forepeak. The valves may be fitted on the after side of the collision bulkhead provided that the valves are readily accessible under all service conditions and the space in which they are located is not a cargo space. All valves shall be of steel, bronze or other approved ductile material. Valves of ordinary cast iron or similar material are not acceptable. No door, manhole, ventilation duct or any other opening shall be fitted in this bulkhead.

5. Where a long forward superstructure is fitted the collision bulkhead shall be extended weathertight to the deck next above the freeboard deck. The extension need not be fitted directly above the bulkhead below provided it is located within the limits prescribed in paragraph 2 or 3 with the exemption permitted by paragraph 6 and the part of the deck which forms the step is made effectively weathertight.

6. Where bow doors are fitted and a sloping loading ramp forms part of the extension of the collision bulkhead above the freeboard deck the part of the ramp which is more than 2.3 m above the freeboard deck may extend forward of the limit specified in paragraph 2 or 3. The ramp shall be weathertight over its complete length.

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

Regulation 12. DOUBLE BOTTOMS IN PASSENGER SHIPS

1. A double bottom shall be fitted extending from the forepeak bulkhead to the afterpeak bulkhead as far as this is practicable and compatible with the design and proper working of the ship.

1. In ships of 50 m and upwards but less than 61 m in length a double bottom shall be fitted at least from the machinery space to the forepeak bulkhead, or as near thereto as practicable.
2. In ships of 61 m and upwards but less than 76 m in length a double bottom shall be fitted at least outside the machinery space, and shall extend to the fore and after peak bulkheads, or as near thereto as practicable.
3. In ships of 76 m in length and upwards, a double bottom shall be fitted amidships, and shall extend to the fore and after peak bulkheads, or as near thereto as practicable.

2. Where a double bottom is required to be fitted its depth shall be to the satisfaction of the Administration and the inner bottom shall be continued out to the ship's sides in such a manner as to protect the bottom to the turn of the bilge. Such protection will be deemed satisfactory if the line of intersection of the outer edge of the margin plate with the bilge plating is not lower at any part than a horizontal plane passing through the point of intersection with the frame line amidships of a transverse diagonal line inclined at 25° to the base line and cutting it at a point one-half the ship's moulded breadth from the middle line.

3. Small wells constructed in the double bottom in connexion with drainage arrangements of holds, etc., shall not extend downwards more than necessary. The depth of the well shall in no case be more than the depth less 460 mm of the double bottom at the centre line,

nor shall the well extend below the horizontal plane referred to in paragraph 2. A well extending to the outer bottom is, however, permitted at the after end of the shaft tunnel. Other wells (e.g., for lubricating oil under main engines) may be permitted by the Administration if satisfied that the arrangements give protection equivalent to that afforded by a double bottom complying with this regulation.

4. A double bottom need not be fitted in way of watertight compartments of moderate size used exclusively for the carriage of liquids, provided the safety of the ship, in the event of bottom or side damage, is not, in the opinion of the Administration, thereby impaired.

5. In the case of ships to which the provisions of regulation 1.5 apply and which are engaged on regular service within the limits of a short international voyage as defined in regulation III/2, the Administration may permit a double bottom to be dispensed with in any part of the ship which is subdivided by a factor not exceeding .50, if satisfied that the fitting of a double bottom in that part would not be compatible with the design and proper working of the ship.

**Regulation 13. ASSIGNING, MARKING AND RECORDING OF SUBDIVISION LOAD LINES
FOR PASSENGER SHIPS**

1. In order that the required degree of subdivision shall be maintained, a load line corresponding to the approved subdivision draught shall be assigned and marked on the ship's sides. A ship having spaces which are specially adapted for the accommodation of passengers and the carriage of cargo alternatively may, if the owners desire, have one or more additional load lines assigned and marked to correspond with the subdivision draughts which the Administration may approve for the alternative service conditions.

2. The subdivision load lines assigned and marked shall be recorded in the Passenger Ship Safety Certificate, and shall be distinguished by the notation C.1 for the principal passenger condition, and C.2, C.3, etc. for the alternative conditions.

3. The freeboard corresponding to each of these load lines shall be measured at the same position and from the same deck line as the freeboards determined in accordance with the International Convention on Load Lines in force.

4. The freeboard corresponding to each approved subdivision load line and the conditions of service for which it is approved, shall be clearly indicated on the Passenger Ship Safety Certificate.

5. In no case shall any subdivision load line mark be placed above the deepest load line in salt water as determined by the strength of the ship or the International Convention on Load Lines in force.

6. Whatever may be the position of the subdivision load line marks, a ship shall in no case be loaded so as to submerge the load line mark appropriate to the season and locality as determined in accordance with the International Convention on Load Lines in force.

7. A ship shall in no case be so loaded that when it is in salt water the subdivision load line mark appropriate to the particular voyage and condition of service is submerged.

**Regulation 14. CONSTRUCTION AND INITIAL TESTING OF WATERTIGHT BULKHEADS, ETC.,
IN PASSENGER SHIPS AND CARGO SHIPS**

1. Each watertight subdivision bulkhead, whether transverse or longitudinal, shall be constructed in such a manner that it shall be capable of supporting, with a proper margin of resistance, the pressure due to the maximum head of water which it might have to sustain in the event of damage to the ship but at least the pressure due to a head of water up to the margin line. The construction of these bulkheads shall be to the satisfaction of the Administration.

2.1. Steps and recesses in bulkheads shall be watertight and as strong as the bulkhead at the place where each occurs.

2.2. Where frames or beams pass through a watertight deck or bulkhead, such deck or bulkhead shall be made structurally watertight without the use of wood or cement.

3. Testing main compartments by filling them with water is not compulsory. When testing by filling with water is not carried out, a hose test is compulsory; this test shall be carried out in the most advanced stage of the fitting out of the ship. In any case, a thorough inspection of the watertight bulkheads shall be carried out.

4. The forepeak, double bottoms (including duct keels) and inner skins shall be tested with water to a head corresponding to the requirements of paragraph 1.

5. Tanks which are intended to hold liquids, and which form part of the subdivision of the ship, 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 the tank.

6. The tests referred to in paragraphs 4 and 5 are for the purpose of ensuring that the subdivision structural arrangements are watertight and are not to be regarded as a test of the fitness of any compartment for the storage of oil fuel or for other special purposes for which a test of a superior character may be required depending on the height to which the liquid has access in the tank or its connexions.

Regulation 15. OPENINGS IN WATERTIGHT BULKHEADS IN PASSENGER SHIPS

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

2.1. Where pipes, scuppers, electric cables, etc. are carried through watertight subdivision bulkheads, arrangements shall be made to ensure the watertight integrity of the bulkheads.

2.2. Valves not forming part of a piping system shall not be permitted in watertight subdivision bulkheads.

2.3. Lead or other 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.

3.1. No doors, manholes, or access openings are permitted:

1. In the collision bulkhead below the margin line;
2. In watertight transverse bulkheads dividing a cargo space from an adjoining cargo space or from a permanent or reserve bunker, except as provided in paragraph 12 and in regulation 16.

3.2. Except as provided in paragraph 3.3 the collision bulkhead may be pierced below the margin line 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.

3.3. If the forepeak is divided to hold two different kinds of liquids the Administration may allow the collision bulkhead to be pierced below the margin line by two pipes, each of which is fitted as required by paragraph 3.2, provided the Administration is satisfied that there is no practical alternative to the fitting of such a second pipe and that, having regard to the additional subdivision provided in the forepeak, the safety of the ship is maintained.

4.1. Watertight doors fitted in bulkheads between permanent and reserve bunkers shall be always accessible, except as provided in paragraph 11.2 for between deck bunker doors.

4.2. Satisfactory arrangements shall be made by means of screens or otherwise to prevent the coal from interfering with the closing of watertight bunker doors.

5. Within spaces containing the main and auxiliary propulsion machinery including boilers serving the needs of propulsion and all permanent bunkers, not more than one door apart from the doors to bunkers and shaft tunnels may be fitted in each main transverse bulkhead. Where two or more shafts are fitted the tunnels shall be connected by an intercommunicating passage. There shall be only one door between the machinery space and the tunnel spaces where two shafts are fitted and only two doors where there are more than two shafts. All these doors shall be of the sliding type and shall be so located as to have their sills as high as practicable. The hand gear for operating these doors from above the bulkhead deck shall be situated outside the spaces containing the machinery if this is consistent with a satisfactory arrangement of the necessary gearing.

6.1. Watertight doors shall be sliding doors or hinged doors or doors of an equivalent type. Plate doors secured only by bolts and doors required to be closed by dropping or by the action of a dropping weight are not permitted.

6.2. Sliding doors may be either:

- Hand-operated only, or
- Power-operated as well as hand-operated.

6.3. Authorized watertight doors may therefore be divided into three classes:

- Class 1, hinged doors;
- Class 2, hand-operated sliding doors;
- Class 3, sliding doors which are power-operated as well as hand-operated.

6.4. 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° either way.

6.5. In all classes of watertight doors indicators shall be fitted which show, at all operating stations from which the doors are not visible, whether the doors are open or closed. If any of the watertight doors, of whatever class, is not fitted so as to enable it to be closed from a central control station, it shall be provided with a mechanical, electrical, telephonic, or any other suitable direct means of communication, enabling the officer of the watch promptly to contact the person who is responsible for closing the door in question, under previous orders.

7. Hinged doors (class 1) shall be fitted with quick action closing devices, such as catches, workable from each side of the bulkhead.

8. Hand-operated sliding doors (class 2) may have a horizontal or vertical 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 and of an approved type. Departures from the requirement of operation on both sides may be allowed, 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.

9.1. Power-operated sliding doors (class 3) may have a vertical or 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 upper control. Local control handles in connexion 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 and of an approved type. Provision shall be made to give warnings by sound signal that the door has begun to close and will con-

tinue to move until it is completely closed. The door shall take a sufficient time to close to ensure safety.

9.2. There shall be at least two independent power sources capable of opening and closing all the doors under control, each of them capable of operating all the doors simultaneously. The two power sources shall be controlled from the central station on the navigating bridge provided with all the necessary indicators for checking that each of the two power sources is capable of giving the required service satisfactorily.

9.3. In the case of hydraulic operation, each power source shall consist of a pump capable of closing all doors in not more than 60 seconds. In addition, there shall be for the whole installation hydraulic accumulators of sufficient capacity to operate all the doors at least three times, i.e., closed-open-closed. The fluid used shall be one which does not freeze at any of the temperatures liable to be encountered by the ship during its service.

10.1. Hinged watertight doors (class 1) in passenger, crew and working spaces are only permitted above a deck the underside of which, at its lowest point at side, is at least 2.0 m above the deepest subdivision load line.

10.2. Watertight doors, the sills of which are above the deepest load line and below the line specified in paragraph 10.1 shall be sliding doors and may be hand-operated (class 2), except in vessels engaged on short international voyages and required to have a factor of subdivision of .50 or less in which all such doors shall be power-operated. When trunkways in connexion with refrigerated cargo and ventilation or forced draught ducts are carried through more than one main watertight subdivision bulkhead, the doors at such openings shall be operated by power.

11.1. Watertight doors which may sometimes be opened at sea, and the sills of which are below the deepest subdivision load line shall be sliding doors. The following rules shall apply:

1. When the number of such doors (excluding doors at entrances to shaft tunnels) exceeds five, all of these doors and those at the entrance to shaft tunnels or ventilation or forced draught ducts, shall be power-operated (class 3) and shall be capable of being simultaneously closed from a central station situated on the navigating bridge;
2. When the number of such doors (excluding doors at entrances to shaft tunnels) is greater than one, but does not exceed five,
 - 2.1. Where the ship has no passenger spaces below the bulkhead deck, all the above-mentioned doors may be hand-operated (class 2);
 - 2.2. Where the ship has passenger spaces below the bulkhead deck all the above-mentioned doors shall be power-operated (class 3) and shall be capable of being simultaneously closed from a central station situated on the navigating bridge;
3. In any ship where there are only two such watertight doors and they are situated in the machinery space or in the bulkheads bounding such space, the Administration may allow these two doors to be hand-operated only (class 2).

11.2. If sliding watertight doors which have sometimes to be open at sea for the purpose of trimming coal are fitted between bunkers in the between decks below the bulkhead deck, these doors shall be operated by power. The opening and closing of these doors shall be recorded in such log book as may be prescribed by the Administration.

12.1. If the Administration is satisfied that such doors are essential, watertight doors of satisfactory construction may be fitted in watertight bulkheads dividing cargo between deck spaces. Such doors may be hinged, rolling or sliding doors but shall not be remotely controlled. They shall be fitted at the highest level and as far from the shell plating as practicable, but in no case shall the outboard vertical edges be situated at a distance from the shell plating which is less than one-fifth of the breadth of the ship, as defined in regulation 2, such distance being measured at right angles to the centre line of the ship at the level of the deepest subdivision load line.

12.2. Such doors shall be closed before the voyage commences and shall be kept closed during navigation: the time of opening such doors in port and of closing them before the ship leaves port shall be entered in the log book. Should any of the doors be accessible during the voyage, they shall be fitted with a device which prevents unauthorized opening. When it is proposed to fit such doors, the number and arrangements shall receive the special consideration of the Administration.

13. Portable plates on bulkheads shall not be permitted except in machinery spaces. Such plates shall always be in place before the ship 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.

14. All watertight doors shall be kept closed during navigation except when necessarily opened for the working of the ship, in which case they shall always be ready to be immediately closed.

15.1. Where trunkways or tunnels for access from crew accommodation to the stokehold, for piping, or for any other purpose are carried through main transverse watertight bulkheads, they shall be watertight and in accordance with the requirements of regulation 19. The access to at least one end of each such tunnel or trunkway, if used as a passage at sea, shall be through a trunk extending watertight to a height sufficient to permit access above the marginline. The access to the other end of the trunkway or tunnel may be through a watertight door of the type required by its location in the ship. Such trunkways or tunnels shall not extend through the first subdivision bulkhead abaft the collision bulkhead.

15.2. Where it is proposed to fit tunnels or trunkways for forced draught, piercing main transverse watertight bulkheads, these shall receive the special consideration of the Administration.

Regulation 16. PASSENGER SHIPS CARRYING GOODS VEHICLES AND ACCOMPANYING PERSONNEL

1. This Regulation applies to passenger ships regardless of the date of construction designed or adapted for the carriage of goods vehicle accompanying personnel where the total number of persons on board, other than those specified in regulation 1/2(e)(i) and (ii), exceeds 12.

2. If in such a ship the total number of passengers which include personnel accompanying vehicles does not exceed $N = 12 + \sqrt{A}/25$, where A = total deck area (square metres) of spaces available for the stowage of goods vehicles and where the clear height at the storage position and at the entrance to such spaces is not less than 4 m, the provisions of regulation 15.12 in respect of watertight doors apply except that the doors may be fitted at any level in watertight bulkheads dividing cargo spaces. Additionally, indicators are required on the navigating bridge to show automatically when each door is closed and all door fastenings are secured.

3. When applying the provisions of this Chapter to such a ship, N shall be taken as the maximum number of passengers for which the ship may be certified in accordance with this regulation.

4. In applying regulation 8 for the worst operating conditions, the permeability for cargo spaces intended for the stowage of goods vehicles and containers shall be derived by calculation in which the goods vehicles and containers shall be assumed to be non-watertight and their permeability taken as 65. For ships engaged in dedicated services the actual value of permeability for goods vehicles or containers may be applied. In no case shall the permeability of the cargo spaces in which the goods vehicles and containers are carried be taken as less than 60.

Regulation 17. OPENINGS IN THE SHELL PLATING OF PASSENGER SHIPS BELOW THE MARGIN LINE

1. The number of openings in the shell plating shall be reduced to the minimum compatible with the design and proper working of the ship.

2. The arrangement and efficiency of the means for closing any opening in the shell plating shall be consistent with its intended purpose and the position in which it is fitted and generally to the satisfaction of the Administration.

3.1. Subject to the requirements of the International Convention on Load Lines in force, no sidescuttle shall be fitted in such a position that its sill is below a line drawn parallel to the bulkhead deck at side and having its lowest point 2.5 per cent of the breadth of the ship above the deepest subdivision load line, or 500 mm, whichever is the greater.

3.2. All sidescuttles the sills of which are below the margin line, as permitted by paragraph 3.1 shall be of such construction as will effectively prevent any person opening them without the consent of the master of the ship.

3.1.1. Where in a between decks, the sills of any of the sidescuttles referred to in paragraph 3.2 are below a line drawn parallel to the bulkhead deck at side and having its lowest point 1.4 m plus 2.5 per cent of the breadth of the ship above the water when the ship departs from any port, all the sidescuttles in that between decks shall be closed watertight and locked before the ship leaves port, and they shall not be opened before the ship arrives at the next port. In the application of this paragraph the appropriate allowance for fresh water may be made when applicable.

3.3.2. The time of opening such sidescuttles in port and of closing and locking them before the ship leaves port shall be entered in such log book as may be prescribed by the Administration.

3.3.3. For any ship that has one or more sidescuttles so placed that the requirements of paragraph 3.3.1. would apply when it was floating at its deepest subdivision load line, the Administration may indicate the limiting mean draught at which these sidescuttles will have their sills above the line drawn parallel to the bulkhead deck at side, and having its lowest point 1.4 m plus 2.5 per cent of the breadth of the ship above the water-line corresponding to the limiting mean draught, and at which it will therefore be part from port without previously closing and locking them and to open them at sea on the responsibility of the master during the voyage to the next port. In tropical zones as defined in the International Convention on Load Lines in force, this limiting draught may be increased by 0.3 m.

4. Efficient hinged inside deadlights so arranged that they can be easily and effectively closed and secured watertight, shall be fitted to all sidescuttles except that abaft one-eighth of the ship's length from the forward perpendicular and above a line drawn parallel to the bulkhead deck at side and having its lowest point at a height of 3.7 m plus 2.5 per cent of the breadth of the ship above the deepest subdivision load line, the deadlights may be portable in passenger accommodation other than that for steerage passengers, unless the deadlights are required by the International Convention on Load Lines in force to be permanently attached in their proper positions. Such portable deadlights shall be stowed adjacent to the sidescuttles they serve.

5. Sidescuttles and their deadlights which will not be accessible during navigation shall be closed and secured before the ship leaves port.

6.1. No sidescuttles shall be fitted in any spaces which are appropriated exclusively to the carriage of cargo or coal.

6.2. Sidescuttles may, however, be fitted in spaces appropriated alternatively to the carriage of cargo or passengers, but they shall be of such construction as will effectively prevent any person opening them or their deadlights without the consent of the master.

6.3. If cargo is carried in such spaces, the sidescuttles and their deadlights shall be closed watertight and locked before the cargo is shipped and such closing and locking shall be recorded in such log book as may be prescribed by the Administration.

7. Automatic ventilating sidescuttles shall not be fitted in the shell plating below the margin line without the special sanction of the Administration.

8. The number of scuppers, sanitary discharges and other similar openings in the shell plating shall be reduced to the minimum either by making each discharge serve for as many as possible of the sanitary and other pipes, or in any other satisfactory manner.

9.1. 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 ship.

9.2.1. Subject to the requirements of the International Convention on Load Lines in force, and except as provided in paragraph 9.3, each separate discharge led through the shell plating from spaces below the margin line shall be provided with either one automatic non-return valve fitted with a positive means of closing it from above the bulkhead deck or with two automatic non-return valves without positive means of closing, provided that the inboard valve is situated above the deepest subdivision load line and is always accessible for examination under service conditions. Where a valve with positive means of closing is fitted, the operating position above the bulkhead deck shall always be readily accessible and means shall be provided for indicating whether the valve is open or closed.

9.2.2. The requirements of the International Convention on Load Lines in force shall apply to discharges led through the shell plating from spaces above the margin line.

9.3. Machinery space main and auxiliary sea inlets and discharges in connexion with the operation of machinery shall be fitted with readily accessible valves between the pipes and the shell plating or between the pipes and fabricated boxes attached to the shell plating. The valves may be controlled locally and shall be provided with indicators showing whether they are open or closed.

9.4. All shell fittings and valves required by this regulation shall be of steel, bronze or other approved ductile material. Valves of ordinary cast iron or similar material are not acceptable. All pipes to which this regulation refers shall be of steel or other equivalent material to the satisfaction of the Administration.

10.1. Gangway, cargo and coaling ports fitted below the margin line shall be of sufficient strength. They shall be effectively closed and secured watertight before the ship leaves port, and shall be kept closed during navigation.

10.2. Such ports shall in no case be so fitted as to have their lowest point below the deepest subdivision load line.

11.1. The inboard opening of each ash-shoot, rubbish-shoot, etc. shall be fitted with an efficient cover.

11.2. If the inboard opening is situated below the margin line, the cover shall be watertight, and in addition an automatic non-return valve shall be fitted in the shoot in an easily accessible position above the deepest subdivision load line. When the shoot is not in use both the cover and the valve shall be kept closed and secured.

Regulation 18. CONSTRUCTION AND INITIAL TESTS OF WATERTIGHT DOORS, SIDESCUTTLES, ETC., IN PASSENGER SHIPS AND CARGO SHIPS

1. In passenger ships:

1. The design, materials and construction of all watertight doors, sidescuttles, gangway, cargo and coaling ports, valves, pipes, ash-shoots and rubbish-shoots referred to in these regulations shall be to the satisfaction of the Administration;
2. The frames of vertical watertight doors shall have no groove at the bottom in which dirt might lodge and prevent the door closing properly.

2. In passenger ships and cargo ships each watertight door shall be tested by water pressure to a head up to the bulkhead deck or freeboard deck respectively. The test shall be made before the ship is put into service, either before or after the door is fitted.

*Regulation 19. CONSTRUCTION AND INITIAL TESTS OF WATERTIGHT DECKS, TRUNKS, ETC.,
IN PASSENGER SHIPS AND CARGO SHIPS*

1. Watertight decks, trunks, tunnels, duct keels and ventilators shall be of the same strength as watertight bulkheads at corresponding levels. The means used for making them watertight, and the arrangements adopted for closing openings in them, shall be to the satisfaction of the Administration. Watertight ventilators and trunks shall be carried at least up to the bulkhead deck in passenger ships and up to the freeboard deck in cargo ships.

2. After completion, a hose or flooding test shall be applied to watertight decks and a hose test to watertight trunks, tunnels and ventilators.

Regulation 20. WATERTIGHT INTEGRITY OF PASSENGER SHIPS ABOVE THE MARGIN LINE

1. The Administration may require that all reasonable and practicable measures shall be taken to limit the entry and spread of water above the bulkhead deck. Such measures may include partial bulkheads or webs. When partial watertight bulkheads and webs are fitted on the bulkhead deck, above or in the immediate vicinity of main subdivision bulkheads, they shall have watertight shell and bulkhead deck connexions so as to restrict the flow of water along the deck when the ship is in a heeled damaged condition. Where the partial watertight bulkhead does not line up with the bulkhead below, the bulkhead deck between shall be made effectively watertight.

2. The bulkhead deck or a deck above it shall be weathertight. All openings in the exposed weather deck shall have coamings of ample height and strength and shall be provided with efficient means for expeditiously closing them weathertight. Freeing ports, open rails and scuppers shall be fitted as necessary for rapidly clearing the weather deck of water under all weather conditions.

3. Sidescuttles, gangway, cargo and coaling ports and other means for closing openings in the shell plating above the margin line 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 deepest subdivision load line.

4. Efficient inside deadlights, so arranged that they can be easily and effectively closed and secured watertight, shall be provided for all sidescuttles to spaces below the first deck above the bulkhead deck.

Regulation 21. BILGE PUMPING ARRANGEMENTS

1. Passenger ships and cargo ships

1.1. An efficient bilge pumping system shall be provided, capable of pumping from and draining any watertight compartment other than a space permanently appropriated for the carriage of fresh water, water ballast, oil fuel or liquid cargo and for which other efficient means of pumping are provided, under all practical conditions. Efficient means shall be provided for draining water from insulated holds.

1.2. Sanitary, ballast and general service pumps may be accepted as independent power bilge pumps if fitted with the necessary connexions to the bilge pumping system.

1.3. All bilge pipes used in or under coal bunkers or fuel storage tanks or in boiler or machinery spaces, including spaces in which oil-settling tanks or oil fuel pumping units are situated, shall be of steel or other suitable material.

1.4. The arrangement of the bilge and ballast pumping system shall be such as to prevent the possibility of water passing from the sea and from water ballast spaces into the cargo and machinery spaces, or from one compartment to another. Provision shall be made to prevent any deep tank having bilge and ballast connexions being inadvertently flooded from the sea when containing cargo, or being discharged through a bilge pipe when containing water ballast.

1.5. All distribution boxes and manually operated valves in connexion with the bilge pumping arrangements shall be in positions which are accessible under ordinary circumstances.

2. *Passenger ships*

2.1. The bilge pumping system required by paragraph 1.1 shall be capable of operation under all practicable conditions after a casualty whether the ship is upright or listed. For this purpose wing suctions shall generally be fitted except in narrow compartments at the end of the ship where one suction may be sufficient. In compartments of unusual form, additional suctions may be required. Arrangements shall be made whereby water in the compartment may find its way to the suction pipes. Where, for particular compartments, the Administration is satisfied that the provision of drainage may be undesirable, it may allow such provision to be dispensed with if calculations made in accordance with the conditions laid down in regulation 8.2.1 to 8.2.3 show that the survival capability of the ship will not be impaired.

2.2. At least three power pumps shall be fitted connected to the bilge main, one of which may be driven by the propulsion machinery. Where the criterion numeral is 30 or more, one additional independent power pump shall be provided.

2.3. Where practicable, the power bilge pumps shall be placed in separate watertight compartments and so arranged or situated that these compartments will not be flooded by the same damage. If the main propulsion machinery, auxiliary machinery and boilers are in two or more watertight compartments, the pumps available for bilge service shall be distributed as far as is possible throughout these compartments.

2.4. On a ship of 91.5 m in length and upwards or having a criterion numeral of 30 or more, the arrangements shall be such that at least one power bilge pump shall be available for use in all flooding conditions which the ship is required to withstand, as follows:

1. One of the required bilge pumps shall be an emergency pump of a reliable submersible type having a source of power situated above the bulkhead deck; or
2. The bilge pumps and their sources of power shall be so distributed throughout the length of the ship that at least one pump in an undamaged compartment will be available.

2.5. With the exception of additional pumps which may be provided for peak compartments only, each required bilge pump shall be so arranged as to draw water from any space required to be drained by paragraph 1.1.

2.6. Each power bilge pump shall be capable of pumping water through the required main bilge pipe at a speed of not less than 2 m/sec. Independent power bilge pumps situated in machinery spaces shall have direct suctions from these spaces, except that not more than two such suctions shall be required in any one space. Where two or more such suctions are provided there shall be at least one on each side of the ship. The Administration may require independent power bilge pumps situated in other spaces to have separate direct suctions. Direct suctions shall be suitably arranged and those in a machinery space shall be of a diameter not less than that required for the bilge main.

2.7.1. In addition to the direct bilge suction or suctions required by paragraph 2.6 a direct suction from the main circulating pump leading to the drainage level of the machinery space and fitted with a non-return valve shall be provided in the machinery space. The diameter of this direct suction pipe shall be at least two-thirds of the diameter of the pump inlet in the case of steamships, and of the same diameter as the pump inlet in the case of motorships.

2.7.2. Where in the opinion of the Administration the main circulating pump is not suitable for this purpose, a direct emergency bilge suction shall be led from the largest available independent power driven pump to the drainage level of the machinery space; the suction shall be of the same diameter as the main inlet of the pump used. The capacity of the pump so connected shall exceed that of a required bilge pump by an amount deemed satisfactory by the Administration.

2.7.3. The spindles of the sea inlet and direct suction valves shall extend well above the engine room platform.

2.8. All bilge suction piping up to the connexion to the pumps shall be independent of other piping.

2.9. The diameter d of the bilge main shall be calculated according to the following formula. However, the actual internal diameter of the bilge main may be rounded off to the nearest standard size acceptable to the Administration:

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

where d is the internal diameter of the bilge main (millimetres);

L and B are the length and the breadth of the ship (metres) as defined in Regulation 2; and

D is the moulded depth of the ship to bulkhead deck (metres).

The diameter of the bilge branch pipes shall meet the requirements of the Administration.

2.10. Provision shall be made to prevent the compartment served by any bilge suction pipe being flooded in the event of the pipe being severed or otherwise damaged by collision or grounding in any other compartment. For this purpose, where the pipe is at any part situated nearer the side of the ship than one-fifth of the breadth of the ship (as defined in regulation 2 and measured at right angles to the centreline at the level of the deepest subdivision load line), or is in a duct keel, a non-return valve shall be fitted to the pipe in the compartment containing the open end.

2.11. Distribution boxes, cocks and valves in connexion with the bilge pumping system shall be so arranged that, in the event of flooding, one of the bilge pumps may be operative on any compartment; in addition, damage to a pump or its pipe connecting to the bilge main outboard of a line drawn at one-fifth of the breadth of the ship shall not put the bilge system out of action. If there is only one system of pipes common to all the pumps, the necessary valves for controlling the bilge suction must be capable of being operated from above the bulkhead deck. Where in addition to the main bilge pumping system an emergency bilge pumping system is provided, it shall be independent of the main system and so arranged that a pump is capable of operating on any compartment under flooding condition as specified in paragraph 2.1; in that case only the valves necessary for the operation of the emergency system need be capable of being operated from above the bulkhead deck.

2.12. All cocks and valves referred to in paragraph 2.11 which can be operated from above the bulkhead deck shall have their controls at their place of operation clearly marked and shall be provided with means to indicate whether they are open or closed.

3. *Cargo ships*

At least two power pumps connected to the main bilge system shall be provided, one of which may be driven by the propulsion machinery. If the Administration is satisfied that the safety of the ship is not impaired, bilge pumping arrangements may be dispensed with in particular compartments.

Regulation 22. STABILITY INFORMATION FOR PASSENGER SHIPS AND CARGO SHIPS*

1. Every passenger ship regardless of size and every cargo ship having a length, as defined in the International Convention on Load Lines in force, of 24 m and upwards, shall be inclined upon its completion and the elements of its stability determined. The master shall be sup-

* Reference is made to the Recommendation on Intact Stability for Passenger and Cargo Ships under 100 metres in length, adopted by the Organization by resolution A.167(ES.IV), and Amendments to this Recommendation, adopted by the Organization by resolution A.206(VII).

plied with such information satisfactory to the Administration as is necessary to enable him by rapid and simple processes to obtain accurate guidance as to the stability of the ship under varying conditions of service. A copy of the stability information shall be furnished to the Administration.

2. Where any alterations are made to a ship so as to materially affect the stability information supplied to the master, amended stability information shall be provided. If necessary the ship shall be re-inclined.

3. The Administration may allow the inclining test of an individual ship to be dispensed with provided basic stability data are available from the inclining test of a sister ship and it is shown to the satisfaction of the Administration that reliable stability information for the exempted ship can be obtained from such basic data.

4. The Administration may also allow the inclining test of an individual ship or class of ships especially designed for the carriage of liquids or ore in bulk to be dispensed with when reference to existing data for similar ships clearly indicates that due to the ship's proportions and arrangements more than sufficient metacentric height will be available in all probable loading conditions.

Regulation 23. DAMAGE CONTROL PLANS IN PASSENGER SHIPS

There shall be permanently exhibited, for the guidance of the officer in charge of the ship, plans showing clearly for each deck and hold the boundaries of the watertight compartments, the openings therein with the means of closure and position of any controls thereof, and the arrangements for the correction of any list due to flooding. In addition, booklets containing the aforementioned information shall be made available to the officers of the ship.

Regulation 24. MARKING, PERIODICAL OPERATION AND INSPECTION OF WATERTIGHT DOORS, ETC. IN PASSENGER SHIPS

1. This regulation applies to all ships.

2.1. Drills for the operating of watertight doors, sidescuttles, valves and closing mechanisms of scuppers, ash-shoots and rubbish-shoots shall take place weekly. In ships in which the voyage exceeds one week in duration a complete drill shall be held before leaving port, and others thereafter at least once a week during the voyage.

2.2. All watertight doors, both hinged and power operated, in main transverse bulkheads, in use at sea, shall be operated daily.

3.1. The watertight doors and all mechanisms and indicators connected therewith, all valves, the closing of which is necessary to make a compartment watertight, and all valves the operation of which is necessary for damage control cross connexions shall be periodically inspected at sea at least once a week.

3.2. Such valves, doors and mechanisms shall be suitably marked to ensure that they may be properly used to provide maximum safety.

Regulation 25. ENTRIES IN LOG OF PASSENGER SHIPS

1. This regulation applies to all ships.

2. Hinged doors, portable plates, sidescuttles, gangway, cargo and coaling ports and other openings, which are required by these regulations to be kept closed during navigation, shall be closed before the ship leaves port. The time of closing and the time of opening (if permissible under these regulations) shall be recorded in such log book as may be prescribed by the Administration.

3. A record of all drills and inspections required by regulation 24 shall be entered in the log book with an explicit record of any defects which may be disclosed.

PART C. MACHINERY INSTALLATIONS

(Except where expressly provided otherwise part C applies to passenger ships and cargo ships)

Regulation 26. GENERAL

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

2. The Administration shall give special consideration to the reliability of single essential propulsion components and may require a separate source of propulsion power sufficient to give the ship a navigable speed, especially in the case of unconventional arrangements.

3. Means shall be provided whereby normal operation of propulsion machinery can be sustained or restored even though one of the essential auxiliaries becomes inoperative. Special consideration shall be given to the malfunctioning of:

1. A generating set which serves as a main-source of electrical power;
2. The sources of steam supply;
3. The boiler feed water systems;
4. The fuel oil supply systems for boilers or engines;
5. The sources of lubricating oil pressure;
6. The sources of water pressure;
7. A condensate pump and the arrangements to maintain vacuum in condensers;
8. The mechanical air supply for boilers;
9. An air compressor and receiver for starting or control purposes;
10. The hydraulic, pneumatic or electrical means for control in main propulsion machinery including controllable pitch propellers.

However, the Administration, having regard to overall safety considerations, may accept a partial reduction in propulsion capability from normal operation.

4. Means shall be provided to ensure that the machinery can be brought into operation from the dead ship condition without external aid.

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

6. Main propulsion machinery and all auxiliary machinery essential to the propulsion and the safety of the ship shall, as fitted in the ship, be designed to operate when the ship is upright and when inclined at any angle of list up to and including 15° either way under static conditions and 22.5° under dynamic conditions (rolling) either way and simultaneously inclined dynamically (pitching) 7.5° by bow or stern. The Administration may permit deviation from these angles, taking into consideration the type, size and service conditions of the ship.

7. Provision shall be made to facilitate cleaning, inspection and maintenance of main propulsion and auxiliary machinery including boilers and pressure vessels.

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

Regulation 27. MACHINERY

1. Where risk from overspeeding of machinery exists, means shall be provided to ensure that the safe speed is not exceeded.
2. Where main or auxiliary machinery including pressure vessels or any parts of such machinery are subject to internal pressure and may be subject to dangerous overpressure, means shall be provided where practicable to protect against such excessive pressure.
3. All gearing and every shaft and coupling used for transmission of power to machinery essential for the propulsion and safety of the ship or for the safety of persons on board shall be so designed and constructed that they will withstand the maximum working stresses to which they may be subjected in all service conditions, and due consideration shall be given to the type of engines by which they are driven or of which they form part.
4. Internal combustion engines of a cylinder diameter of 200 mm or a crankcase volume of 0.6 m³ and above shall be provided with crankcase explosion relief valves of a suitable type with sufficient relief area. The relief valves shall be arranged or provided with means to ensure that discharge from them is so directed as to minimize the possibility of injury to personnel.
5. Main turbine propulsion machinery and, where applicable, main internal combustion propulsion machinery and auxiliary machinery shall be provided with automatic shut-off arrangements in the case of failures such as lubricating oil supply failure which could lead rapidly to complete breakdown, serious damage or explosion. The Administration may permit provisions for overriding automatic shut-off devices.

Regulation 28. MEANS OF GOING ASTERN

1. Sufficient power for going astern shall be provided to secure proper control of the ship in all normal circumstances.
2. The ability of the machinery to reverse the direction of thrust of the propeller in sufficient time, and so to bring the ship to rest within a reasonable distance from maximum ahead service speed, shall be demonstrated and recorded.*
3. The stopping times, ship headings and distances recorded on trials, together with the results of trials to determine the ability of ships having multiple propellers to navigate and manoeuvre with one or more propellers inoperative, shall be available on board for the use of the master or designated personnel.*
4. Where the ship is provided with supplementary means for manoeuvring or stopping, the effectiveness of such means shall be demonstrated and recorded as referred to in paragraphs 2 and 3.

Regulation 29. STEERING GEAR

1. Unless expressly provided otherwise, every ship shall be provided with a main steering gear and an auxiliary steering gear to the satisfaction of the Administration. The main steering gear and the auxiliary steering gear shall be so arranged that the failure of one of them will not render the other one inoperative.
- 2.1. All the steering gear components and the rudder stock shall be of sound and reliable construction to the satisfaction of the Administration. Special consideration shall be given to the suitability of any essential component which is not duplicated. Any such essential component shall, where appropriate, utilize anti-friction bearings such as ball bearings, roller bearings or sleeve bearings which shall be permanently lubricated or provided with lubrication fittings.

* Reference is made to the Recommendation on Information to be Included in the Manoeuvring Booklets adopted by the Organization by resolution A.209(VII).

2.2. The design pressure for calculations to determine the scantlings of piping and other steering gear components subjected to internal hydraulic pressure shall be at least 1.25 times the maximum working pressure to be expected under the operational conditions specified in paragraph 3.2, taking into account any pressure which may exist in the low pressure side of the system. At the discretion of the Administration, fatigue criteria shall be applied for the design of piping and components, taking into account pulsating pressures due to dynamic loads.

2.3. Relief valves shall be fitted to any part of the hydraulic system which can be isolated and in which pressure can be generated from the power source or from external forces. The setting of the relief valves shall not exceed the design pressure. The valves shall be of adequate size and so arranged as to avoid an undue rise in pressure above the design pressure.

3. The main steering gear and rudder stock shall be:

1. Of adequate strength and capable of steering the ship at maximum ahead service speed which shall be demonstrated;
2. Capable of putting the rudder over from 35° on one side to 35° on the other side with the ship at its deepest seagoing draught and running ahead at maximum ahead service speed and, under the same conditions, from 35° on either side to 30° on the other side in not more than 28 seconds;
3. Operated by power where necessary to meet the requirements of paragraph 3.2 and in any case when the Administration requires a rudder stock of over 120 mm diameter in way of the tiller, excluding strengthening for navigation in ice; and
4. So designed that they will not be damaged at maximum astern speed; however, this design requirement need not be proved by trials at maximum astern speed and maximum rudder angle.

4. The auxiliary steering gear shall be:

1. Of adequate strength and capable of steering the ship at navigable speed and of being brought speedily into action in an emergency;
2. Capable of putting the rudder over from 15° on one side to 15° on the other side in not more than 60 seconds with the ship at its deepest seagoing draught and running ahead at one half of the maximum ahead service speed or 7 knots, whichever is the greater; and
3. Operated by power where necessary to meet the requirements of paragraph 4.2 and in any case when the Administration requires a rudder stock of over 230 mm diameter in way of the tiller, excluding strengthening for navigation in ice.

5. Main and auxiliary steering gear power units shall be:

1. Arranged to re-start automatically when power is restored after a power failure; and
2. Capable of being brought into operation from a position on the navigating bridge. In the event of a power failure to any one of the steering gear power units, an audible and visual alarm shall be given on the navigating bridge.

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

1. In a passenger ship, the main steering gear is capable of operating the rudder as required by paragraph 3.2 while any one of the power units is out of operation;
2. In a cargo ship, the main steering gear is capable of operating the rudder as required by paragraph 3.2 while operating with all power units;
3. The main steering gear is so arranged that after a single failure in its piping system or in one of the power units the defect can be isolated so that steering capability can be maintained or speedily regained.

6.2. The Administration may, until 1 September 1986, accept the fitting of a steering gear which has a proven record of reliability but does not comply with the requirements of paragraph 6.1.3 for a hydraulic system.

6.3. Steering gears, other than of the hydraulic type, shall achieve standards equivalent to the requirements of this paragraph to the satisfaction of the Administration.

7. Steering gear control shall be provided:

1. For the main steering gear, both on the navigating bridge and in the gear compartment;
2. Where the main steering gear is arranged in accordance with paragraph 6, by two independent control systems, both operable from the navigating bridge. This does not require duplication of the steering wheel or steering lever. Where the control system consists of an hydraulic telemotor, a second independent system need not be fitted, except in a tanker, chemical tanker or gas carrier of 10,000 tons gross tonnage and upwards;
3. For the auxiliary steering gear, in the steering gear compartment and, if power operated, it shall also be operable from the navigating bridge and shall be independent of the control system for the main steering gear.

8. Any main and auxiliary steering gear control system operable from the navigating bridge shall comply with the following:

1. If electric, it shall be served by its own separate circuit supplied from a steering gear power circuit from a point within the steering gear compartment, or directly from switchboard busbars supplying that steering gear power circuit at a point on the switchboard adjacent to the supply to the steering gear power circuit;
2. Means shall be provided in the steering gear compartment for disconnecting any control system operable from the navigating bridge from the steering gear it serves;
3. The system shall be capable of being brought into operation from a position on the navigating bridge;
4. In the event of a failure of electrical power supply to the control system, an audible and visual alarm shall be given on the navigating bridge; and
5. Short circuit protection only shall be provided for steering gear control supply circuits.

9. The electric power circuits and the steering gear control systems with their associated components, cables and pipes required by this regulation and by regulation 30 shall be separated as far as is practicable throughout their length.

10. A means of communication shall be provided between the navigating bridge and the steering gear compartment.

11. The angular position of the rudder shall:

1. If the main steering gear is power operated, be indicated on the navigating bridge. The rudder angle indication shall be independent of the steering gear control system;
2. Be recognizable in the steering gear compartment.

12. Hydraulic power-operated steering gear shall be provided with the following:

1. Arrangements to maintain the cleanliness of the hydraulic fluid taking into consideration the type and design of the hydraulic system;
2. A low level alarm for each hydraulic fluid reservoir to give the earliest practicable indication of hydraulic fluid leakage. Audible and visual alarms shall be given on the navigating bridge and in the machinery space where they can be readily observed; and
3. A fixed storage tank having sufficient capacity to recharge at least one power actuating system including the reservoir, where the main steering gear is required to be power operated. The storage tank shall be permanently connected by piping in such a manner that the hydraulic systems can be readily recharged from a position within the steering gear compartment and shall be provided with a contents gauge.

13. The steering gear compartment shall be:

1. Readily accessible and, as far as practicable, separated from machinery spaces; and
2. Provided with suitable arrangements to ensure working access to steering gear machinery and controls. These arrangements shall include handrails and gratings or other non-slip surfaces to ensure suitable working conditions in the event of hydraulic fluid leakage.

14. Where the rudder stock is required to be over 230 mm diameter in way of the tiller, excluding strengthening for navigation in ice, an alternative power supply, sufficient at least to supply the steering gear power unit which complies with the requirements of paragraph 4.2 and also its associated control system and the rudder angle indicator, shall be provided automatically, within 45 seconds, either from the emergency source of electrical power or from an independent source of power located in the steering gear compartment. This independent source of power shall be used only for this purpose. In every ship of 10,000 tons gross tonnage and upwards, the alternative power supply shall have a capacity for at least 30 minutes of continuous operation and in any other ship for at least 10 minutes.

15. In every tanker, chemical tanker or gas carrier of 10,000 tons gross tonnage and upwards and in every other ship of 70,000 tons gross tonnage and upwards, the main steering gear shall comprise two or more identical power units complying with the provisions of paragraph 6.

16. Every tanker, chemical tanker or gas carrier of 10,000 tons gross tonnage and upwards shall, subject to paragraph 17, comply with the following:

1. The main steering gear shall be so arranged that in the event of loss of steering capability due to a single failure in any part of one of the power actuating systems of the main steering gear, excluding the tiller, quadrant or components serving the same purpose, or seizure of the rudder actuators, steering capability shall be regained in not more than 45 seconds after the loss of one power actuating system;
2. The main steering gear shall comprise either:
 - 2.1. Two independent and separate power actuating systems, each capable of meeting the requirements of paragraph 3.2; or
 - 2.2. At least two identical power actuating systems which, acting simultaneously in normal operation, shall be capable of meeting the requirements of paragraph 3.2. Where necessary to comply with this requirement, inter-connexion of hydraulic power actuating systems shall be provided. Loss of hydraulic fluid from one system shall be capable of being detected and the defective system automatically isolated so that the other actuating system or systems shall remain fully operational;
3. Steering gears other than of the hydraulic type shall achieve equivalent standards.

17. For tankers, chemical tankers or gas carriers of 10,000 tons gross tonnage and upwards, but of less than 100,000 tonnes deadweight, solutions other than those set out in paragraph 16, which need not apply the single failure criterion to the rudder actuator or actuators, may be permitted provided that an equivalent safety standard is achieved and that:

1. Following loss of steering capability due to a single failure of any part of the piping system or in one of the power units, steering capability shall be regained within 45 seconds; and
2. Where the steering gear includes only a single rudder actuator, special consideration is given to stress analysis for the design including fatigue analysis and fracture mechanics analysis, as appropriate, to the material used, to the installation of sealing arrangements and to testing and inspection and to the provision of effective maintenance. In consideration of the foregoing, the Administration shall adopt regulations which include the provisions of the Guidelines for Acceptance of Non-Duplicated Rudder Actuators for Tankers,

Chemical Tankers and Gas Carriers of 10,000 Tons Gross Tonnage and Above but Less than 100,000 Tonnes Deadweight, adopted by the Organization.*

18. For a tanker, chemical tanker or gas carrier of 10,000 tons gross tonnage and upwards, but less than 70,000 tonnes deadweight, the Administration may, until 1 September 1986, accept a steering gear system with a proven record of reliability which does not comply with the single failure criterion required for a hydraulic system in paragraph 16.

19. Every tanker, chemical tanker or gas carrier of 10,000 tons gross tonnage and upwards, constructed before 1 September 1984, shall comply, not later than 1 September 1986, with the following:

1. The requirements of paragraphs 7.1, 8.2, 8.4, 10, 11, 12.2, 12.3 and 13.2;
2. Two independent steering gear control systems shall be provided each of which can be operated from the navigating bridge. This does not require duplication of the steering wheel or steering lever;
3. If the steering gear control system in operation fails, the second system shall be capable of being brought into immediate operation from the navigating bridge; and
4. Each steering gear control system, if electric, shall be served by its own separate circuit supplied from the steering gear power circuit or directly from switchboard busbars supplying that steering gear power circuit at a point on the switchboard adjacent to the supply to the steering gear power circuit.

20. In addition to the requirements of paragraph 19, in every tanker, chemical tanker or gas carrier of 40,000 tons gross tonnage and upwards, constructed before 1 September 1984, the steering gear shall, not later than 1 September 1988, be so arranged that, in the event of a single failure of the piping or of one of the power units, steering capability can be maintained or the rudder movement can be limited so that steering capability can be speedily regained. This shall be achieved by:

1. An independent means of restraining the rudder; or
2. Fast acting valves which may be manually operated to isolate the actuators from the external hydraulic piping together with a means of directly refilling the actuators by a fixed independent power-operated pump and piping system; or
3. An arrangement such that, where hydraulic power systems are interconnected, loss of hydraulic fluid from one system shall be detected and the defective system isolated either automatically or from the navigating bridge so that the other system remains fully operational.

Regulation 30. ADDITIONAL REQUIREMENTS FOR ELECTRIC AND ELECTROHYDRAULIC STEERING GEAR

1. Means for indicating that the motors of electric and electrohydraulic steering gear are running shall be installed on the navigating bridge and at a suitable main machinery control position.

2. Each electric or electrohydraulic steering gear comprising one or more power units shall be served by at least two exclusive circuits fed directly from the main switchboard; however, one of the circuits may be supplied through the emergency switchboard. An auxiliary electric or electrohydraulic steering gear associated with a main electric or electrohydraulic steering gear may be connected to one of the circuits supplying this main steering gear. The circuits supplying an electric or electrohydraulic steering gear shall have adequate rating for sup-

* Reference is made to the Guidelines for Acceptance of Non-Duplicated Rudder Actuators for Tankers, Chemical Tankers and Gas Carriers of 10,000 Tons Gross Tonnage and Above but Less than 100,000 Tonnes Deadweight, adopted by the Organization by resolution A.467(XII).

plying all motors which can be simultaneously connected to them and may be required to operate simultaneously.

3. Short circuit protection and an overload alarm shall be provided for such circuits and motors. Protection against excess current, including starting current, if provided, shall be for not less than twice the full load current of the motor or circuit so protected, and shall be arranged to permit the passage of the appropriate starting currents. Where a three-phase supply is used an alarm shall be provided that will indicate failure of any one of the supply phases. The alarms required in this paragraph shall be both audible and visual and shall be situated in a conspicuous position in the main machinery space or control room from which the main machinery is normally controlled and as may be required by regulation 51.

4. When in a ship of less than 1,600 tons gross tonnage an auxiliary steering gear which is required by regulation 29.4.3 to be operated by power is not electrically powered or is powered by an electric motor primarily intended for other services, the main steering gear may be fed by one circuit from the main switchboard. Where such an electric motor primarily intended for other services is arranged to power such an auxiliary steering gear, the requirement of paragraph 3 may be waived by the Administration if satisfied with the protection arrangement together with the requirements of [regulations] 29.5.1 and 2 and 29.7.3 applicable to auxiliary steering gear.

Regulation 31. MACHINERY CONTROLS

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

2. Where remote control of propulsion machinery from the navigating bridge is provided and the machinery spaces are intended to be manned, the following shall apply:

1. The speed, direction of thrust and, if applicable, the pitch of the propeller shall be fully controllable from the navigating bridge under all sailing conditions, including manoeuvring;
2. The remote control shall be performed, for each independent propeller, by a control device so designed and constructed that its operation does not require particular attention to the operational details of the machinery. Where multiple propellers are designed to operate simultaneously, they may be controlled by one control device;
3. The main propulsion machinery shall be provided with an emergency stopping device on the navigating bridge which shall be independent of the navigating bridge control system;
4. Propulsion machinery orders from the navigating bridge shall be indicated in the main machinery control room or at the manoeuvring platform as appropriate;
5. Remote control of the propulsion machinery shall be possible only from one location at a time; at such locations interconnected control positions are permitted. At each location there shall be an indicator showing which location is in control of the propulsion machinery. The transfer of control between the navigating bridge and machinery spaces shall be possible only in the main machinery space or the main machinery control room. This system shall include means to prevent the propelling thrust from altering significantly when transferring control from one location to another;
6. It shall be possible to control the propulsion machinery locally, even in the case of failure in any part of the remote control system;
7. The design of the remote control system shall be such that in case of its failure an alarm will be given. Unless the Administration considers it impracticable the preset speed and direction of thrust of the propeller shall be maintained until local control is in operation;
8. Indicators shall be fitted on the navigating bridge for:
 - 8.1. Propeller speed and direction of rotation in the case of fixed pitch propellers;
 - 8.2. Propeller speed and pitch position in the case of controllable pitch propellers;

9. An alarm shall be provided on the navigating bridge and in the machinery space to indicate low starting air pressure which shall be set at a level to permit further main engine starting operations. If the remote control system of the propulsion machinery is designed for automatic starting, the number of automatic consecutive attempts which fail to produce a start shall be limited in order to safeguard sufficient starting air pressure for starting locally.

3. Where the main propulsion and associated machinery, including sources of main electrical supply, are provided with various degrees of automatic or remote control and are under continuous manual supervision from a control room the arrangements and controls shall be so designed, equipped and installed that the machinery operation will be as safe and effective as if it were under direct supervision; for this purpose regulations 46 to 50 shall apply as appropriate. Particular consideration shall be given to protect such spaces against fire and flooding.

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

Regulation 32. STEAM BOILERS AND BOILER FEED SYSTEMS

1. Every steam boiler and every unfired steam generator shall be provided with not less than two safety valves of adequate capacity. However, having regard to the output or any other features of any boiler or unfired steam generator, the Administration may permit only one safety valve to be fitted if it is satisfied that adequate protection against overpressure is thereby provided.

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

3. Water tube boilers serving turbine propulsion machinery shall be fitted with a high-water-level alarm.

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

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

6. Every boiler essential for the safety of the ship and designed to contain water at a specified level shall be provided with at least two means for indicating its water level, at least one of which shall be a direct reading gauge glass.

Regulation 33. STEAM PIPE SYSTEMS

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

2. Means shall be provided for draining every steam pipe in which dangerous water hammer action might otherwise occur.

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

Regulation 34. AIR PRESSURE SYSTEMS

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

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

3. All discharge pipes from starting air compressor^{*} shall lead directly to the starting air receivers, and all starting pipes from the air receivers to main or auxiliary engines shall be entirely separate from the compressor discharge pipe system.

4. Provision shall be made to reduce to a minimum the entry of oil into the air pressure systems and to drain these systems.

Regulation 35. VENTILATING SYSTEMS IN MACHINERY SPACES

Machinery spaces of category A shall be adequately ventilated so as to ensure that when machinery or boilers therein are operating at full power in all weather conditions including heavy weather, an adequate supply of air is maintained to the spaces for the safety and comfort of personnel and the operation of the machinery. Any other machinery space shall be adequately ventilated appropriate for the purpose of that machinery space.

Regulation 36. PROTECTION AGAINST NOISE*

Measures shall be taken to reduce machinery noise in machinery spaces to acceptable levels as determined by the Administration. If this noise cannot be sufficiently reduced the source of excessive noise shall be suitably insulated or isolated or a refuge from noise shall be provided if the space is required to be manned. Ear protectors shall be provided for personnel required to enter such spaces, if necessary.

Regulation 37. COMMUNICATION BETWEEN NAVIGATING BRIDGE AND MACHINERY SPACE

At least two independent means shall be provided for communicating orders from the navigating bridge to the position in the machinery space or in the control room from which the engines are normally controlled: one of these shall be an engine room telegraph which provides visual indication of the orders and responses both in the machinery space and on the navigating bridge. Appropriate means of communication shall be provided to any other positions from which the engines may be controlled.

Regulation 38. ENGINEERS' ALARM

An engineers' alarm shall be provided to be operated from the engine control room or at the manoeuvring platform as appropriate, and shall be clearly audible in the engineers' accommodation.

Regulation 39. LOCATION OF EMERGENCY INSTALLATIONS IN PASSENGER SHIPS

Emergency sources of electrical power, fire pumps, bilge pumps except those specifically serving the spaces forward of the collision bulkhead, any fixed fire-extinguishing system required by chapter II-2 and other emergency installations which are essential for the safety of the ship, except anchor windlasses, shall not be installed forward of the collision bulkhead.

* Reference is made to the Code on Noise Levels on Board Ships, adopted by the Organization by resolution A.468(XII).

PART D. ELECTRICAL INSTALLATIONS

(Except where expressly provided otherwise part D applies to passenger ships and cargo ships)

Regulation 40. GENERAL

1. Electrical installations shall be such that:
 1. All electrical auxiliary services necessary for maintaining the ship in normal operational and habitable conditions will be ensured without recourse to the emergency source of electrical power;
 2. Electrical services essential for safety will be ensured under various emergency conditions; and
 3. The safety of passengers, crew and ship from electrical hazards will be ensured.
2. The Administration shall take appropriate steps to ensure uniformity in the implementation and application of the provisions of this Part in respect of electrical installations.*

Regulation 41. MAIN SOURCE OF ELECTRICAL POWER AND LIGHTING SYSTEMS

1.1. A main source of electrical power of sufficient capacity to supply all those services mentioned in regulation 40.1.1 shall be provided. This main source of electrical power shall consist of at least two generating sets.

1.2. The capacity of these generating sets shall be such that in the event of any one generating set being stopped it will still be possible to supply those services necessary to provide normal operational conditions of propulsion and safety. Minimum comfortable conditions of habitability shall also be ensured which include at least adequate services for cooking, heating, domestic refrigeration, mechanical ventilation, sanitary and fresh water.

1.3. The arrangements of the ship's main source of electrical power shall be such that the services referred to in regulation 40.1.1 can be maintained regardless of the speed and direction [of rotation] of the propulsion machinery or shafting.

1.4. In addition, the generating sets shall be such as to ensure that with any one generator or its primary source of power out of operation, the remaining generating sets shall be capable of providing the electrical services necessary to start the main propulsion plant from a dead ship condition. The emergency source of electrical power may be used for the purpose of starting from a dead ship condition if its capability either alone or combined with that of any other source of electrical power is sufficient to provide at the same time those services required to be supplied by regulations 42.2.1 to 42.2.3 or 43.2.1 to 43.2.4.

1.5. Where transformers constitute an essential part of the electrical supply system required by this paragraph, the system shall be so arranged as to ensure the same continuity of the supply as is stated in this paragraph.

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

2.2. The arrangement of the main electric lighting system shall be such that a fire or other casualty in spaces containing the main source of electrical power, associated transforming equipment, if any, the main switchboard and the main lighting switchboard, will not render the emergency electric lighting system required by regulations 42.2.1 and 42.2.2 or 43.2.1, 43.2.2 and 43.2.3 inoperative.

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

* Reference is made to the Recommendations published by the International Electrotechnical Commission and, in particular, Publication 92 — Electrical Installations in Ships.

3. The main switchboard shall be so placed relative to one main generating station that, as far as is practicable, the integrity of the normal electrical supply may be affected only by a fire or other casualty in one space. An environmental enclosure for the main switchboard such as may be provided by a machinery control room situated within the main boundaries of the space, is not to be considered as separating the switchboards from the generators.

4. Where the total installed electrical power of the main generating sets is in excess of 3 MW, the main busbars shall be subdivided into at least two parts which shall normally be connected by removable links or other approved means; so far as is practicable, the connexion of generating sets and any other duplicated equipment shall be equally divided between the parts. Equivalent arrangements may be permitted to the satisfaction of the Administration.

Regulation 42. EMERGENCY SOURCE OF ELECTRICAL POWER IN PASSENGER SHIPS

1.1. A self-contained emergency source of electrical power shall be provided.

1.2. The emergency source of electrical power, associated transforming equipment, if any, transitional source of emergency power, emergency switchboard and emergency lighting switchboard shall be located above the uppermost continuous deck and shall be readily accessible from the open deck. They shall not be located forward of the collision bulkhead.

1.3. The location of the emergency source of electrical power and associated transforming equipment, if any, the transitional source of emergency power, the emergency switchboard and the emergency electric lighting switchboards in relation to the main source of electrical power, associated transforming equipment, if any, and the main switchboard shall be such as to ensure to the satisfaction of the Administration that a fire or other casualty in spaces containing the main source of electrical power, associated transforming equipment, if any, and the main switchboard or in any machinery space of category A will not interfere with the supply, control and distribution of emergency electrical power. As far as practicable, the space containing the emergency source of electrical power, associated transforming equipment, if any, the transitional source of emergency electrical power and the emergency switchboard shall not be contiguous to the boundaries of machinery spaces of category A or those spaces containing the main source of electrical power, associated transforming equipment, if any, or the main switchboard.

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

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

2.1. For a period of 36 hours, emergency lighting:

1. At every embarkation station on deck and over sides as required by regulations III/19 and III/30;
2. In all service and accommodation alleyways, stairways and exits, personnel lift cars;
3. In the machinery spaces and main generating stations including their control positions;
4. In all control stations, machinery control rooms, and at each main and emergency switchboard;
5. At all stowage positions for firemen's outfits;
6. At the steering gear; and
7. At the fire pump, the sprinkler pump and the emergency bilge pump referred to in paragraph 2.4 and at the starting position of their motors.

2.2. For a period of 36 hours, the navigation lights and other lights required by the International Regulations for Preventing Collisions at Sea in force.

2.3. For a period of 36 hours:

1. All internal communication equipment required in an emergency;
 2. The navigational aids as required by regulation V/12; where such provision is unreasonable or impracticable the Administration may waive this requirement for ships of less than 5,000 tons gross tonnage;
 3. The fire detection and fire alarm system, and the fire door holding and release system, and
 4. For intermittent operation of the daylight signalling lamp, the ship's whistle, the [manually operated call points] and all internal signals that are required in an emergency;
- unless such services have an independent supply for the period of 36 hours from an accumulator battery suitably located for use in an emergency.

2.4. For a period of 36 hours:

1. One of the fire pumps required by regulation 11-2/4.3.1 and 4.3.3;
2. The automatic sprinkler pump, if any; and
3. The emergency bilge pump and all the equipment essential for the operation of electrically powered remote controlled bilge valves.

2.5. For the period of time required by regulation 29.14 the steering gear if required to be so supplied by that regulation.

2.6. For a period of half an hour:

1. Any watertight doors required by regulation 15 to be power operated together with their indicators and warning signals. Provided the requirements of regulation 15.9.2 are complied with, sequential operation of the doors may be permitted providing all doors can be closed in 60 seconds;
2. The emergency arrangements to bring the lift cars to deck level for the escape of persons. The passenger lift cars may be brought to deck level sequentially in an emergency.

2.7. In a ship engaged regularly on voyages of short duration, the Administration if satisfied that an adequate standard of safety would be attained may accept a lesser period than the 36 hour period specified in paragraphs 2.1 to 2.5 but not less than 12 hours.

3. The emergency source of electrical power may be either a generator or an accumulator battery, which shall comply with the following:

3.1. Where the emergency source of electrical power is a generator, it shall be:

1. Driven by a suitable prime-mover with an independent supply of fuel having a flashpoint (closed cup test) of not less than 43°C;
2. Started automatically upon failure of the electrical supply from the main source of electrical power and shall be automatically connected to the emergency switchboard; those services referred to in paragraph 4 shall then be transferred automatically to the emergency generating set. The automatic starting system and the characteristic of the prime-mover shall be such as to permit the emergency generator to carry its full rated load as quickly as is safe and practicable, subject to a maximum of 45 seconds; unless a second independent means of starting the emergency generating set is provided, the single source of stored energy shall be protected to preclude its complete depletion by the automatic starting system; and
3. Provided with a transitional source of emergency electrical power according to paragraph 4.

3.2. Where the emergency source of electrical power is an accumulator battery, it shall be capable of:

1. Carrying the emergency electrical load without recharging while maintaining the voltage of the battery throughout the discharge period within 12 per cent above or below its nominal voltage;
2. Automatically connecting to the emergency switchboard in the event of failure of the main source of electrical power; and
3. Immediately supplying at least those services specified in paragraph 4.

4. The transitional source of emergency electrical power required by paragraph 3.1.3 shall consist of an accumulator battery suitably located for use in an emergency which shall operate without recharging while maintaining the voltage of the battery throughout the discharge period within 12 per cent above or below its nominal voltage and be of sufficient capacity and so arranged as to supply automatically in the event of failure of either the main or emergency source of electrical power at least the following services, if they depend upon an electrical source for their operation:

4.1. For half an hour:

1. The lighting required by paragraphs 2.1 and 2.2;
2. All services required by paragraphs 2.3.1, 2.3.3 and 2.3.4 unless such services have an independent supply for the period specified from an accumulator battery suitably located for use in an emergency.

4.2. Power to close the watertight doors but not necessarily all of them simultaneously, together with their indicators and warning signals as required by paragraph 2.6.1.

5.1. The emergency switchboard shall be installed as near as is practicable to the emergency source of electrical power.

5.2. Where the emergency source of electrical power is a generator, the emergency switchboard shall be located in the same space unless the operation of the emergency switchboard would thereby be impaired.

5.3. No accumulator battery fitted in accordance with this regulation shall be installed in the same space as the emergency switchboard. An indicator shall be mounted in a suitable place on the main switchboard or in the machinery control room to indicate when the batteries constituting either the emergency source of electrical power or the transitional source of emergency electrical power referred to in paragraph 3.1.3 or 4 are being discharged.

5.4. The emergency switchboard shall be supplied during normal operation from the main switchboard by an interconnector feeder which is to be adequately protected at the main switchboard against overload and short circuit and which is to be disconnected automatically at the emergency switchboard upon failure of the main source of electrical power. Where the system is arranged for feedback operation, the interconnector feeder is also to be protected at the emergency switchboard at least against short circuit.

5.5. In order to ensure ready availability of the emergency source of electrical power, arrangements shall be made where necessary to disconnect automatically non-emergency circuits from the emergency switchboard to ensure that power shall be available to the emergency circuits.

6. The emergency generator and its prime-mover and any emergency accumulator battery shall be so designed and arranged as to ensure that they will function at full rated power when the ship is upright and when inclined at any angle of list up to 22.5° or when inclined up to 10° either in the fore or aft direction, or is in any combination of angles within those limits.

7. Provision shall be made for the periodic testing of the complete emergency system and shall include the testing of automatic starting arrangements.

Regulation 43. EMERGENCY SOURCE OF ELECTRICAL POWER IN CARGO SHIPS

1.1. A self-contained emergency source of electrical power shall be provided.

1.2. The emergency source of electrical power, associated transforming equipment, if any, transitional source of emergency power, emergency switchboard and emergency lighting switchboard shall be located above the [uppermost] continuous deck and shall be readily accessible from the open deck. They shall not be located forward of the collision bulkhead, except where permitted by the Administration in exceptional circumstances.

1.3. The location of the emergency source of electrical power, associated transforming equipment, if any, the transitional source of emergency power, the emergency switchboard and the emergency lighting switchboard in relation to the main source of electrical power, associated transforming equipment, if any, and the main switchboard shall be such as to ensure to the satisfaction of the Administration that a fire or other casualty in the space containing the main source of electrical power, associated transforming equipment, if any, and the main switchboard, or in any machinery space of category A will not interfere with the supply, control and distribution of emergency electrical power. As far as practicable the [space] containing the emergency source of electrical power, associated transforming equipment, if any, the transitional source of emergency electrical power and the emergency switchboard shall not be contiguous to the boundaries of machinery spaces of category A or those spaces containing the main source of electrical power, associated transforming equipment, if any, and the main switchboard.

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

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

2.1. For a period of 3 hours, emergency lighting at every embarkation station on deck and over sides as required by regulations III/19 and III/38.

2.2. For a period of 18 hours, emergency lighting:

1. In all service and accommodation alleyways stairways and exits, personnel lift cars and personnel lift trunks;
2. In the machinery spaces and main generating stations including their control positions;
3. In all control stations, machinery control rooms, and at each main and emergency switchboard;
4. At all stowage positions for firemen's outfits;
5. At the steering gear; and
6. At the fire pump referred to in paragraph 2.5, at the sprinkler pump, if any, and at the emergency bilge pump, if any, and at the starting positions of their motors.

2.3. For a period of 18 hours, the navigation lights and other lights required by the International Regulations for Preventing Collisions at Sea in force.

2.4. For a period of 18 hours:

1. All internal communication equipment as required in an emergency;
2. The navigational aids as required by regulation V/12; where such provision is unreasonable or impracticable the Administration may waive this requirement for ships of less than 5,000 tons gross tonnage;
3. The fire detection and fire alarm system; and

4. Intermittent operation of the daylight signalling lamp, the ship's whistle, the [manually operated call points] and all internal signals that are required in an emergency; unless such services have an independent supply for the period of 18 hours from an accumulator battery suitably located for use in an emergency.

2.5. For a period of 18 hours one of the fire pumps required by regulation II-2/4.3.1 and 4.3.3 if dependent upon the emergency generator for its source of power.

2.6.1. For the period of time required by regulation 29.14 the steering gear where it is required to be so supplied by that regulation.

2.6.2. In a ship engaged regularly in voyages of short duration, the Administration if satisfied that an adequate standard of safety would be attained may accept a lesser period than the 18 hour period specified in paragraphs 2.2 to 2.5 but not less than 12 hours.

3. The emergency source of electrical power may be either a generator or an accumulator battery, which shall comply with the following:

3.1. Where the emergency source of electrical power is a generator, it shall be:

1. Driven by a suitable prime-mover with an independent supply of fuel, having a flashpoint (closed cup test) of not less than 43°C;
2. Started automatically upon failure of the main source of electrical power supply unless a transitional source of emergency electrical power in accordance with paragraph 3.1.3 is provided; where the emergency generator is automatically started, it shall be automatically connected to the emergency switchboard; those services referred to in paragraph 4 shall then be connected automatically to the emergency generator; and unless a second independent means of starting the emergency generator is provided the single source of stored energy shall be protected to preclude its complete depletion by the automatic starting system; and
3. Provided with a transitional source of emergency electrical power as specified in paragraph 4 unless an emergency generator is provided capable both of supplying the services mentioned in that paragraph and of being automatically started and supplying the required load as quickly as is safe and practicable subject to a maximum of 45 seconds.

3.2. Where the emergency source of electrical power is an accumulator battery it shall be capable of:

1. Carrying the emergency electrical load without recharging while maintaining the voltage of the battery throughout the discharge period within 12 per cent above or below its nominal voltage;
2. Automatically connecting to the emergency switchboard in the event of failure of the main source of electrical power; and
3. Immediately supplying at least those services specified in paragraph 4.

4. The transitional source of emergency electrical power where required by paragraph 3.1.3 shall consist of an accumulator battery suitably located for use in an emergency which shall operate without recharging while maintaining the voltage of the battery throughout the discharge period within 12 per cent above or below its nominal voltage and be of sufficient capacity and shall be so arranged as to supply automatically in the event of failure of either the main or the emergency source of electrical power for half an hour at least the following services if they depend upon an electrical source for their operation:

1. The lighting required by paragraphs 2.1, 2.2 and 2.3. For this transitional phase, the required emergency electric lighting, in respect of the machinery space and accommodation and service spaces may be provided by permanently fixed, individual, automatically charged, relay operated accumulator lamps; and

2. All services required by paragraphs 2.4.1, 2.4.3 and 2.4.4 unless such services have an independent supply for the period specified from an accumulator battery suitably located for use in an emergency.

5.1. The emergency switchboard shall be installed as near as is practicable to the emergency source of electrical power.

5.2. Where the emergency source of electrical power is a generator, the emergency switchboard shall be located in the same space unless the operation of the emergency switchboard would thereby be impaired.

5.3. No accumulator battery fitted in accordance with this regulation shall be installed in the same space as the emergency switchboard. An indicator shall be mounted in a suitable place on the main switchboard or in the machinery control room to indicate when the batteries constituting either the emergency source of electrical power or the transitional source of electrical power referred to in paragraph 3.2 or 4 are being discharged.

5.4. The emergency switchboard shall be supplied during normal operation from the main switchboard by an interconnector feeder which is to be adequately protected at the main switchboard against overload and short circuit and which is to be disconnected automatically at the emergency switchboard upon failure of the main source of electrical power. Where the system is arranged for feedback operation, the interconnector feeder is also to be protected at the emergency switchboard at least against short circuit.

5.5. In order to ensure ready availability of the emergency source of electrical power, arrangements shall be made where necessary to disconnect automatically non-emergency circuits from the emergency switchboard to ensure that electrical power shall be available automatically to the emergency circuits.

6. The emergency generator and its prime-mover and any emergency accumulator battery shall be so designed and arranged as to ensure that they will function at full rated power when the ship is upright and when inclined at any angle of list up to 22.5° or when inclined up to 10° either in the fore or aft direction, or is in any combination of angles within those limits.

7. Provision shall be made for the periodic testing of the complete emergency system and shall include the testing of automatic starting arrangements.

Regulation 44. STARTING ARRANGEMENTS FOR EMERGENCY GENERATING SETS

1. Emergency generating sets shall be capable of being readily started in their cold condition at a temperature of 0 °C. If this is impracticable, or if lower temperatures are likely to be encountered, provision acceptable to the Administration shall be made for the maintenance of heating arrangements, to ensure ready starting of the generating sets.

2. Each emergency generating set arranged to be automatically started shall be equipped with starting devices approved by the Administration with a stored energy capability of at least three consecutive starts. A second source of energy shall be provided for an additional three starts within 30 minutes unless manual starting can be demonstrated to be effective.

3. The stored energy shall be maintained at all times as follows:

1. Electrical and hydraulic starting systems shall be maintained from the emergency switchboard;
2. Compressed air starting systems may be maintained by the main or auxiliary compressed air receivers through a suitable non-return valve or by an emergency air compressor which, if electrically driven, is supplied from the emergency switchboard;
3. All of these starting, charging and energy storing devices shall be located in the emergency generator space; these devices are not to be used for any purpose other than the operation of the emergency generating set. This does not preclude the supply to the air receiver of the emergency generating set from the main or auxiliary compressed air system through the non-return valve fitted in the emergency generator space.

4.1. Where automatic starting is not required, manual starting is permissible, such as manual cranking, inertia starters, manually charged hydraulic accumulators, or powder charge cartridges, where they can be demonstrated as being effective.

4.2. When manual starting is not practicable, the requirements of paragraphs 2 and 3 shall be complied with except that starting may be manually initiated.

**Regulation 45. PRECAUTIONS AGAINST SHOCK, FIRE AND OTHER HAZARDS
OF ELECTRICAL ORIGIN**

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

1. Supplied at a voltage not exceeding 55 V direct current or 55 V, root mean square between conductors; auto-transformers shall not be used for the purpose of achieving this voltage; or
2. Supplied at a voltage not exceeding 250 V by safety isolating transformers supplying only one consuming device; or
3. Constructed in accordance with the principle of double insulation.

1.2. The Administration may require additional precautions for portable electrical equipment for use in confined or exceptionally damp spaces where particular risks due to conductivity may exist.

1.3. All electrical apparatus shall be so constructed and so installed as not to cause injury when handled or touched in the normal manner.

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

3.1. The hull return system of distribution shall not be used for any purpose in a tanker, or for power, heating, or lighting in any other ship of 1,600 tons gross tonnage and upwards.

3.2. The requirement of paragraph 3.1 does not preclude under conditions by the Administration the use of:

1. Impressed current cathodic protective systems;
2. Limited and locally earthed systems; or
3. Insulation level monitoring devices provided the circulation current does not exceed 30 mA under the most unfavourable conditions.

3.3. Where the hull return system is used, all final subcircuits, i.e. all circuits after the last protective device, shall be two-wire and special precautions shall be taken to the satisfaction of the Administration.

4.1. Earthed distribution systems shall not be used in a tanker. The Administration may exceptionally permit in a tanker the earthing of the neutral for alternating current power networks of 3,000 V (line to line) and over, provided that any possible resulting current does not flow directly through any of the dangerous spaces.

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

5.1. Except as permitted by the Administration in exceptional circumstances, all metal sheaths and armour of cables shall be electrically continuous and shall be earthed.

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

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

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

5.5. Cables and wiring shall be installed and supported in such a manner as to avoid chaffing or other damage.

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

6.1. Each separate circuit shall be protected against short circuit and against overload, except as permitted in regulations 29 and 30 or where the Administration may exceptionally otherwise permit.

6.2. The rating or appropriate setting of the overload protective device for each circuit shall be permanently indicated at the location of the protective device.

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

8. All lighting and power circuits terminating in a bunker or cargo space shall be provided with a multiple pole switch outside the space for disconnecting such circuits.

9.1. Accumulator batteries shall be suitably housed, and compartments used primarily for their accommodation shall be properly constructed and efficiently ventilated.

9.2. Electrical or other equipment which may constitute a source of ignition of flammable vapours shall not be permitted in these compartments except as permitted in paragraph 10.

9.3. Accumulator batteries shall not be located in sleeping quarters except where hermetically sealed to the satisfaction of the Administration.

10. No electrical equipment shall be installed in any space where flammable mixtures are liable to collect including those on board tankers or in compartments assigned principally to accumulator batteries, in paint lockers, acetylene stores or similar spaces, unless the Administration is satisfied that such equipment is:

1. Essential for operational purposes;
2. Of a type which will not ignite the mixture concerned;
3. Appropriate to the space concerned; and
4. Appropriately certified for safe usage in the dusts, vapours or gases likely to be encountered.

11. In a passenger ship, distribution systems shall be so arranged that fire in any main vertical zone as is defined in regulation 11-2/3.9 will not interfere with services essential for safety in any other such zone. This requirement will be met if main and emergency feeders passing through any such zone are separated both vertically and horizontally as widely as is practicable.

**PART E. ADDITIONAL REQUIREMENTS FOR
PERIODICALLY UNATTENDED MACHINERY SPACES**
(Part E applies to cargo ships except that regulation 54 refers to passenger ships)

Regulation 46. GENERAL

1. The arrangements provided shall be such as to ensure that the safety of the ship in all sailing conditions, including manoeuvring, is equivalent to that of a ship having the machinery spaces manned.
2. Measures shall be taken to the satisfaction of the Administration to ensure that the equipment is functioning in a reliable manner and that satisfactory arrangements are made for regular inspections and routine tests to ensure continuous reliable operation.
3. Every ship shall be provided with documentary evidence, to the satisfaction of the Administration, of its fitness to operate with periodically unattended machinery spaces.

Regulation 47. FIRE PRECAUTIONS

1. Means shall be provided to detect and give alarms at an early stage in case of fires:
 1. In boiler air supply casings and exhausts (uptakes); and
 2. In scavenging air belts of propulsion machinery,unless the Administration considers this to be unnecessary in a particular case.
2. Internal combustion engines of 2250 kW and above or having cylinders of more than 300 mm bore shall be provided with crankcase oil mist detectors or engine bearing temperature monitors or equivalent devices.

Regulation 48. PROTECTION AGAINST FLOODING

1. Bilge wells in periodically unattended machinery spaces shall be located and monitored in such a way that the accumulation of liquids is detected at normal angles of trim and heel, and shall be large enough to accommodate easily the normal drainage during the unattended period.
2. Where the bilge pumps are capable of being started automatically, means shall be provided to indicate when the influx of liquid is greater than the pump capacity or when the pump is operating more frequently than would normally be expected. In these cases, smaller bilge wells to cover a reasonable period of time may be permitted. Where automatically controlled bilge pumps are provided, special attention shall be given to oil pollution prevention requirements.
3. The location of the controls of any valve serving a sea inlet, a discharge below the water-line or a bilge injection system shall be so sited as to allow adequate time for operation in case of influx of water to the space, having regard to the time likely to be required in order to reach and operate such controls. If the level to which the space could become flooded with the ship in the fully loaded condition so requires, arrangements shall be made to operate the controls from a position above such level.

Regulation 49. CONTROL OF PROPULSION MACHINERY FROM THE NAVIGATING BRIDGE

1. Under all sailing conditions, including manoeuvring, the speed, direction of thrust and, if applicable, the pitch of the propeller shall be fully controllable from the navigating bridge.
 - 1.1. Such remote control shall be performed by a single control device for each independent propeller, with automatic performance of all associated services, including, where necessary, means of preventing overload of the propulsion machinery.

1.2. The main propulsion machinery shall be provided with an emergency stopping device on the navigating bridge which shall be independent of the navigating bridge control system.

2. Propulsion machinery orders from the navigating bridge shall be indicated in the main machinery control room or at the propulsion machinery control position as appropriate.

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

4. It shall be possible for all machinery essential for the safe operation of the ship to be controlled from a local position, even in the case of failure in any part of the automatic or remote control systems.

5. The design of the remote automatic control system shall be such that in case of its failure an alarm will be given. Unless the Administration considers it impracticable, the preset speed and direction of thrust [of the propeller] shall be maintained until local control is in operation.

6. Indicators shall be fitted on the navigating bridge for:

1. Propeller speed and direction of rotation in [the] case of fixed pitch propellers; or
2. Propeller speed and pitch position in [the] case of controllable pitch propellers.

7. The number of consecutive automatic attempts which fail to produce a start shall be limited to safeguard sufficient starting air pressure. An alarm shall be provided to indicate low starting air pressure set at a level which still permits starting operations of the propulsion machinery.

Regulation 50. COMMUNICATION

A reliable means of vocal communication shall be provided between the main machinery control room or the propulsion machinery control position as appropriate, the navigating bridge and the engineer officers' accommodation.

Regulation 51. ALARM SYSTEM

1. An alarm system shall be provided indicating any fault requiring attention and shall:

1. Be capable of sounding an audible alarm in the main machinery control room or at the propulsion machinery control position, and indicate visually each separate alarm function at a suitable position;
2. Have a connexion to the engineers' public rooms and to each of the engineers' cabins through a selector switch, to ensure connexion to at least one of those cabins. Administrations may permit equivalent arrangements;
3. Activate an audible and visual alarm on the navigating bridge for any situation which requires action by or attention of the officer on watch;
4. As far as is practicable be designed on the fail-to-safety principle; and
5. Activate the engineers' alarm required by regulation 38 if an alarm function has not received attention locally within a limited time.

2.1. The alarm system shall be continuously powered and shall have an automatic change-over to a stand-by power supply in case of loss of normal power supply.

2.2. Failure of the normal power supply of the alarm system shall be indicated by an alarm.

3.1. The alarm system shall be able to indicate at the same time more than one fault and the acceptance of any alarm shall not inhibit another alarm.

3.2. Acceptance at the position referred to in paragraph 1 of any alarm condition shall be indicated at the positions where it was shown. Alarms shall be maintained until they are accepted and the visual indications of individual alarms shall remain until the fault has been corrected, when the alarm system shall automatically reset to the normal operating condition.

Regulation 52. SAFETY SYSTEMS

A safety system shall be provided to ensure that serious malfunction in machinery or boiler operations, which presents an immediate danger, shall initiate the automatic shut-down of that part of the plant and that an alarm shall be given. Shut-down of the propulsion system shall not be automatically activated except in cases which could lead to serious damage, complete breakdown, or explosion. Where arrangements for overriding the shut-down of the main propelling machinery are fitted, these shall be such as to preclude inadvertent operation. Visual means shall be provided to indicate when the override has been activated.

Regulation 53. SPECIAL REQUIREMENTS FOR MACHINERY, BOILER AND ELECTRICAL INSTALLATIONS

1. The special requirements for the machinery, boiler and electrical installations shall be to the satisfaction of the Administration and shall include at least the requirements of this regulation.

2. The main source of electrical power shall comply with the following:

2.1. Where the electrical power can normally be supplied by one generator, suitable load shedding arrangements shall be provided to ensure the integrity of supplies to services required for propulsion and steering as well as the safety of the ship. In the case of loss of the generator in operation adequate provision shall be made for automatic starting and connecting to the main switchboard of a stand-by generator of sufficient capacity to permit propulsion and steering and to ensure the safety of the ship with automatic re-starting of the essential auxiliaries including, where necessary, sequential operations. The Administration may dispense with this requirement for a ship of less than 1,600 tons gross tonnage, if it is considered impracticable.

2.2. If the electrical power is normally supplied by more than one generator simultaneously in parallel operation, provision shall be made, for instance by load shedding, to ensure that, in case of loss of one of these generating sets, the remaining ones are kept in operation without overload to permit propulsion and steering, and to ensure the safety of the ship.

3. Where stand-by machines are required for other auxiliary machinery essential to propulsion, automatic change-over devices shall be provided.

4. Automatic control and alarm system

4.1. The control system shall be such that the services needed for the operation of the main propulsion machinery and its auxiliaries are ensured through the necessary automatic arrangements.

4.2. An alarm shall be given on the automatic change-over.

4.3. An alarm system complying with regulation 51 shall be provided for all important pressures, temperatures and fluid levels and other essential parameters.

4.4. A centralized control position shall be arranged with the necessary alarm panels and instrumentation indicating any alarm.

5. Means shall be provided to keep the starting air pressure at the required level where internal combustion engines are used for main propulsion.

Regulation 54. SPECIAL CONSIDERATION IN RESPECT OF PASSENGER SHIPS

Passenger ships shall be specially considered by the Administration as to whether or not their machinery spaces may be periodically unattended and if so whether additional requirements to those stipulated in these regulations are necessary to achieve equivalent safety to that of normally attended machinery spaces.

CHAPTER II-2. CONSTRUCTION – FIRE PROTECTION, FIRE DETECTION AND FIRE EXTINCTION

The existing text of chapter II-2 is replaced by the following:

PART A. GENERAL

Regulation 1. APPLICATION

1.1. Unless expressly provided otherwise, this chapter shall apply to ships the keels of which are laid or which are at a similar stage of construction on or after 1 September 1984.

1.2. For the purpose of this chapter the term “a similar stage of construction” means the stage at which:

1. Construction identifiable with a specific ship begins; and
2. Assembly of that ship has commenced comprising at least 50 tonnes or one per cent of the estimated mass of all structural material, whichever is less.

1.3. For the purpose of this chapter:

1. The expression “ships constructed” means “ships the keels of which are laid or which are at a similar stage of construction”;

2. The expression “all ships” means “ships constructed before, on or after 1 September 1984”;

3. A cargo ship, whenever built, which is converted to a passenger ship shall be treated as a passenger ship constructed on the date on which such a conversion commences.

2. Unless expressly provided otherwise:

1. For ships constructed before 1 September 1984, the Administration shall ensure that, subject to the provisions of paragraph 2.2, the requirements which are applicable under chapter II-2 of the International Convention for the Safety of Life at Sea, 1974* to new or existing ships as defined in that chapter are complied with;

2. For tankers constructed before 1 September 1984, the Administration shall ensure that the requirements which are applicable under chapter II-2 of the annex to the Protocol of 1978 relating to the International Convention for the Safety of Life at Sea, 1974 to new or existing ships as defined in that chapter are complied with.

3. All ships which undergo repairs, alterations, modifications and outfitting related thereto shall continue to comply with at least the requirements previously applicable to these ships. Such ships, if constructed before 1 September 1984 shall, as a rule, comply with the requirements for ships constructed on or after that date to at least the same extent as they did before undergoing such repairs, alterations, modifications or outfitting. Repairs, alterations and modifications of a major character and outfitting related thereto shall meet the requirements for ships constructed on or after 1 September 1984 in so far as the Administration deems reasonable and practicable.

4.1. The Administration of a State may, if it considers that the sheltered nature and conditions of the voyage are such as to render the application of any specific requirements of this chapter unreasonable or unnecessary, exempt from those requirements individual ships or

* The text as adopted by the International Conference on Safety of Life at Sea, 1974.

classes of ships entitled to fly the flag of that State which, in the course of their voyage, do not proceed more than 20 miles from the nearest land.

4.2. In the case of passenger ships which are employed in special trades for the carriage of large numbers of special trade passengers, such as the pilgrim trade, the Administration of the State whose flag such ships are entitled to fly, if satisfied that it is impracticable to enforce compliance with the requirements of this chapter, may exempt such ships from those requirements, provided that they comply fully with provisions of:

1. The Rules annexed to the Special Trade-Passenger Ships Agreement, 1971; and
2. The Rules annexed to the Protocol on Space Requirements for Special Trade Passenger Ships, 1973.

Regulation 2. BASIC PRINCIPLES

1. The purpose of this chapter is to require the fullest practicable degree of fire protection, fire detection and fire extinction in ships.

2. The following basic principles underlie the regulations in this chapter and are embodied in the regulations as appropriate, having regard to the type of ships and the potential fire hazard involved:

1. Division of ship into main vertical zones by thermal and structural boundaries;
2. Separation of accommodation spaces from the remainder of the ship by thermal and structural boundaries;
3. Restricted use of combustible materials;
4. Detection of any fire in the zone of origin;
5. Containment and extinction of any fire in the space of origin;
6. Protection of means of escape or access for fire fighting;
7. Ready availability of fire-extinguishing appliances;
8. Minimization of possibility of ignition of flammable cargo vapour.

Regulation 3. DEFINITIONS

For the purpose of this chapter, unless expressly provided otherwise:

1. "Non-combustible material" is a material which neither burns nor gives off flammable vapours in sufficient quantity for self-ignition when heated to approximately 750 °C, this being determined to the satisfaction of the Administration by an established test procedure.* Any other material is a combustible material.

2. "A standard fire test" is one in which specimens of the relevant bulkheads or decks are exposed in a test furnace to temperatures corresponding approximately to the standard time-temperature curve. The specimen shall have an exposed surface of not less than 4.65 m² and height (or length of deck) of 2.44 m, resembling as closely as possible the intended construction and including where appropriate at least one joint. The standard time-temperature curve is 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, 556 °C
- At the end of the first 10 minutes, 659 °C
- At the end of the first 15 minutes, 718 °C
- At the end of the first 30 minutes, 821 °C
- At the end of the first 60 minutes, 925 °C

* Reference is made to Improved Recommendation on Test Method for Qualifying Marine Construction Materials as Non-Combustible, adopted by the Organization by resolution A.472(XII).

3. "A' class divisions" are those divisions formed by bulkheads and decks which comply with the following:

1. They shall be constructed of steel or other equivalent material;
2. They shall be suitably stiffened;
3. They shall be so constructed as to be capable of preventing the passage of smoke and flame to the end of the one-hour standard fire test;
4. They shall be insulated with approved non-combustible materials such that the average temperature of the unexposed side will not rise more than 139°C above the original temperature, nor will the temperature, at any one point, including any joint, rise more than 180°C above the original temperature, within the time listed below:
 - Class "A-60", 60 minutes
 - Class "A-30", 30 minutes
 - Class "A-15", 15 minutes
 - Class "A-0", 0 minutes
5. The Administration may require a test of a prototype bulkhead or deck to ensure that it meets the above requirements for integrity and temperature rise.*

4. "B' class divisions" are those divisions formed by bulkheads, decks, ceilings or linings which comply with the following:

1. They shall be so constructed as to be capable of preventing the passage of flame to the end of the first half hour of the standard fire test;
2. They shall have an insulation value such that the average temperature of the unexposed side will not rise more than 139°C above the original temperature, nor will the temperature at any one point, including any joint, rise more than 225°C above the original temperature, within the time listed below:
 - Class "B-15" 15 minutes
 - Class "B-0" 0 minutes
3. They shall be constructed of approved non-combustible materials and all materials entering into the construction and erection of "B" class divisions shall be non-combustible, with the exception that combustible veneers may be permitted provided they meet other requirements of this chapter;
4. The Administration may require a test of a prototype division to ensure that it meets the above requirements for integrity and temperature rise.*

5. "C' class divisions" are divisions constructed of approved non-combustible materials. They need meet neither requirements relative to the passage of smoke and flame nor limitations relative to the temperature rise. Combustible veneers are permitted provided they meet other requirements of this chapter.

6. "Continuous 'B' class ceilings or linings" are those "B" class ceilings or linings which terminate only at an "A" or "B" class division.

7. "Steel or other equivalent material". Where the words "steel or other equivalent material" occur, "equivalent material" means any non-combustible material which, by itself or due to insulation provided, has structural and integrity properties equivalent to steel at the end of the applicable exposure to the standard fire test (e.g., aluminium alloy with appropriate insulation).

* Reference is made to Recommendation for Fire Test Procedures for "A" and "B" Class Divisions, adopted by the Organization by resolutions A.163(ES.IV)¹ and A.215(VII).

8. "Low flame spread" means that the surface thus described will adequately restrict the spread of flame, this being determined to the satisfaction of the Administration by an established test procedure.

9. "Main vertical zones" are those sections into which the hull, superstructure, and deck-houses are divided by "A" class divisions, the mean length of which on any deck does not in general exceed 40 m.

10. "Accommodation spaces" are those spaces used for public spaces, corridors, lavatories, cabins, offices, hospitals, cinemas, games and hobbies rooms, barber shops, pantries containing no cooking appliances and similar spaces.

11. "Public spaces" are those portions of the accommodation which are used for halls, dining rooms, lounges and similar permanently enclosed spaces.

12. "Service spaces" are those spaces used for galleys, pantries containing cooking appliances, lockers, [mail] and specie rooms, store-rooms, workshops other than those forming part of the machinery spaces, and similar spaces and trunks to such spaces.

13. "Cargo spaces" are all spaces used for cargo (including cargo oil tanks) and trunks to such spaces.

14. "Ro/ro cargo spaces" are spaces not normally subdivided in any way and extending to either a substantial length or the entire length of the ship in which goods (packaged or in bulk, in or on rail or road-cars, vehicles (including road or rail tankers), trailers, containers, pallets, demountable tanks or in or on similar stowage units or other receptacles) can be loaded and unloaded normally in a horizontal direction.

15. "Open ro/ro cargo spaces" are ro/ro cargo spaces either open at both ends, or open at one end and provided with adequate natural ventilation effective over their entire length through permanent openings in the side plating or deckhead to the satisfaction of the Administration.

16. "Closed ro/ro cargo spaces" are ro/ro cargo spaces which are neither open ro/ro cargo spaces nor weather decks.

17. "Weather deck" is a deck which is completely exposed to the weather, from above and from at least two sides.

18. "Special category spaces" are those enclosed spaces above or below the bulkhead deck intended for the carriage of motor vehicles with fuel in their tanks for their own propulsion, into and from which such vehicles can be driven and to which passengers have access.

19. "Machinery spaces of category A" are those spaces and trunks to such spaces which contain:

1. Internal combustion machinery used for main propulsion; or
2. Internal combustion machinery used for purposes other than main propulsion where such machinery has in the aggregate a total power output of not less than 375 kW; or
3. Any oil-fired boiler or oil fuel unit.

20. "Machinery spaces" are all machinery spaces of category A and all other spaces containing propulsion machinery, boilers, oil fuel units, steam and internal combustion engines, generators and major electrical machinery, oil filling stations, refrigerating, stabilizing, ventilation and air conditioning machinery, and similar spaces, and trunks to such spaces.

21. "Oil fuel unit" is the equipment used for the preparation of oil fuel for delivery to an oil-fired boiler, or equipment used for the preparation for delivery of heated oil to an internal combustion engine, and includes any oil pressure pumps, filters and heaters dealing with oil at a pressure of more than 0.18 N/mm².

22. "Control stations" are those spaces in which the ship's radio or main navigation equipment or the emergency source of power is located or where the fire recording or fire control equipment is centralized.

23. "Rooms containing furniture and furnishings of restricted fire risk" are, for the purpose of regulation 26, those rooms containing furniture and furnishings of restricted fire risk (whether cabins, public spaces, offices or other types of accommodation) in which:

1. All case furniture such as desks, wardrobes, dressing tables, bureaux, dressers, is constructed entirely of approved non-combustible materials, except that a combustible veneer not exceeding 2 mm may be used on the working surface of such articles;
2. All free-standing furniture such as chairs, sofas, tables, is constructed with frames of non-combustible materials;
3. All draperies, curtains and other suspended textile materials have, to the satisfaction of the Administration, qualities of resistance to the propagation of flame not inferior to those of wool of mass 0.8 kg/m²;^{*}
4. All floor coverings have, to the satisfaction of the Administration, qualities of resistance to the propagation of flame not inferior to those of an equivalent woollen material used for the same purpose;
5. All exposed surfaces of bulkheads, linings and ceilings have low flame-spread characteristics; and
6. All upholstered furniture has qualities of resistance to the ignition and propagation of flame to the satisfaction of the Administration.

24. "Bulkhead deck" is the uppermost deck up to which the transverse watertight bulkheads are carried.

25. "Deadweight" is the difference in tonnes between the displacement of a ship in water of a specific gravity of 1.025 at the load water-line corresponding to the assigned summer free-board and the lightweight of the ship.

26. "Lightweight" is the displacement of a ship in tonnes without cargo, fuel, lubricating oil, ballast water, fresh water and feedwater in tanks, consumable stores, and passengers and crew and their effects.

27. "Combination carrier" is a tanker designed to carry oil or alternatively solid cargoes in bulk.

28. "Crude oil" is any oil occurring naturally in the earth whether or not treated to render it suitable for transportation and includes:

1. Crude oil from which certain distillate fractions may have been removed; and
2. Crude oil to which certain distillate fractions may have been added.

29. "Dangerous goods" are those goods referred to in regulation V11/2.

30. "Chemical tanker" is a tanker constructed or adapted and used for the carriage in bulk of any liquid product of a flammable nature listed in the summary of minimum requirements of the Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk to be adopted by the Maritime Safety Committee under the authority of the Assembly of the Organization conferred by resolution A.490(XII), hereinafter referred to as "Bulk Chemical Code", as may be amended by the Organization.

31. "Gas carrier" is a tanker constructed or adapted and used for the carriage in bulk of any liquefied gas or certain other substances of a flammable nature listed in chapter XIX of the Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk adopted by the Organization by resolution A.328(IX), hereinafter referred to as "Gas Carrier Code", as has been or may be amended by the Organization.

^{*} Reference is made to Recommendation on Test Method for Determining the Resistance to Flame of Vertically Supported Textiles and Films, adopted by the Organization by resolution A.471(XII).

Regulation 4. FIRE PUMPS, FIRE MAINS, HYDRANTS AND HOSES

1. Every ship shall be provided with fire pumps, fire mains, hydrants and hoses complying as applicable with the requirements of this Regulation.

2. Capacity of fire pumps

2.1. The required fire pumps shall be capable of delivering for fire-fighting purposes a quantity of water, at the pressure specified in paragraph 4, as follows:

1. Pumps in passenger ships, not less than two-thirds of the quantity required to be dealt with by the bilge pumps when employed for bilge pumping; and
2. Pumps in cargo ships, other than any emergency pump, not less than four-thirds of the quantity required under regulation 11-1/21 to be dealt with by each of the independent bilge pumps in a passenger ship of the same dimension when employed in bilge pumping, provided that in no cargo ship need the total required capacity of the fire pumps exceed 180 m³/hour.

2.2. Each of the required fire pumps (other than any emergency pump required in paragraph 3.3.2 for cargo ships) shall have a capacity not less than 80 per cent of the total required capacity divided by the minimum number of required fire pumps but in any case not less than 25 m³/hour and each such pump shall in any event be capable of delivering at least the two required jets of water. These fire pumps shall be capable of supplying the fire main system under the required conditions. Where more pumps than the minimum of required pumps are installed the capacity of such additional pumps shall be to the satisfaction of the Administration.

3. Arrangements of fire pumps and of fire mains

3.1. Ships shall be provided with independently driven fire pumps as follows:

1. Passenger ships of 4,000 tons gross tonnage and upwards: at least three
2. Passenger ships of less than 4,000 tons gross tonnage and cargo ships of 1,000 tons gross tonnage and upwards: at least two
3. Cargo ships of less than 1,000 tons gross tonnage: to the satisfaction of the Administration

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

3.3. The arrangement of sea connexions, fire pumps and their sources of power shall be such as to ensure that:

1. In passenger ships of 1,000 tons gross tonnage and upwards, in the event of a fire in any one compartment all the fire pumps will not be put out of action.
2. In cargo ships of 2,000 tons gross tonnage and upwards if a fire in any one compartment could put all the pumps out of action there shall be an alternative means consisting of a fixed independently driven emergency pump which shall be capable of supplying two jets of water to the satisfaction of the Administration. The pump and its location shall comply with the following requirements:
 - 2.1. The capacity of the pump shall not be less than 40 per cent of the total capacity of the fire pumps required by this Regulation and in any case not less than 25 m³/hour.
 - 2.2. When the pump is delivering the quantity of water required by paragraph 3.3.2.1 the pressure at any hydrant shall be not less than the minimum pressures given in paragraph 4.2.
 - 2.3. Any diesel driven power source for the pump shall be capable of being readily started in its cold condition down to a temperature of 0 °C by hand (manual) cranking. If this is impracticable, or if lower temperatures are likely to be encountered, consideration is to be given to the provision and maintenance of heating arrangements, acceptable to the Administration, so that ready starting will be assured. If hand (manual) starting is impracticable the Administration may permit other means

of starting. These means shall be such as to enable the diesel driven power source to be started at least 6 times within a period of 30 minutes, and at least twice within the first 10 minutes.

- 2.4. Any service fuel tank shall contain sufficient fuel to enable the pump to run on full load for at least three hours and sufficient reserves of fuel shall be available outside the main machinery space to enable the pump to be run on full load for an additional 15 hours.
 - 2.5. The total suction head of the pump shall not exceed 4.5 m under all conditions of list and trim likely to be encountered in service and the suction piping shall be designed to minimize suction losses.
 - 2.6. The boundaries of the space containing the fire pump shall be insulated to a standard of structural fire protection equivalent to that required for a control [station] in regulation 44.
 - 2.7. No direct access shall be permitted between the machinery space and the space containing the emergency fire pump and its source of power. When this is impracticable an Administration may accept an arrangement where the access is by means of an airlock, each of the two doors being self-closing, or through a watertight door capable of being operated from a space remote from the machinery space and the space containing the emergency fire pump and unlikely to be cut off in the event of fire in those spaces. In such cases a second means of access to the space containing the emergency fire pump and its source of power shall be provided.
 - 2.8. Ventilation arrangements to the space containing the independent source of power for the emergency fire pump shall be such as to preclude, as far as practicable, the possibility of smoke from a machinery space fire entering or being drawn into that space.
3. In passenger ships of less than 1,000 tons gross tonnage and cargo ships of less than 2,000 tons gross tonnage, if a fire in any one compartment could put all the pumps out of action the alternative means of providing water for fire-fighting purposes are to the satisfaction of the Administration.
 4. In addition, in cargo ships where other pumps, such as general service, bilge and ballast, etc., are fitted in a machinery space, arrangements shall be made to ensure that at least one of these pumps, having the capacity and pressure required by paragraphs 2.2 and 4.2, is capable of providing water to the fire main.
 - 3.4. The arrangements for the ready availability of water supply shall be:
 1. In passenger ships of 1,000 tons gross tonnage and upwards such that at least one effective jet of water is immediately available from any hydrant in an interior location and so as to ensure the continuation of the output of water by the automatic starting of a required fire pump;
 2. In passenger ships of less than 1,000 tons gross tonnage and in cargo ships to the satisfaction of the Administration;
 3. In cargo ships with a periodically unattended machinery space or when only one person is required on watch there shall be immediate water delivery from the fire main system at a suitable pressure, either by remote starting of one of the main fire pumps with remote starting from the navigating bridge and fire control station, if any, or permanent pressurization of the fire main system by one of the main fire pumps, except that the Administration may waive this requirement for cargo ships of less than 1,600 tons gross tonnage if the arrangement of the machinery space access makes it unnecessary;
 4. In passenger ships, if fitted with periodically unattended machinery spaces in accordance with Regulation II-1/54, the Administration shall determine provisions for fixed water

fire-extinguishing arrangement for such spaces equivalent to those required for normally attended machinery spaces.

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

3.6. In tankers isolation valves shall be fitted in the fire main at poop front in a protected position and on the tank deck at intervals of not more than 40 m to preserve the integrity of the fire main system in case of fire or explosion.

4. *Diameter of and pressure in the fire mains*

4.1. The diameter of the fire main and water service pipes shall be sufficient for the effective distribution of the maximum required discharge from two fire pumps operating simultaneously; except that in the case of cargo ships the diameter need only be sufficient for the discharge of 140 m³/hour.

4.2. With the two pumps simultaneously delivering through nozzles specified in paragraph 8 the quantity of water specified in paragraph 4.1, through any adjacent hydrants, the following minimum pressures shall be maintained at all hydrants:

– Passenger ships:

- 4,000 tons gross tonnage and upwards: 0.31 N/mm²
- 1,000 tons gross tonnage and upwards but under 4,000 tons gross tonnage: 0.27 N/mm²
- Under 1,000 tons gross tonnage: to the satisfaction of the Administration

– Cargo ships:

- 6,000 tons gross tonnage and upwards: 0.27 N/mm²
- 1,000 tons gross tonnage and upwards but under 6,000 tons gross tonnage: 0.25 N/mm²
- Under 1,000 tons gross tonnage: to the satisfaction of the Administration

4.3. The maximum pressure at any hydrant shall not exceed that at which the effective control of a fire hose can be demonstrated.

5. *Number and position of hydrants*

5.1. The number and position of hydrants shall be such that at least two jets of water not emanating from the same hydrant, one of which shall be from a single length of hose, may reach any part of the ship normally accessible to the passengers or crew while the ship is being navigated and any part of any cargo space when empty, any ro/ro cargo space or any special category space in which latter case the two jets shall reach any part of such space, each from a single length of hose. Furthermore, such hydrants shall be positioned near the accesses to the protected spaces.

5.2. In the accommodation, service and machinery spaces of passenger ships the number and position of hydrants shall be such that the requirements of paragraph 5.1 may be complied with when all watertight doors and all doors in main vertical zone bulkheads are closed.

5.3. Where, in a passenger ship, access is provided to a machinery space of category A at a low level from an adjacent shaft tunnel, two hydrants shall be provided external to, but near the entrance to that machinery space. Where such access is provided from other spaces, in one of those spaces two hydrants shall be provided near the entrance to the machinery space of category A. Such provision need not be made where the tunnel or adjacent spaces are not part of the escape route.

6. *Pipes and hydrants*

6.1. Materials readily rendered ineffective by heat shall not be used for fire mains and hydrants unless adequately protected. The pipes and hydrants shall be so placed that the fire hoses may be easily coupled to them. The arrangement of pipes and hydrants shall be such as to avoid

the possibility of freezing. In ships where deck cargo may be carried, the positions of the hydrants shall be such that they are always readily accessible and the pipes shall be arranged as far as practicable to avoid risk of damage by such cargo. Unless one hose and nozzle is provided for each hydrant in the ship, there shall be complete interchangeability of hose couplings and nozzles.

6.2. A valve shall be fitted to serve each fire hose so that any fire hose may be removed while the fire pumps are at work.

6.3. Isolating valves to separate the section of the fire main within the machinery space containing the main fire pump or pumps from the rest of the fire main shall be fitted in an easily accessible and tenable position outside the machinery spaces. The fire main shall be so arranged that when the isolating valves are shut all the hydrants on the ship, except those in the machinery space referred to above, can be supplied with water by a fire pump not located in this machinery space through pipes which do not enter this space. Exceptionally, the Administration may permit short lengths of the emergency fire pump suction and discharge piping to penetrate the machinery space if it is impracticable to route it externally provided that the integrity of the fire main is maintained by the enclosure of the piping in a substantial steel casing.

7. Fire hoses

7.1. Fire hoses shall be of material approved by the Administration and shall be sufficient in length to project a jet of water to any of the spaces in which they may be required to be used. Their maximum length shall be to the satisfaction of the Administration. Each hose shall be provided with a nozzle and the necessary couplings. Hoses specified in this chapter as "fire hoses" shall together with any necessary fittings and tools be kept ready for use in conspicuous positions near the water service hydrants or connexions. Additionally in interior locations in passenger ships carrying more than 36 passengers fire hoses shall be connected to the hydrants at all times.

7.2. Ships shall be provided with fire hoses the number and diameter of which shall be to the satisfaction of the Administration.

7.3. In passenger ships there shall be at least one fire hose for each of the hydrants required by paragraph 5 and these hoses shall be used only for the purposes of extinguishing fires or testing the fire-extinguishing apparatus at fire drills and surveys.

7.4.1. In cargo ships of 1,000 tons gross tonnage and upwards the number of fire hoses to be provided shall be one for each 30 m length of the ship and one spare but in no case less than five in all. This number does not include any hoses required in any engine or boiler room. The Administration may increase the number of hoses required so as to ensure that hoses in sufficient number are available and accessible at all times, having regard to the type of ship and the nature of trade in which the ship is employed.

7.4.2. In cargo ships of less than 1,000 tons gross tonnage the number of fire hoses to be provided shall be to the satisfaction of the Administration.

8. Nozzles

8.1. For the purposes of this chapter, standard nozzle sizes shall be 12 mm, 16 mm and 19 mm or as near thereto as possible. Larger diameter nozzles may be permitted at the discretion of the Administration.

8.2. For accommodation and service spaces, a nozzle size greater than 12 mm need not be used.

8.3. For machinery spaces and exterior locations, the nozzle size shall be such as to obtain the maximum discharge possible from two jets at the pressure mentioned in paragraph 4 from the smallest pump, provided that a nozzle size greater than 19 mm need not be used.

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

9. *Location and arrangement of water pumps, etc., for other fire-extinguishing systems*

Pumps required for the provision of water for other fire-extinguishing systems required by this chapter, their sources of power and their controls shall be installed outside the space or spaces protected by such systems and shall be so arranged that a fire in the space or spaces protected will not put any such system out of action.

Regulation 5. FIXED GAS FIRE-EXTINGUISHING SYSTEMS

1. *General*

1.1. The use of a fire-extinguishing medium which, in the opinion of the Administration, either by itself or under expected conditions of use gives off toxic gases in such quantities as to endanger persons shall not be permitted.

1.2. The necessary pipes for conveying fire-extinguishing medium into protected spaces shall be provided with control valves so marked as to indicate clearly the spaces to which the pipes are led. Suitable provision shall be made to prevent inadvertent admission of the medium to any space. Where a cargo space fitted with a gas fire-extinguishing system is used as a passenger space the gas connexion shall be blanked during such use.

1.3. The piping for the distribution of fire-extinguishing medium shall be arranged and discharge nozzles so positioned that a uniform distribution of medium is obtained.

1.4. Means shall be provided to close all openings which may admit air to or allow gas to escape from a protected space.

1.5. Where the volume of free air contained in air receivers in any space is such that, if released in such space in the event of fire, such release of air within that space would seriously affect the efficiency of the fixed fire-extinguishing system, the Administration shall require the provision of an additional quantity of fire-extinguishing medium.

1.6. Means shall be provided for automatically giving audible warning of the release of fire-extinguishing medium into any space in which personnel normally work or to which they have access. The alarm shall operate for a suitable period before the medium is released.

1.7. The means of control of any fixed gas fire-extinguishing system shall be readily accessible and simple to operate and shall be grouped together in as few locations as possible at positions not likely to be cut off by a fire in a protected space. At each location there shall be clear instructions relating to the operation of the system having regard to the safety of personnel.

1.8. Automatic release of fire-extinguishing medium shall not be permitted, except as permitted by paragraph 3.3.5 and in respect of local automatically operated units referred to in paragraphs 3.4 and 3.5.

1.9. Where the quantity of extinguishing medium is required to protect more than one space, the quantity of medium available need not be more than the largest quantity required for any one space so protected.

1.10. Except as otherwise permitted by paragraphs 3.3, 3.4 or 3.5 pressure containers required for the storage of fire-extinguishing medium, other than steam, shall be located outside protected spaces in accordance with paragraph 1.13.

1.11. Means shall be provided for the crew to safely check the quantity of medium in the containers.

1.12. Containers for the storage of fire-extinguishing medium and associated pressure components shall be designed to pressure codes of practice to the satisfaction of the Administration having regard to their locations and maximum ambient temperatures expected in service.

1.13. When the fire-extinguishing medium is stored outside a protected space, it shall be stored in a room which shall be situated in a safe and readily accessible position and shall be effectively ventilated to the satisfaction of the Administration. Any entrance to such a storage room shall preferably be from the open deck and in any case shall be independent of the protected

space. Access doors shall open outwards, and bulkheads and decks including doors and other means of closing any opening therein, which form the boundaries between such rooms and adjoining enclosed spaces shall be gastight. For the purpose of the application of the integrity tables in regulations 26, 27, 44 and 58, such storage rooms shall be treated as control stations.

1.14. Spare parts for the system shall be stored on board and be to the satisfaction of the Administration.

2. Carbon dioxide systems

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

2.2. For machinery spaces the quantity of carbon dioxide carried shall be [sufficient] to give a minimum [volume] of free gas equal to the larger of the following [volumes], either:

1. 40 per cent of the gross volume of the largest machinery space so protected, the volume to exclude that part of the casing above the level at which the horizontal area of the casing is 40 per cent or less of the horizontal area of the space concerned taken midway between the tank top and the lowest part of the casing; or
2. 35 per cent of the gross volume of the largest machinery space protected, including the casing;

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

2.3. For the purpose of this paragraph the volume of free carbon dioxide shall be calculated at 0.56 m³/kg.

2.4. For machinery spaces the fixed piping system shall be such that 85 per cent of the gas can be discharged into the space within 2 minutes.

3. Halogenated hydrocarbon systems

3.1. The use of halogenated hydrocarbons as fire-extinguishing media is only permitted in machinery spaces, pumprooms and in cargo spaces intended solely for the carriage of vehicles which are not carrying any cargo.

3.2. When halogenated hydrocarbons are used as the fire-extinguishing media in total flooding systems:

1. The system shall be arranged for manual initiation of power release only.
2. If the charge of halogenated hydrocarbon is required to supply more than one space, the arrangements for its storage and release shall be such that compliance with paragraphs 3.2.9 or 3.2.10 respectively, is obtained.
3. Means shall be provided for automatically stopping all ventilation fans serving the protected space before the medium is released.
4. Means shall be provided to manually close all dampers in the ventilation system serving a protected space.
5. The discharge arrangements shall be so designed that the minimum quantity of medium required for cargo spaces or machinery spaces in paragraphs 3.2.9 or 3.2.10 respectively can be substantially discharged in a nominal 20 seconds or less based on the discharge of the liquid phase.
6. The system shall be designed to operate within a temperature range to the satisfaction of the Administration.
7. The discharge shall not endanger personnel engaged on maintenance of equipment or using the normal access ladders and escapes serving the space.
8. Means shall be provided for the crew to safely check the pressure within containers.

9. The quantity of extinguishing medium for cargo spaces intended solely for the carriage of vehicles which are not carrying any cargo shall be calculated in accordance with table 5.1. This quantity shall be based on the gross volume of the protected space. In respect of Halon 1301 and 1211, the quantity shall be calculated on a volumetric ratio basis, and in respect of Halon 2402 on a mass per unit volume basis.

Table 5.1

<i>Halon</i>	<i>Minimum</i>	<i>Maximum</i>
1301	5 per cent	7 per cent
1211	5 per cent	5.5 per cent
2402	0.23 kg/m ³	0.30 kg/m ³

10. The quantity of extinguishing media for machinery spaces shall be calculated in accordance with table 5.2. This quantity shall be based on the gross volume of the space in respect of the minimum concentration and the net volume of the space in respect of the maximum concentration, including the casing. In respect of Halon 1301 and 1211, the quantity shall be calculated on a volumetric ratio basis, and in respect of Halon 2402 on a mass per unit volume basis.

Table 5.2

<i>Halon</i>	<i>Minimum</i>	<i>Maximum</i>
1301	4.25 per cent	7 per cent
1211	4.25 per cent	5.5 per cent
2402	0.20 kg/m ³	0.30 kg/m ³

11. For the purpose of paragraphs 3.2.9 and 3.2.10, the volume of Halon 1301 shall be calculated at 0.16 m³/kg and the volume of Halon 1211 shall be calculated at 0.14 m³/kg.

3.3. Only Halon 1301 may be stored within a protected machinery space. Containers shall be individually distributed throughout that space and the following requirements shall be complied with:

1. A manually initiated power release, located outside the protected space, shall be provided. Duplicate sources of power shall be provided for this release and shall be located outside the protected space and be immediately available except that for machinery spaces, one of the sources of power may be located inside the protected space.
2. Electric power circuits connecting the containers shall be monitored for fault conditions and loss of power. Visual and audible alarms shall be provided to indicate this.
3. Pneumatic or hydraulic power circuits connecting the containers shall be duplicated. The sources of pneumatic or hydraulic pressure shall be monitored for loss of pressure. Visual and audible alarms shall be provided to indicate this.
4. Within the protected space, electrical circuits essential for the release of the system shall be heat resistant e.g. mineral insulated cable or equivalent. Piping systems essential for the release of systems designed to be operated hydraulically or pneumatically shall be of steel or other equivalent heat-resisting material to the satisfaction of the Administration.
5. Each pressure container shall be fitted with an automatic overpressure release device which, in the event of the container being exposed to the effects of fire and the system not being operated, will safely vent the contents of the container into the protected space.
6. The arrangement of containers and the electrical circuits and piping essential for the release of any system shall be such that in the event of damage to any one power release line through fire or explosion in a protected space, i.e. a single fault concept, at least two thirds of the fire-extinguishing charge required by paragraphs 3.2.9 or 3.2.10 for that space can still be discharged having regard to the requirement for uniform distribution of medium

throughout the space. The arrangements in respect of systems for spaces requiring only one or two containers shall be to the satisfaction of the Administration.

7. Not more than two discharge nozzles shall be fitted to any pressure container and the maximum quantity of agent in each container shall be to the satisfaction of the Administration having regard to the requirement for uniform distribution of medium throughout the space.
8. The containers shall be monitored for decrease in pressure due to leakage and discharge. Visual and audible alarms in the protected area and on the navigating bridge or in the space where the fire control equipment is centralized shall be provided to indicate this condition, except that for cargo spaces, alarms are only required on the navigating bridge or the space where the fire control equipment is centralized.

3.4. Local automatically operated fixed fire-extinguishing units containing Halon 1301 or 1211, fitted in enclosed areas of high fire risk within machinery spaces, in addition to, and independent of, any required fixed fire-extinguishing system may be accepted subject to compliance with the following:

1. The space in which such additional local protection is provided shall preferably be on one working level and on the same level as the access. At the discretion of the Administration more than one working level may be permitted subject to an access being provided on each level.
2. The size of the space and arrangements of accesses thereto and machinery therein, shall be such that escape from anywhere in the space can be effected in not more than 10 seconds.
3. The operation of any unit shall be signalled both visually and audibly outside each access to the machinery space and at the navigating bridge or in the space where the fire control equipment is centralized.
4. A notice indicating that the space contains one or more automatically operated fire-extinguishing units and stating which medium is used, shall be displayed outside each access thereto.
5. Discharge nozzles shall be so positioned that the discharge does not endanger personnel using the normal access ladders and escapes serving the compartment. Provision shall also be made to protect personnel engaged in maintenance of machinery from inadvertent discharge of the medium.
6. The fire-extinguishing units shall be designed to operate within a temperature range to the satisfaction of the Administration.
7. Means shall be provided for the crew to safely check the pressure within the containers.
8. The total quantity of extinguishing medium provided in the local automatically operated units shall be such that a concentration of 7 per cent in respect of Halon 1301 and 5.5 per cent in respect of Halon 1211 at 20°C based on the net volume of the enclosed space is not exceeded. This requirement applies when either a local automatically operated unit or a fixed system fitted in compliance with paragraph 3.2 has operated, but not when both have operated. The volume of Halon 1301 shall be calculated at 0.16 m³/kg and the volume of Halon 1211 shall be calculated at 0.14 m³/kg.
9. The time of discharge of a unit, based on the discharge of the liquid phase, shall be 10 seconds or less.
10. The arrangement of local automatically operated fire-extinguishing units shall be such that their release does not result in loss of electrical power or reduction of the manoeuvrability of the ship.

3.5. Automatically operated fire-extinguishing units, as described in paragraph 3.4, fitted in machinery spaces over equipment having a high fire risk, in addition to and independent of any required fixed fire-extinguishing system, may be accepted subject to compliance with paragraphs 3.4.3 to 3.4.6, 3.4.9 and 3.4.10 and with the following:

1. The quantity of medium provided in local automatically operated units shall be such that a vapour in air concentration not greater than 1.25 per cent at 20 °C based on the gross volume of the machinery space is obtained in the event of their simultaneous operation.
2. The volume of Halon 1301 shall be calculated at 0.16 m³/kg and the volume of Halon 1211 shall be calculated at 0.14 m³/kg.

4. *Steam systems*

In general, the Administration shall not permit the use of steam as a fire-extinguishing medium in fixed fire-extinguishing systems. Where the use of steam is permitted by the Administration it shall be used only in restricted areas as an addition to the required fire-extinguishing medium and with the proviso that the boiler or boilers available for supplying steam shall have an evaporation of at least 1.0 kg of steam per hour for each 0.75 m³ of the gross volume of the largest space so protected. In addition to complying with the foregoing requirements the systems in all respects shall be as determined by, and to the satisfaction of, the Administration.

5. *Other gas systems*

5.1. Where gas other than carbon dioxide or halogenated hydrocarbons, or steam as permitted by paragraph 4 is produced on the ship and is used as a fire-extinguishing medium, it shall be a gaseous product of fuel combustion in which the oxygen content, the carbon monoxide content, the corrosive elements and any solid combustible elements have been reduced to a permissible minimum.

5.2. Where such gas is used as the fire-extinguishing medium in a fixed fire-extinguishing system for the protection of machinery spaces it shall afford protection equivalent to that provided by a fixed system using carbon dioxide as the medium.

5.3. Where such gas is used as a fire-extinguishing medium in a fixed fire-extinguishing system for the protection of cargo spaces, a sufficient quantity of such gas shall be available to supply hourly a volume of free gas at least equal to 25 per cent of the gross volume of the largest space protected in this way for a period of 72 hours.

Regulation 6. FIRE EXTINGUISHERS

1. *All fire extinguishers shall be of approved types and designs.*

1.1. The capacity of required portable fluid extinguishers shall be not more than 13.5 l and not less than 9 l. Other extinguishers shall be at least as portable as the 13.5 l fluid extinguisher and shall have a fire-extinguishing capability at least equivalent to that of a 9 l fluid extinguisher.

1.2. The Administration shall determine the equivalents of fire extinguishers.

2. Spare charges shall be provided in accordance with requirements to be specified by the Administration.

3. Fire extinguishers containing an extinguishing medium which, in the opinion of the Administration, either by itself or under expected conditions of use gives off toxic gases in such quantities as to endanger persons shall not be permitted.

4. A portable foam applicator unit shall consist of an air-foam nozzle of an inductor type capable of being connected to the fire main by a fire hose, together with a portable tank containing at least 20 l of foam-making liquid and one spare tank. The nozzle shall be capable of producing effective foam suitable for extinguishing an oil fire, at the rate of at least 1.5 m³/minute.

5. Fire extinguishers shall be periodically examined and subjected to such tests as the Administration may require.

6. One of the portable fire extinguishers intended for use in any space shall be stowed near the entrance to that space.

7. Accommodation spaces, service spaces and control stations shall be [sufficient] with portable fire extinguishers of appropriate types and in sufficient number to the satisfaction of the Administration. Ships of 1,000 tons gross tonnage and upwards shall carry at least five portable fire extinguishers.

Regulation 7. FIRE-EXTINGUISHING ARRANGEMENTS IN MACHINERY SPACES

1. Spaces containing oil-fired boilers or oil fuel units

1.1. Machinery spaces of category A containing oil-fired boilers or oil fuel units shall be provided with any one of the following fixed fire-extinguishing systems:

1. A gas system complying with the provisions of regulation 5;
2. A high expansion foam system complying with the provisions of regulation 9;
3. A pressure water-spraying system complying with the provisions of regulation 10.

In each case if the engine and boiler rooms are not entirely separate, or if fuel oil can drain from the boiler room into the engine room, the combined engine and boiler rooms shall be considered as one compartment.

1.2. There shall be in each boiler room at least one set of portable [foam applicator unit] complying with the provisions of regulation 6.4.

1.3. There shall be at least two portable foam extinguishers or equivalent in each firing space in each boiler room and in each space in which a part of the oil fuel installation is situated. There shall be not less than one approved foam-type extinguisher of at least 135 l capacity or equivalent in each boiler room. These extinguishers shall be provided with hoses on reels suitable for reaching any part of the boiler room. In the case of domestic boilers of less than 175 kW in cargo ships the Administration may consider relaxing the requirements of this paragraph.

1.4. In each firing space there shall be a receptacle containing sand, sawdust impregnated with soda, or other approved dry material in such quantity as may be required by the Administration. An approved portable extinguisher may be substituted as an alternative:

2. Spaces containing internal combustion machinery

Machinery spaces of category A containing internal combustion machinery shall be provided with:

1. One of the fire-extinguishing systems required by paragraph 1.1.
2. At least one set of portable air-foam equipment complying with the provisions of regulation 6.4.
3. In each such space approved foam type fire extinguishers, each of at least 45 l capacity or equivalent, sufficient in number to enable foam or its equivalent to be directed on to any part of the fuel and lubricating oil pressure systems, gearing and other fire hazards. In addition, there shall be provided a sufficient number of portable foam extinguishers or equivalent which shall be so located that no point in the space is more than 10 m walking distance from an extinguisher and that there are at least two such extinguishers in each such space. For smaller spaces of cargo ships the Administration may consider relaxing this requirement.

3. Spaces containing steam turbines or enclosed steam engines

In spaces containing steam turbines or enclosed steam engines used either for main propulsion or for other purposes when such machinery has in the aggregate a total power output of not less than 375 kW there shall be provided:

1. Approved foam fire extinguishers each of at least 45 l capacity or equivalent sufficient in number to enable foam or its equivalent to be directed on to any part of the pressure lubrication system, on to any part of the casings enclosing pressure lubricated parts of the turbines, engines or associated gearing, and any other fire hazards. However, such extinguishers

shall not be required if protection at least equivalent to that required by this sub-paragraph is provided in such spaces by a fixed fire-extinguishing system fitted in compliance with paragraph 1.1.

2. A sufficient number of portable foam extinguishers or equivalent which shall be so located that no point in the space is more than 10 m walking distance from an extinguisher and that there are at least two such extinguishers in each such space, except that such extinguishers shall not be required in addition to any provided in compliance with paragraph 1.3.
3. One of the fire-extinguishing systems required by paragraph 1.1, where such spaces are periodically unattended.

4. *Fire-extinguishing appliances in other machinery spaces*

Where, in the opinion of the Administration, a fire hazard exists in any machinery space for which no specific provisions for fire-extinguishing appliances are prescribed in paragraphs 1, 2 and 3, there shall be provided in, or adjacent to, that space such a number of approved portable fire extinguishers or other means of fire extinction as the Administration may deem sufficient.

5. *Fixed fire-extinguishing systems not required by this chapter*

Where a fixed fire-extinguishing system not required by this chapter is installed, such a system shall be to the satisfaction of the Administration.

6. *Machinery spaces of category A in passenger ships*

In passenger ships carrying more than 36 passengers each machinery space of category A shall be provided with at least two suitable water fog applicators.*

**Regulation 8. FIXED LOW-EXPANSION FOAM FIRE-EXTINGUISHING SYSTEMS
IN MACHINERY SPACES**

1. Where in any machinery space a fixed low-expansion foam fire-extinguishing system is fitted in addition to the requirements of regulation 7, such system shall be capable of discharging through fixed discharge outlets in not more than five minutes a quantity of foam sufficient to cover to a depth of 150 mm the largest single area over which oil fuel is liable to spread. The system shall be capable of generating foam suitable for extinguishing oil fires. Means shall be provided for effective distribution of the foam through a permanent system of piping and control valves or cocks to suitable discharge outlets, and for the foam to be effectively directed by fixed sprayers on other main fire hazards in the protected space. The expansion ratio of the foam shall not exceed 12 to 1.

2. The means of control of any such systems shall be readily accessible and simple to operate and shall be grouped together in as few locations as possible at positions not likely to be cut off by a fire in the protected space.

**Regulation 9. FIXED HIGH-EXPANSION FOAM FIRE-EXTINGUISHING SYSTEMS
IN MACHINERY SPACES**

1.1. Any required fixed high-expansion foam system in machinery spaces shall be capable of rapidly discharging through fixed discharge outlets a quantity of foam sufficient to fill the greatest space to be protected at a rate of at least 1 m in depth per minute. The quantity of foam-forming liquid available shall be sufficient to produce a volume of foam equal to five times the volume of the largest space to be protected. The expansion ratio of the foam shall not exceed 1,000 to 1.

1.2. The Administration may permit alternative arrangements and discharge rates provided that it is satisfied that equivalent protection is achieved.

* A water fog applicator might consist of a metal "L"-shaped pipe, the long limb being about 2 m in length capable of being fitted to a fire hose and the short limb being about 250 mm in length fitted with a fixed water fog nozzle or capable of being fitted with a water spray nozzle.

2. Supply ducts for delivering foam, air intakes to the foam generator and the number of foam-producing units shall in the opinion of the Administration be such as will provide effective foam production and distribution.

3. The arrangement of the foam generator delivery ducting shall be such that a fire in the protected space will not affect the foam generating equipment.

4. The foam generator, its sources of power supply, foam-forming liquid and means of controlling the system shall be readily accessible and simple to operate and shall be grouped in as few locations as possible at positions not likely to be cut off by a fire in the protected space.

*Regulation 10. FIXED PRESSURE WATER-SPRAYING FIRE-EXTINGUISHING SYSTEMS
IN MACHINERY SPACES*

1. Any required fixed pressure water-spraying fire-extinguishing system in machinery spaces shall be provided with spraying nozzles of an approved type.

2. The number and arrangement of the nozzles shall be to the satisfaction of the Administration and shall be such as to ensure an effective average distribution of water of at least 5 l/m² per minute in the spaces to be protected. Where increased application rates are considered necessary, these shall be to the satisfaction of the Administration. Nozzles shall be fitted above bilges, tank tops and other areas over which oil fuel is liable to spread and also above other specific fire hazards in the machinery spaces.

3. The system may be divided into sections, the distribution valves of which shall be operated from easily accessible positions outside the spaces to be protected and will not be readily cut off by a fire in the protected space.

4. The system shall be kept charged at the necessary pressure and the pump supplying the water for the system shall be put automatically into action by a pressure drop in the system.

5. The pump shall be capable of simultaneously supplying at the necessary pressure all sections of the system in any one compartment to be protected. The pump and its controls shall be installed outside the space or spaces to be protected. It shall not be possible for a fire in the space or spaces protected by the water-spraying system to put the system out of action.

6. The pump may be driven by independent internal combustion machinery but, if it is dependent upon power being supplied from the emergency generator fitted in compliance with the provisions of regulation II-1/44 or regulation II-1/45, as appropriate, that generator shall be so arranged as to start automatically in case of main power failure so that power for the pump required by paragraph 5 is immediately available. When the pump is driven by independent internal combustion machinery it shall be so situated that a fire in the protected space will not affect the air supply to the machinery.

7. Precautions shall be taken to prevent the nozzles from becoming clogged by impurities in the water or corrosion of piping, nozzles, valves and pump.

Regulation 11. SPECIAL ARRANGEMENTS IN MACHINERY SPACES

1. The provisions of this regulation shall apply to machinery spaces of category A and, where the Administration considers it desirable, to other machinery spaces.

2.1. The number of skylights, doors, ventilators, openings in funnels to permit exhaust ventilation and other openings to machinery spaces shall be reduced to a minimum consistent with the needs of ventilation and the proper and safe working of the ship.

2.2. Skylights shall be of steel and shall not contain glass panels. Suitable arrangements shall be made to permit the release of smoke in the event of fire, from the space to be protected.

2.3. In passenger ships, doors other than power-operated watertight doors, shall be so arranged that positive closure is assured in case of fire in the space, by power-operated closing arrangements or by the provision of self-closing doors capable of closing against an inclination

of 3.5° opposing closure and having a fail-safe hook-back facility, provided with a remotely operated release device.

3. Windows shall not be fitted in machinery space boundaries. This does not preclude the use of glass in control rooms within the machinery spaces.

4. Means of control shall be provided for:

1. Opening and closure of skylights, closure of openings in funnels which normally allow exhaust ventilation, and closure of ventilator dampers;
2. Permitting the release of smoke;
3. Closing power-operated doors or actuating release mechanism on doors other than power-operated watertight doors;
4. Stopping ventilating fans; and
5. Stopping forced and induced draught fans, oil fuel transfer pumps, oil fuel unit pumps and other similar fuel pumps.

5. The controls required in paragraph 4 and in regulation 15.2.5 shall be located outside the space concerned, where they will not be cut off in the event of fire in the space they serve. In passenger ships such controls and the controls for any required fire-extinguishing system shall be situated at one control position or grouped in as few positions as possible to the satisfaction of the Administration. Such positions shall have a safe access from the open deck.

6. When access to any machinery space of category A is provided at a low level from an adjacent shaft tunnel, there shall be provided in the shaft tunnel, near the watertight door, a light steel fire-screen door operable from each side.

7. For periodically unattended machinery spaces in cargo ships, the Administration shall give special consideration to maintaining fire integrity of the machinery spaces, the location and centralization of the fire-extinguishing system controls, the required shut-down arrangements (e.g., ventilation, fuel pumps, etc.) and may require additional fire-extinguishing appliances and other fire-fighting equipment and breathing apparatus. In passenger ships these requirements shall be at least equivalent to those of machinery spaces normally attended.

8. [A fixed] fire detection and alarm system complying with the provisions of regulation 14 shall be fitted in any machinery space:

1. Where the installation of automatic and remote control systems and equipment has been approved in lieu of continuous manning of the space; and
2. Where the main propulsion and associated machinery including sources of main electrical supply are provided with various degrees of automatic or remote control and are under continuous manned supervision from a control room.

Regulation 12. AUTOMATIC SPRINKLER, FIRE DETECTION AND FIRE ALARM SYSTEMS

1.1. Any required automatic sprinkler, fire detection and fire alarm system shall be capable of immediate operation at all times and no action by the crew shall be necessary to set it in operation. It shall be of the wet pipe type but small exposed sections may be of the dry pipe type where in the opinion of the Administration this is a necessary precaution. Any parts of the system which may be subjected to freezing temperatures in service shall be suitably protected against freezing. It shall be kept charged at the necessary pressure and shall have provision for a continuous supply of water as required in this regulation.

1.2. Each section of sprinklers shall include means for giving a visual and audible alarm signal automatically at one or more indicating units whenever any sprinkler comes into operation. Such alarm systems shall be such as to indicate if any fault occurs in the system.

1.2.1. In passenger ships such units shall give an indication of any fire and its location in any space served by the system and shall be centralized on the navigating bridge or in the main

fire control station, which shall be so manned or equipped as to ensure that any alarm from the system is immediately received by a responsible member of the crew.

1.2.2. In cargo ships such units shall indicate in which section served by the system fire has occurred and shall be centralized on the navigating bridge and in addition, visible and audible alarms from the unit shall be placed in a position other than on the navigating bridge, so as to ensure that the indication of fire is immediately received by the crew.

2.1. Sprinklers shall be grouped into separate sections, each of which shall contain not more than 200 sprinklers. In passenger ships any section of sprinklers shall not serve more than two decks and shall not be situated in more than one main vertical zone. However, the Administration may permit such a section of sprinklers to serve more than two decks or be situated in more than one main vertical zone, if it is satisfied that the protection of the ship against fire will not thereby be reduced.

2.2. Each section of sprinklers shall be capable of being isolated by one stop valve only. The stop valve in each section shall be readily accessible and its location shall be clearly and permanently indicated. Means shall be provided to prevent the operation of the stop valves by any unauthorized person.

2.3. A gauge indicating the pressure in the system shall be provided at each section stop valve and at a central station.

2.4. The sprinklers shall be resistant to corrosion by marine atmosphere. In accommodation and service spaces the sprinklers shall come into operation within the temperature range from 68° to 79°C, except that in locations such as drying rooms, where high ambient temperatures might be expected, the operating temperature may be increased by not more than 30°C above the maximum deckhead temperature.

2.5. A list or plan shall be displayed at each indicating unit showing the spaces covered and the location of the zone in respect of each section. Suitable instructions for testing and maintenance shall be available.

3. Sprinklers shall be placed in an overhead position and [spaced] in a suitable pattern to maintain an average application rate of not less than 5 l/m² per minute over the nominal area covered by the sprinklers. However, the Administration may permit the use of sprinklers providing such an alternative amount of water suitably distributed as has been shown to the satisfaction of the Administration to be not less effective.

4.1. A pressure tank having a volume equal to at least twice that of the charge of water specified in this sub-paragraph shall be provided. The tank shall contain a standing charge of fresh water, equivalent to the amount of water which would be discharged in one minute by the pump referred to in paragraph 5.2, and the arrangements shall provide for maintaining an air pressure in the tank such as to ensure that where the standing charge of fresh water in the tank has been used the pressure will be not less than the working pressure of the sprinkler, plus the pressure exerted by a head of water measured from the bottom of the tank to the highest sprinkler in the system. Suitable means of replenishing the air under pressure and of replenishing the fresh water charge in the tank shall be provided. A glass gauge shall be provided to indicate the correct level of the water in the tank.

4.2. Means shall be provided to prevent the passage of sea-water into the tank.

5.1. An independent power pump shall be provided solely for the purpose of continuing automatically the discharge of water from the sprinklers. The pump shall be brought into action automatically by the pressure drop in the system before the standing fresh water charge in the pressure tank is completely exhausted.

5.2. The pump and the piping system shall be capable of maintaining the necessary pressure at the level of the highest sprinkler to ensure a continuous output of water sufficient for the simultaneous coverage of a minimum area of 280 m² at the application rate specified in paragraph 3.

5.3. The pump shall have fitted on the delivery side a test valve with a short open-ended discharge pipe. The effective area through the valve and pipe shall be adequate to permit the release of the required pump output while maintaining the pressure in the system specified in paragraph 4.1.

5.4. The sea inlet to the pump shall wherever possible be in the space containing the pump and shall be so arranged that when the ship is afloat it will not be necessary to shut off the supply of sea-water to the pump for any purpose other than the inspection or repair of the pump.

6. The sprinkler pump and tank shall be situated in a position reasonably remote from any machinery space of category A and shall not be situated in any space required to be protected by the sprinkler system.

7.1. In passenger ships there shall be not less than two sources of power supply for the sea-water pump and automatic alarm and detection system. Where the sources of power for the pump are electrical, these shall be a main generator and an emergency source of power. One supply for the pump shall be taken from the main switchboard, and one from the emergency switchboard by separate feeders reserved solely for that purpose. The feeders shall be so arranged as to avoid galleys, machinery spaces and other enclosed spaces of high fire risk except in so far as it is necessary to reach the appropriate switchboards, and shall be run to an automatic change-over switch situated near the sprinkler pump. This switch shall permit the supply of power from the main switchboard so long as a supply is available therefrom, and be so designed that upon failure of that supply it will automatically change over to the supply from the emergency switchboard. The switches on the main switchboard and the emergency switchboard shall be clearly labelled and normally kept closed. No other switch shall be permitted in the feeders concerned. One of the sources of power supply for the alarm and detection system shall be an emergency source. Where one of the sources of power for the pump is an internal combustion engine it shall, in addition to complying with the provisions of paragraph 6, be so situated that a fire in any protected space will not affect the air supply to the machinery.

7.2. In cargo ships there shall not be less than two sources of power supply for the sea-water pump and automatic alarm and detection system. If the pump is electrically driven it shall be connected to the main source of electrical power, which shall be capable of being supplied by at least two generators. The feeders shall be so arranged as to avoid galleys, machinery spaces and other enclosed spaces of high fire risk except in so far as it is necessary to reach the appropriate switchboards. One of the sources of power supply for the alarm and detection system shall be an emergency source. Where one of the sources of power for the pump is an internal combustion engine it shall, in addition to complying with the provisions of paragraph 6, be so situated that a fire in any protected space will not affect the air supply to the machinery.

8. The sprinkler system shall have a connexion from the ship's fire main by prevent a backflow from the sprinkler system to the fire main.

9.1. A test valve shall be provided for testing the automatic alarm for each section of sprinklers by a discharge of water equivalent to the operation of one sprinkler. The test valve for each section shall be situated near the stop valve for that section.

9.2. Means shall be provided for testing the automatic operation of the pump on reduction of pressure in the system.

9.3. Switches shall be provided at one of the indicating positions referred to in paragraph 1.2 which will enable the alarm and the indicators for each section of sprinklers to be tested.

10. Spare sprinkler heads shall be provided for each section of sprinklers to the satisfaction of the Administration.

Regulation 13. FIXED FIRE DETECTION AND FIRE ALARM SYSTEMS

1. General requirements

1.1. Any required fixed fire detection and fire alarm system with manually operated call points shall be capable of immediate operation at all times.

1.2. Power supplies and electric circuits necessary for the operation of the system shall be monitored for loss of power or fault conditions as appropriate. Occurrence of a fault condition shall initiate a visual and audible fault signal at the control panel which shall be distinct from a fire signal.

1.3. There shall be not less than two sources of power supply for the electrical equipment used in the operation of the fire detection and fire alarm system, one of which shall be an emergency source. The supply shall be provided by separate feeders reserved solely for that purpose. Such feeders shall run to an automatic change-over switch situated in or adjacent to the control panel for the fire detection system.

1.4. Detectors and manually operated call points shall be grouped into sections. The activation of any detector or manually operated call point shall initiate a visual and audible fire signal at the control panel and indicating units. If the signals have not received attention within two minutes an audible alarm shall be automatically sounded throughout the crew accommodation and service spaces, control stations and machinery spaces of category A. This alarm sounder system need not be an integral part of the detection system.

1.5. The control panel shall be located on the navigating bridge or in the main fire control station.

1.6. Indicating units shall denote the section in which a detector or manually operated call point has operated. At least one unit shall be so located that it is easily accessible to responsible members of the crew at all times, when at sea or in port except when the ship is out of service. One indicating unit shall be located on the navigating bridge if the control panel is located in the main fire control station.

1.7. Clear information shall be displayed on or adjacent to each indicating unit about the spaces covered and the location of the sections.

1.8. No section covering more than one deck within accommodation, service and control stations shall normally be permitted except a section which covers an enclosed stairway. In order to avoid delay in identifying the source of fire, the number of enclosed spaces included in each section shall be limited as determined by the Administration. In no case shall more than fifty enclosed spaces be permitted in any section.

1.9. In passenger ships a section of detectors shall not serve spaces on both sides of the ship nor on more than one deck and neither shall it be situated in more than one main vertical zone except that the Administration, if it is satisfied that the protection of the ship against fire will not thereby be reduced, may permit such a section of detectors to serve both sides of the ship and more than one deck.

1.10. A section of fire detectors which covers a control station, a service space or an accommodation space shall not include a machinery space of category A.

1.11. Detectors shall be operated by heat, smoke or other products of combustion, flame, or any combination of these factors. Detectors operated by other factors indicative of incipient fires may be considered by the Administration provided that they are no less sensitive than such detectors. Flame detectors shall only be used in addition to smoke or heat detectors.

1.12. Suitable instructions and components spares for testing and maintenance shall be provided.

1.13. The function of the detection system shall be periodically tested to the satisfaction of the Administration by means of equipment producing hot air at the appropriate temperature, or smoke or aerosol particles having the appropriate range of density or particle size, or

other phenomena associated with incipient fires to which the detector is designed to respond. All detectors shall be of a type such that they can be tested for correct operation and restored to normal surveillance without the renewal of any component.

1.14. The fire detection system shall not be used for any other purpose, except that closing of fire doors and similar functions may be permitted at the control panel.

2. Installation requirements

2.1. [Manually operated] call points shall be installed throughout the accommodation spaces, service spaces and control stations. One [manually operated] call point shall be located at each exit. [Manually operated] call points shall be readily accessible in the corridors of each deck such that no part of the corridor is more than 20 m from a [manually operated] call point.

2.2. Smoke detectors shall be installed in all stairways, corridors and escape routes within accommodation spaces. Consideration shall be given to the installation of special purpose smoke detectors within ventilation ducting.

2.3. Where a fixed fire detection and fire alarm system is required for the protection of spaces other than those specified in paragraph 2.2, at least one detector complying with paragraph 1.11 shall be installed in each such space.

2.4. Detectors shall be located for optimum performance. Positions near beams and ventilation ducts or other positions where patterns of air flow could adversely affect performance and positions where impact or physical damage is likely shall be avoided. In general, detectors which are located on the overhead shall be a minimum distance of 0.5 m away from bulkheads.

2.5. The maximum spacing of detectors shall be in accordance with the table below:

Type of detector	Maximum floor area per detector	Maximum distance apart between centres	Maximum distance away from bulkheads
Heat	37 m ²	9 m	4.5 m
Smoke	74 m ²	11 m	5.5 m

The Administration may require or permit other spacings based upon test data which demonstrate the characteristics of the detectors.

2.6. Electrical wiring which forms part of the system shall be so arranged as to avoid galleys, machinery spaces of category A, and other enclosed spaces of high fire risk except where it is necessary to provide for fire detection or fire alarm in such spaces or to connect to the appropriate power supply.

3. Design requirements

3.1. The system and equipment shall be suitably designed to withstand supply voltage variation and transients, ambient temperature changes, vibration, humidity, shock, impact and corrosion normally encountered in ships.

3.2. Smoke detectors required by paragraph 2.2 shall be certified to operate before the smoke density exceeds 12.5 per cent obscuration per metre, but not until the smoke density exceeds 2 per cent obscuration per metre. Smoke detectors to be installed in other spaces shall operate within sensitivity limits to the satisfaction of the Administration having regard to the avoidance of detector insensitivity or oversensitivity.

3.3. Heat detectors shall be certified to operate before the temperature exceeds 78°C but not until the temperature exceeds 54°C, when the temperature is raised to those limits at a rate less than 1°C per minute. At higher rates of temperature rise, the heat detector shall operate within temperature limits to the satisfaction of the Administration having regard to the avoidance of detector insensitivity or oversensitivity.

3.4. At the discretion of the Administration, the permissible temperature of operation of heat detectors may be increased to 30°C above the maximum deckhead temperature in drying rooms and similar spaces of a normal high ambient temperature.

Regulation 14. FIXED FIRE DETECTION AND FIRE ALARM SYSTEMS FOR PERIODICALLY UNATTENDED MACHINERY SPACES

1. A fixed fire detection and fire alarm system in accordance with the relevant provisions of regulation 13 shall be installed in periodically unattended machinery spaces.

2. This fire detection system shall be so designed and the detectors so positioned as to detect rapidly the onset of fire in any part of those spaces and under any normal conditions of operation of the machinery and variations of ventilation as required by the possible range of ambient temperatures. Except in spaces of restricted height and where their use is specially appropriate, detection systems using only thermal detectors shall not be permitted. The detection system shall initiate audible and visual alarms distinct in both respects from the alarms of any other system not indicating fire, in sufficient places to ensure that the alarms are heard and observed on the navigating bridge and by a responsible engineer officer. When the navigating bridge is unmanned the alarm shall sound in a place where a responsible member of the crew is on duty.

3. After installation the system shall be tested under varying conditions of engine operation and ventilation.

Regulation 15. ARRANGEMENTS FOR OIL FUEL, LUBRICATING OIL AND OTHER FLAMMABLE OILS

1. Limitations in the use of oil as fuel

The following limitations shall apply to the use of oil as fuel:

1. Except as otherwise permitted by this paragraph, no oil fuel with a flashpoint of less than 60°C shall be used.
2. In emergency generators oil fuel with a flashpoint of not less than 43°C may be used.
3. Subject to such additional precautions as it may consider necessary and on condition that the ambient temperature of the space in which such oil fuel is stored or used shall not be allowed to rise to within 10°C below the flashpoint of the oil fuel, the Administration may permit the general use of oil fuel having a flashpoint of less than 60°C but not less than 43°C.
4. In cargo ships the use of fuel having a lower flashpoint than otherwise specified in this paragraph, for example crude oil, may be permitted provided that such fuel is not stored in any machinery space and subject to the approval by the Administration of the complete installation.

The flashpoint of oils shall be determined by an approved closed cup method.

2. Oil fuel arrangements

In a ship in which oil fuel is used, the arrangements for the storage, distribution and utilization of the oil fuel shall be such as to ensure the safety of the ship and persons on board and shall at least comply with the following provisions:

1. As far as practicable, parts of the oil fuel system containing heated oil under pressure exceeding 0.18 N/mm² shall not be placed in a concealed position such that defects and leakage cannot readily be observed. The machinery spaces in way of such parts of the oil fuel system shall be adequately illuminated.
2. The ventilation of machinery spaces shall be sufficient under all normal conditions to prevent accumulation of oil vapour.
3. As far as practicable, oil fuel tanks shall be part of the ship's structure and shall be located outside machinery spaces of category A. Where oil fuel tanks, other than double bottom

tanks, are necessarily located adjacent to or within machinery spaces of category A, at least one of their vertical sides shall be contiguous to the machinery space boundaries, and shall preferably have a common boundary with the double bottom tanks, and the area of the tank boundary common with the machinery spaces shall be kept to a minimum. Where such tanks are situated within the boundaries of machinery spaces of category A they shall not contain oil fuel having a flashpoint of less than 60°C. In general the use of free standing oil fuel tanks shall be avoided. When such tanks are employed their use shall be prohibited in category A machinery spaces on passenger ships. Where permitted, they shall be placed in an oil-tight spill tray of ample size having a suitable drain pipe leading to a suitably sized spill oil tank.

4. No oil fuel tank shall be situated where spillage or leakage therefrom can constitute a hazard by falling on heated surfaces. Precautions shall be taken to prevent any oil that may escape under pressure from any pump, filter or heater from coming into contact with heated surfaces.
5. Every oil fuel pipe, which, if damaged, would allow oil to escape from a storage, settling or daily service tank situated above the double bottom shall be fitted with a cock or valve directly on the tank capable of being closed from a safe position outside the space concerned in the event of a fire occurring in the space in which such tanks are situated. In the special case of deep tanks situated in any shaft or pipe tunnel or similar space, valves on the tank shall be fitted but control in the event of fire may be effected by means of an additional valve on the pipe or pipes outside the tunnel or similar space. If such additional valve is fitted in the machinery space it shall be operated from a position outside this space.
6. Safe and efficient means of ascertaining the amount of oil fuel contained in any oil fuel tank shall be provided. Sounding pipes shall not terminate in any space where the risk of ignition of spillage from the sounding pipe might arise. In particular, they shall not terminate in passenger or crew spaces. Other means of ascertaining the amount of oil fuel contained in any oil fuel tank may be permitted:
 - 6.1. In passenger ships, if such means do not require penetration below the top of the tank, and providing their failure or over-filling of the tanks will not permit release of fuel;
 - 6.2. In cargo ships, providing the failure of such means or over-filling of the tanks will not permit release of fuel. The use of cylindrical gauge glasses is prohibited. The Administration may permit the use of oil level gauges with flat glasses and self-closing valves between the gauges and oil tanks.

Such other means shall be acceptable to the Administration and shall be maintained in the proper condition to ensure their continued accurate functioning in service.

7. Provision shall be made to prevent overpressure in any oil tank or in any part of the oil fuel system, including the filling pipes. Any relief valves and air or overflow pipes shall discharge to a position which, in the opinion of the Administration, is safe.
8. Oil fuel pipes and their valves and fittings shall be of steel or other approved material, except that restricted use of flexible pipes shall be permissible in positions where the Administration is satisfied that they are necessary. Such flexible pipes and end attachments shall be of approved fire-resisting materials of adequate strength and shall be constructed to the satisfaction of the Administration.

3. *Lubricating oil arrangements*

The arrangements for the storage, distribution and utilization of oil used in pressure lubrication systems shall be such as to ensure the safety of the ship and persons on board, and such arrangements in machinery spaces of category A and whenever practicable in other machinery spaces shall at least comply with the provisions of paragraphs 2.1, 2.4, 2.5, 2.6, 2.7 and 2.8,

except that this does not preclude the use of sight flow glasses in lubricating systems provided that they are shown by test to have a suitable degree of fire resistance.

4. *Arrangements for other flammable oils*

The arrangements for the storage, distribution and utilization of other flammable oils employed under pressure in power transmission systems, control and activating systems and heating systems shall be such as to ensure the safety of the ship and persons on board. In locations where means of ignition are present, such arrangements shall at least comply with the provisions of paragraphs 2.4 and 2.6, and with the provisions of paragraphs 2.7 and 2.8 in respect of strength and construction.

5. *Periodically unattended machinery spaces*

In addition to the requirements of paragraphs 1 to 4, the oil fuel and lubricating oil systems shall comply with the following:

1. Where necessary, oil fuel and lubricating oil pipelines shall be screened or otherwise suitably protected to avoid as far as practicable oil spray or oil leakages on to hot surfaces or into machinery air intakes. The number of joints in such piping systems shall be kept to a minimum and, where practicable, leakages from high pressure oil fuel pipes shall be collected and arrangements provided for an alarm to be given.
2. Where daily service oil fuel tanks are filled automatically, or by remote control, means shall be provided to prevent overflow spillages. Other equipment which treats flammable liquids automatically, e.g. oil fuel purifiers, which, whenever practicable, shall be installed in a special space reserved for purifiers and their heaters, shall have arrangements to prevent overflow spillages.
3. Where daily service oil fuel tanks or settling tanks are fitted with heating arrangements, a high temperature alarm shall be provided if the flashpoint of the oil fuel can be exceeded.

Regulation 16. VENTILATION SYSTEMS IN SHIPS OTHER THAN PASSENGER SHIPS CARRYING MORE THAN 36 PASSENGERS

1. Ventilation ducts shall be of non-combustible material. Short ducts, however, not generally exceeding 2 m in length and with a cross-section not exceeding 0.02 m² need not be non-combustible, subject to the following conditions:

1. These ducts shall be of a material which, in the opinion of the Administration, has a low fire risk;
2. They may only be used at the end of the ventilation device;
3. They shall not be situated less than 600 mm, measured along the duct, from an opening in an "A" or "B" class division including continuous "B" class ceilings.

2. Where the ventilation ducts with a free-sectional area exceeding 0.02 m² pass through class "A" bulkheads or decks, the opening shall be lined with a steel sheet sleeve unless the ducts passing through the bulkheads or decks are of steel in the vicinity of passage through the deck or bulkhead and the ducts and sleeves shall comply in this part with the following:

1. The sleeves shall have a thickness of at least 3 mm and a length of at least 900 mm. When passing through bulkheads, this length shall be divided preferably into 450 mm on each side of the bulkhead. These ducts, or sleeves lining such ducts, shall be provided with fire insulation. The insulation shall have at least the same fire integrity as the bulkhead or deck through which the duct passes. Equivalent penetration protection may be provided to the satisfaction of the Administration.
2. Ducts with a free cross-sectional area exceeding 0.075 m² shall be fitted with fire dampers in addition to the requirements of paragraph 2.1. The fire damper shall operate automatically but shall also be capable of being closed manually from both sides of the bulkhead or deck. The damper shall be provided with an indicator which shows whether the damper is

open or closed. Fire dampers are not required, however, where ducts pass through spaces surrounded by "A" class divisions, without serving those spaces, provided those ducts have the same fire integrity as the divisions which they pierce.

3. Ducts provided for the ventilation of machinery spaces of category A, galleys, car deck spaces, ro/ro cargo spaces or special category spaces shall not pass through accommodation spaces, service spaces or control stations unless [they comply with the conditions specified in sub-paragraphs 1.1 to 1.4 or 2.1 and 2.2 below:]

- 1.1. [The ducts are] constructed of steel having a thickness of at least 3 mm and 5 mm for ducts the widths or diameters of which are up to and including 300 mm and 760 mm and over respectively and, in the case of such ducts, the widths or diameters of which are between 300 mm and 760 mm having a thickness to be obtained by interpolation;
- 1.2. [The ducts are] suitably supported and stiffened;
- 1.3. [The ducts are] fitted with automatic fire dampers close to the boundaries penetrated; and
- 1.4. [The ducts are] insulated to "A-60" standard from the machinery spaces, galleys, car deck spaces, ro/ro cargo spaces or special category spaces to a point at least 5 m beyond each fire damper;

or

- 2.1. [The ducts are] constructed of steel in accordance with paragraphs 3.1.1 and 3.1.2; and
- 2.2. [The ducts are] insulated to "A-60" standard throughout the accommodation spaces, service spaces or control stations;

except that penetrations of main zone divisions shall also comply with the requirements of paragraph 8.

4. Ducts provided for ventilation to accommodation spaces, service spaces or control stations shall not pass through machinery spaces of category A, galleys, car deck spaces, ro/ro cargo spaces or special category spaces unless [they comply with the conditions specified in sub-paragraphs 1.1 to 1.3 or 2.1 and 2.2 below:]

- 1.1. The ducts where they pass through a machinery space of category A, galley, car deck space, ro/ro cargo space or special category space are constructed of steel in accordance with paragraphs 3.1.1 and 3.1.2;
- 1.2. Automatic fire dampers are fitted close to the boundaries penetrated; and
- 1.3. The integrity of the machinery space, galley, car deck space, ro/ro cargo space or special category space boundaries is maintained at the penetrations;

or

- 2.1. The ducts where they pass through a machinery space of category A, galley, car deck space, ro/ro cargo space or special category space are constructed of steel in accordance with paragraphs 3.1.1 and 3.1.2; and
- 2.2. [The ducts] are insulated to "A-60" standard within the machinery space, galley, car deck space, ro/ro cargo space or special category space;

except that penetrations of main zone divisions shall also comply with the requirements of paragraph 8.

5. Ventilation ducts with a free cross-sectional area exceeding 0.02 m² passing through "B" class bulkheads shall be lined with steel sheet sleeves of 900 mm in length divided preferably into 450 mm on each side of the bulkheads unless the duct is of steel for this length.

6. Such measures as are practicable shall be taken in respect of control stations outside machinery spaces in order to ensure that ventilation, visibility and freedom from smoke are maintained, so that in the event of fire the machinery and equipment contained therein may be supervised and continue to function effectively. Alternative and separate means of air supply shall be provided; air inlets of the two sources of supply shall be so disposed that the risk of

both inlets drawing in smoke simultaneously is minimized. At the discretion of the Administration, such requirements need not apply to control stations situated on, and opening on to, an open deck, or where local closing arrangements would be equally effective.

7. Where they pass through accommodation spaces or spaces containing combustible materials, the exhaust ducts from galley ranges shall be constructed of "A" class divisions. Each exhaust duct shall be fitted with:

1. A grease trap readily removable for cleaning;
2. A fire damper located in the lower end of the duct;
3. Arrangements, operable from within the galley, for shutting off the exhaust fans; and
4. Fixed means for extinguishing a fire within the duct.

8. Where in a passenger ship it is necessary that a ventilation duct passes through a main vertical zone division, a fail-safe automatic closing fire damper shall be fitted adjacent to the division. The damper shall also be capable of being manually closed from each side of the division. The operating position shall be readily accessible and be marked in red light-reflecting colour. The duct between the division and the damper shall be of steel or other equivalent material and, if necessary, insulated to comply with the requirements of regulation 18.1.1. The damper shall be fitted on at least one side of the division with a visible indicator showing whether the damper is in the open position.

9. The main inlets and outlets of all ventilation systems shall be capable of being closed from outside the spaces being ventilated.

10. Power ventilation of accommodation spaces, service spaces, cargo spaces, control stations and machinery spaces shall be capable of being stopped from an easily accessible position outside the space being served. This position should not be readily cut off in the event of a fire in the spaces served. The means provided for stopping the power ventilation of the machinery spaces shall be entirely separate from the means provided for stopping ventilation of other spaces.

Regulation 17. FIREMAN'S OUTFIT

1. A fireman's outfit shall consist of:

1.1. Personal equipment comprising:

1. Protective clothing of material to protect the skin from the heat radiating from the fire and from burns and scalding by steam. The outer surface shall be water-resistant.
2. Boots and gloves of rubber or other electrically non-conducting material.
3. A rigid helmet providing effective protection against impact.
4. An electric safety lamp (hand lantern) of an approved type with a minimum burning period of three hours.
5. An axe to the satisfaction of the Administration.

1.2. A breathing apparatus of an approved type which may be either:

1. A smoke helmet or smoke mask which shall be provided with a suitable air pump and a length of air hose sufficient to reach from the open deck, well clear of hatch or doorway, to any part of the holds or machinery spaces. If, in order to comply with this sub-paragraph, an air hose exceeding 36 m in length would be necessary, a self-contained breathing apparatus shall be substituted or provided in addition as determined by the Administration; or
2. A self-contained compressed air-operated breathing apparatus, the volume of air contained in the cylinders of which shall be at least 1,200 l, or other self-contained breathing apparatus which shall be capable of functioning for at least 30 minutes. A number of spare charges, suitable for use with the apparatus provided, shall be available on board to the satisfaction of the Administration.

2. For each breathing apparatus a fireproof lifeline of sufficient length and strength shall be provided capable of being attached by means of a snaphook to the harness of the apparatus or to a separate belt in order to prevent the breathing apparatus becoming detached when the lifeline is operated.

3. All ships shall carry at least two fireman's outfits complying with the requirements of paragraph 1.

3.1. In addition, there shall be provided:

1. In passenger ships for every 80 m, or part thereof, of the aggregate of the lengths of all passenger spaces and service spaces on the deck which carries such spaces or, if there is more than one such deck, on the deck which has the largest aggregate of such lengths, two fireman's outfits and two sets of personal equipment, each set comprising the items stipulated in paragraphs 1.1.1, 1.1.2 and 1.1.3;

2. In tankers, two fireman's outfits.

3.2. In passenger ships carrying more than 36 passengers for each pair of breathing apparatus there shall be provided one water fog applicator which shall be stored adjacent to such apparatus.

3.3 The Administration may require additional sets of personal equipment and breathing apparatus, having due regard to the size and type of the ship.

4. The fireman's outfits or sets of personal equipment shall be so stored as to be easily accessible and ready for use and, where more than one fireman's outfit or more than one set of personal equipment is carried, they shall be stored in widely separated positions. In passenger ships at least two fireman's outfits and one set of personal equipment shall be available at any one position.

Regulation 18. MISCELLANEOUS ITEMS

1.1. Where "A" class divisions are penetrated for the passage of electric cables, pipes, trunks, ducts, etc., or for girders, beams or other structural members, arrangements shall be made to ensure that the fire resistance is not impaired, subject to the provisions of regulation 30.5.

1.2. Where "B" class divisions are penetrated for the passage of electric cables, pipes, trunks, ducts, etc., or for the fitting of ventilation terminals, lighting fixtures and similar devices, arrangements shall be made to ensure that the fire resistance is not impaired.

2.1. Pipes penetrating "A" or "B" class divisions shall be of materials approved by the Administration having regard to the temperature such divisions are required to withstand.

2.2. Where the Administration may permit the conveying of oil and combustible liquids through accommodation and service spaces, the pipes conveying oil or combustible liquids shall be of a material approved by the Administration having regard to the fire risk.

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

3. Electric radiators, if used, shall be fixed in position and so constructed as to reduce fire risks to a minimum. No such radiators shall be fitted with an element so exposed that clothing, curtains, or other similar materials can be scorched or set on fire by heat from the element.

4. Cellulose-nitrate based films shall not be used for cinematograph installations.

5. All waste-receptacles shall be constructed of non-combustible materials with no openings in the sides or bottom.

6. In spaces where penetration of oil products is possible, the surface of insulation shall be impervious to oil or oil vapours.

Regulation 19. INTERNATIONAL SHORE CONNEXION*

1. Ships of 500 tons gross tonnage and upwards shall be provided with at least one international shore connexion, complying with provisions of paragraph 3.
2. Facilities shall be available enabling such a connexion to be used on either side of the ship.
3. Standard dimensions of flanges for the international shore connexion shall be in accordance with the following table:

<i>Description</i>	<i>Dimension</i>
Outside diameter	178 mm
Inside diameter	64 mm
Bolt circle diameter	132 mm
Slots in flange	4 holes 19 mm in diameter spaced equidistantly on a bolt circle of the above diameter, slotted to the flange periphery
Flange thickness	14.5 mm minimum
Bolts and nuts	4, each of 16 mm diameter, 50 mm in length

4. The connexion shall be of steel or other suitable material and shall be designed for 1.0 N/mm² services. The flange shall have a flat face on one side and on the other shall be permanently attached to a coupling that will fit the ship's hydrant and hose. The connexion shall be kept aboard the ship together with a gasket of any material suitable for 1.0 N/mm² services, together with four 16 mm bolts, 50 mm in length and eight washers.

Regulation 20. FIRE CONTROL PLANS

1. In all ships general arrangement plans shall be permanently exhibited for the guidance of the ship's officers, showing clearly for each deck the control stations, the various fire sections enclosed by "A" class divisions, the sections enclosed by "B" class divisions together with particulars of the fire detection and fire alarm systems, the sprinkler installation, the fire-extinguishing appliances, means of access to different compartments, decks, etc. and the ventilating system including particulars of the fan control positions, the position of dampers and identification numbers of the ventilating fans serving each section. Alternatively, at the discretion of the Administration, the aforementioned details may be set out in a booklet, a copy of which shall be supplied to each officer, and one copy shall at all times be available on board in an accessible position. Plans and booklets shall be kept up to date, any alterations being recorded thereon as soon as practicable. Description in such plans and booklets shall be in the [official language of the flag State]. If the language is neither English nor French, a translation into one of those languages shall be included. In addition, instructions concerning the maintenance and operation of all the equipment and installations on board for the fighting and containment of fire shall be kept under one cover, readily available in an accessible position.
2. In all ships a duplicate set of fire control plans or a booklet containing such plans shall be permanently stored in a prominently marked weathertight enclosure outside the deckhouse for the assistance of shoreside fire-fighting personnel.

Regulation 21. READY AVAILABILITY OF FIRE-EXTINGUISHING APPLIANCES

- In all ships, fire-extinguishing appliances shall be kept in good order and available for immediate use at all times during the voyage.

* Reference is made to the recommendation contained in resolution A.470(XII) adopted by the Organization entitled "International Shore Connexion (shore side)".

Regulation 22. ACCEPTANCE OF SUBSTITUTES

1. This regulation applies to all ships.
2. Where in this chapter any special type of appliance, apparatus, extinguishing medium or arrangement is specified in any ship, any other type of appliance etc., may be allowed, provided the Administration is satisfied that it is not less effective.

PART B. FIRE SAFETY MEASURES FOR PASSENGER SHIPS

Regulation 23. STRUCTURE

1. The hull, superstructure, structural bulkheads, decks and deckhouses shall be constructed of steel or other equivalent material. For the purpose of applying the definition of steel or other equivalent material as given in regulation 3.7 the "applicable fire exposure" shall be according to the integrity and insulation standards given in the tables of regulations 26 and 27. For example where divisions such as decks or sides and ends of deckhouses are permitted to have "B-0" fire integrity, the "applicable fire exposure" shall be half an hour.

2. However, in cases where any part of the structure is of aluminium alloy, the following shall apply:

1. The insulation of aluminium alloy components of "A" or "B" class divisions, except structure which, in the opinion of the Administration, is non-load-bearing, shall be such that the temperature of the structural core does not rise more than 200°C above the ambient temperature at any time during the applicable fire exposure to the standard fire test.
2. Special attention shall be given to the insulation of aluminium alloy components of columns, stanchions and other structural members required to support lifeboat and liferaft stowage, launching and embarkation areas, and "A" and "B" class divisions to ensure:
 - 2.1. That for such members supporting lifeboat and liferaft areas and "A" class divisions, the temperature rise limitation specified in paragraph 2.1 shall apply at the end of one hour; and
 - 2.2. That for such members required to support "B" class divisions, the temperature rise limitation specified in paragraph 2.1 shall apply at the end of half an hour.
3. Crowns and casings of machinery spaces of category A shall be of steel construction adequately insulated and openings therein, if any, shall be suitably arranged and protected to prevent the spread of fire.

Regulation 24. MAIN VERTICAL ZONES AND HORIZONTAL ZONES

1.1. For ships carrying more than 36 passengers, the hull, superstructure and deckhouses shall be subdivided into main vertical zones by "A" class divisions. Steps and recesses shall be kept to a minimum, but where they are necessary they shall also be "A" class divisions. These divisions shall have insulation values in accordance with tables in regulation 26.

1.2. For ships carrying not more than 36 passengers, the hull, superstructure and deckhouses in way of accommodation and service spaces shall be subdivided into main vertical zones by "A" class divisions. These divisions shall have insulation values in accordance with tables in regulation 27.

2. As far as practicable, the bulkheads forming the boundaries of the main vertical zones above the bulkhead deck shall be in line with watertight subdivision bulkheads situated immediately below the bulkhead deck.

3. Such bulkheads shall extend from deck to deck and to the shell or other boundaries.

4. Where a main vertical zone is subdivided by horizontal "A" class divisions into horizontal zones for the purpose of providing an appropriate barrier between sprinklered and non-sprinklered zones of the ship, the divisions shall extend between adjacent main vertical zone

bulkheads and to the shell or exterior boundaries of the ship and shall be insulated in accordance with the fire insulation and integrity values given in table 26.3 or in table 27.2.

5.1. On ships designed for special purposes, such as automobile or railroad car ferries, where the provision of main vertical zone bulkheads would defeat the purpose for which the ship is intended, equivalent means for controlling and limiting a fire shall be substituted and specifically approved by the Administration.

5.2. However, in a ship with special category spaces, any such space shall comply with the applicable provisions of regulation 37 and in so far as such compliance would be inconsistent with compliance with other requirements of this part, the requirements of regulation 37 shall prevail.

Regulation 25. BULKHEADS WITHIN A MAIN VERTICAL ZONE

1.1. For ships carrying more than 36 passengers all bulkheads which are not required to be "A" class divisions shall be at least "B" class or "C" class divisions as prescribed in the tables in regulation 26.

1.2. For ships carrying not more than 36 passengers all bulkheads within accommodation and service spaces which are not required to be "A" class divisions shall be at least "B" class or "C" class divisions as prescribed in the tables in regulation 27.

1.3. All such divisions may be faced with combustible materials in accordance with the provisions of regulation 34.

2. All corridor bulkheads where not required to be "A" class shall be class divisions which shall extend from deck to deck except:

1. When continuous "B" class ceilings or linings are fitted on both sides of the bulkhead, the portion of the bulkhead behind the continuous ceiling or lining shall be of material which, in thickness and composition, is acceptable in the construction of "B" class divisions but which shall be required to meet "B" class integrity standards only in so far as is reasonable and practicable in the opinion of the Administration;
2. In the case of a ship protected by an automatic sprinkler system complying with the provisions of regulation 12 the corridor bulkheads of "B" class materials may terminate at a ceiling in the corridor provided such a ceiling is of material which, in thickness and composition, is acceptable in the construction of "B" class divisions. Notwithstanding the requirements of regulations 26 and 27 such bulkheads and ceilings shall be required to meet "B" class integrity standards only in so far as is reasonable and practicable in the opinion of the Administration. All doors and frames in such shall be of non-combustible materials and shall be so constructed and erected as to provide substantial fire resistance to the satisfaction of the Administration.

3. All bulkheads required to be "B" class divisions, except corridor bulkheads, shall extend from deck to deck and to the shell or other boundaries unless continuous "B" class ceilings or linings are fitted on both sides of the bulkhead, in which case the bulkhead may terminate at the continuous ceiling or lining.

**Regulation 26. FIRE INTEGRITY OF BULKHEADS AND DECKS IN SHIPS
CARRYING MORE THAN 36 PASSENGERS**

1. In addition to complying with the specific provisions for fire integrity of bulkheads and decks mentioned elsewhere in this Part, the minimum fire integrity of all bulkheads and decks shall be as prescribed in tables 26.1 to 26.4. Where, due to any particular structural arrangements in the ship, difficulty is experienced in determining from the tables the minimum fire integrity value of any divisions, such values shall be determined to the satisfaction of the Administration.

2. The following requirements shall govern application of the tables:
1. Table 26.1 shall apply to bulkheads bounding main vertical zones or horizontal zones.
Table 26.2 shall apply to bulkheads not bounding either main vertical zones or horizontal zones.
Table 26.3 shall apply to decks forming steps in main vertical zones or bounding horizontal zones.
Table 26.4 shall apply to decks not forming steps in main vertical zones nor bounding horizontal zones.
2. [For] determining the appropriate fire integrity standards to be applied to boundaries between adjacent spaces, such spaces are classified according to their fire risk as shown in categories (1) to (14) below. Where the contents and use of a space are such that there is a doubt as to its classification for the purpose of this regulation, it shall be treated as a space within the relevant category having the most stringent boundary requirements. The title of each category is intended to be typical rather than restrictive. The number in parentheses preceding each category refers to the applicable column or row [] in the tables.
 - (1) Control stations
 - Spaces containing emergency sources of power and lighting.
 - Wheelhouse and chartroom.
 - Spaces containing the ship's radio equipment.
 - Fire-extinguishing rooms, fire control [rooms] and [fire-]recording stations.
 - Control room for propulsion machinery when located outside the propulsion machinery space.
 - Spaces containing centralized fire alarm equipment.
 - Spaces containing centralized emergency public address system stations and equipment.
 - (2) Stairways
 - Interior stairways, lifts and escalators (other than those wholly contained within the machinery spaces) for passengers and crew and enclosures thereto.
 - In this connexion a stairway which is enclosed at only one level shall be regarded as part of the space from which it is not separated by a fire door.
 - (3) Corridors
 - Passenger and crew corridors and lobbies.
 - (4) Lifeboat and liferaft handling and embarkation stations
 - Open deck spaces and enclosed promenades forming lifeboat and liferaft embarkation and lowering stations.
 - (5) Open deck spaces
 - Open deck spaces and enclosed promenades clear of lifeboat and liferaft embarkation and lowering stations.
 - Air spaces (the space outside superstructures and deckhouses).
 - (6) Accommodation spaces of minor fire risk
 - Cabins containing furniture and furnishings of restricted fire risk.
 - Offices and dispensaries containing furniture and furnishings of restricted fire risk.
 - Public spaces containing furniture and furnishings of restricted fire risk and having a deck area of less than 50 m².

- (7) Accommodation spaces of moderate fire risk
 - Spaces as in category (6) above but containing furniture and furnishings of other than restricted fire risk.
 - Public spaces containing furniture and furnishings of restricted fire risk and having a deck area of 50 m² or more.
 - Isolated lockers and small store-rooms in accommodation spaces.
 - Sale shops.
 - Motion picture projection and film stowage rooms.
 - Diet kitchens (containing no open flame).
 - Cleaning gear lockers (in which flammable liquids are not stowed).
 - Laboratories (in which flammable liquids are not stowed).
 - Pharmacies.
 - Small drying rooms (having a deck area of 4 m² or less).
 - Specie rooms.
- (8) Accommodation spaces of greater fire risk
 - Public spaces containing furniture and furnishings of other than restricted fire risk and having a deck area of 50 m² or more.
 - Barber shops and beauty parlours.
- (9) Sanitary and similar spaces
 - Communal sanitary facilities, showers, baths, water closets, etc.
 - Small laundry rooms.
 - Indoor swimming pool area.
 - Operating rooms.
 - Isolated pantries containing no cooking appliances in accommodation spaces.
 - Private sanitary facilities shall be considered a portion of the space in which they are located.
- (10) Tanks, voids and auxiliary machinery spaces having little or no fire risk
 - Water tanks forming part of the ship's structure.
 - Voids and cofferdams.
 - Auxiliary machinery spaces which do not contain machinery having a pressure lubrication system and where storage of combustibles is prohibited, such as ventilation and air-conditioning rooms; windlass room; steering gear room; stabilizer equipment room; electrical propulsion motor room; rooms containing section switchboards and purely electrical equipment other than oil-filled electrical transformers (above 10 kVA); shaft alleys and pipe tunnels; spaces for pumps and refrigeration machinery (not handling or using flammable liquids).
 - Closed trunks serving the spaces listed above.
 - Other closed trunks such as pipe and cable trunks.
- (11) Auxiliary machinery spaces, cargo spaces, special category spaces, cargo and other oil tanks and other similar spaces of moderate fire risk
 - Cargo oil tanks.
 - Cargo holds, trunkways and hatchways.
 - Refrigerated chambers.
 - Oil fuel tanks (where installed in a separate space with no machinery).
 - Shaft alleys and pipe tunnels allowing storage of combustibles.

- Auxiliary machinery spaces as in category (10) which contain machinery having a pressure lubrication system or where storage of combustibles is permitted.
 - Oil fuel filling stations.
 - Spaces containing oil-filled electrical transformers (above 10 kVA).
 - Spaces containing turbine and reciprocating steam engine driven auxiliary generators and small internal combustion engines of power output up to 110 kW driving emergency generators, sprinkler, drencher or fire pumps, bilge pumps, etc.
 - Special category spaces (tables 26.1 and 26.3 only apply).
 - Closed trunks serving the spaces listed above.
- (12) Machinery spaces and main galleys
- Main propulsion machinery rooms (other than electric propulsion motor rooms) and boiler rooms.
 - Auxiliary machinery spaces other than those in categories (10) and (11) which contain internal combustion machinery or other oil-burning, heating or pumping units.
 - Main galleys and annexes.
 - Trunks and casings to the spaces listed above.
- (13) Store-rooms, workshops, pantries, etc.
- Main pantries not annexed to galleys.
 - Main laundry.
 - Large drying rooms (having a deck area of more than 4 m²).
 - Miscellaneous stores.
 - Mail and baggage rooms.
 - Garbage rooms.
 - Workshops (not part of machinery spaces, galleys, etc.)
- (14) Other spaces in which flammable liquids are stowed
- Lamp rooms.
 - Paint rooms.
 - Store-rooms containing flammable liquids (including dyes, medicines, etc.).
 - Laboratories (in which flammable liquids are stowed).
3. Where a single value is shown for the fire integrity of a boundary between two spaces, that value shall apply in all cases.
 4. In determining the applicable fire integrity standard of a boundary between two spaces within a main vertical zone or horizontal zone which is not protected by an automatic sprinkler system complying with the provisions of regulation 12 or between such zones neither of which is so protected, the higher of the two values given in the tables shall apply.
 5. In determining the applicable fire integrity standard of a boundary between two spaces within a main vertical zone or horizontal zone which is protected by an automatic sprinkler system complying with the provisions of regulation 12 or between such zones both of which are so protected, the lesser of the two values given in the tables shall apply. Where a sprinklered zone and a non-sprinklered zone meet within accommodation and service spaces, the higher of the two values given in the tables shall apply to the division between the zones.
 6. Notwithstanding the provisions of regulation 35 there are no special requirements for material or integrity of boundaries where only a dash appears in the tables.
 7. The Administration shall determine in respect of category (5) spaces whether the insulation values in table 26.1 or 26.2 shall apply to ends of deckhouses and superstructures, and

TABLE 26.2 – BULKHEADS NOT BOUNDING EITHER MAIN VERTICAL ZONES OR HORIZONTAL ZONES

Spaces	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Control stations	(1)	B-0 ^{a/}	A-0	A-0	A-0	A-60	A-60	A-60	A-0	A-0	A-60	A-60	A-60	A-60
Stairways	(2)		A-0 ^{a/}	A-0	A-0	A-0	A-15 A-0	A-30 A-0	A-0	A-0	A-15	A-30	A-15 A-0	A-30
Corridors	(3)			C	A-0	B-0	B-15 B-0	B-15 B-0	B-0	A-0	A-15	A-30	A-0	A-30 A-0
Lifeboat and liferaft handling and embarkation stations	(4)				–	A-0	A-0	A-0	A-0	A-0	A-0	A-15	A-0	A-15 A-0
Open deck space	(5)				–	A-0 B-0	A-0 B-0	A-0 B-0	A-0 B-0	A-0	A-0	A-0	A-0 B-0	A-0 B-0
Accommodation spaces of minor fire risk	(6)					B-0 C	B-15 C	B-15 C	B-0 C	A-0	A-15 A-0	A-30	A-0	A-30 A-0
Accommodation spaces of moderate fire risk	(7)						B-15 C	B-15 C	B-0 C	A-0	A-15 A-0	A-60	A-15 A-0	A-60 A-15
Accommodation spaces of greater fire risk	(8)							B-15 C	B-0 C	A-0	A-30 A-0	A-60	A-15 A-0	A-60 A-15
Sanitary and similar spaces	(9)								C	A-0	A-0	A-0	A-0	A-0
Tanks, voids and auxiliary machinery spaces having little or no fire risk	(10)									A-0 ^{a/}	A-0	A-0	A-0	A-0
Auxiliary machinery spaces, cargo spaces, cargo and other oil tanks and other similar spaces of moderate fire risk	(11)										A-0 ^{a/}	A-0	A-0	A-30 ^{b/} A-15
Machinery spaces and main galleys	(12)											A-0 ^{a/}	A-0	A-60
Store-rooms, workshops, pantries, etc.	(13)												A-0 ^{a/}	A-0
Other spaces in which flammable liquids are stowed	(14)													A-30 ^{b/} A-15

TABLE 26.3 – DECKS FORMING STEPS IN MAIN VERTICAL ZONES OR BOUNDING HORIZONTAL ZONES

Space below ↓	Space above →	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Control stations	(1)	A-60	A-60	A-30	A-0	A-0	A-15	A-30	A-60	A-0	A-0	A-30	A-60	A-15	A-60
Stairways	(2)	A-15	A-0	A-0	A-0	A-0	A-0	A-15 A-0	A-15 A-0	A-0	A-0	A-0	A-60	A-0	A-60
Corridors	(3)	A-30	A-0	A-0	A-0	A-0	A-0	A-15 A-0	A-15 A-0	A-0	A-0	A-0	A-60	A-0	A-60
Lifeboat and liferaft handling and embarkation stations	(4)	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0
Open deck spaces	(5)	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0
Accommodation spaces of minor fire risk	(6)	A-60	A-30 A-0	A-15 A-0	A-0	A-0	A-0	A-15 A-0	A-30 A-0	A-0	A-0	A-15 A-0	A-15 A-0	A-0	A-15
Accommodation spaces of moderate fire risk	(7)	A-60	A-60 A-15	A-30 A-0	A-15 A-0	A-0	A-15 A-0	A-30 A-0	A-60 A-15	A-0	A-0	A-30 A-0	A-30 A-0	A-0	A-30
Accommodation spaces of greater fire risk	(8)	A-60	A-60 A-15	A-60 A-15	A-60 A-15	A-0	A-30 A-0	A-60 A-15	A-60 A-15	A-0	A-0	A-30 A-0	A-60 A-15	A-15 A-0	A-60
Sanitary and similar spaces	(9)	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0
Tanks, voids and auxiliary machinery spaces having little or no fire risk	(10)	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0
Auxiliary machinery spaces, cargo spaces, special category spaces, cargo and other oil tanks and other similar spaces of moderate fire risk	(11)	A-60	A-60	A-60	A-60	A-0	A-30 A-0	A-60 A-15	A-60 A-15	A-0	A-0	A-0	A-30	A-30 A-0	A-30
Machinery spaces and main galleys	(12)	A-60	A-60	A-60	A-60	A-0	A-60	A-60	A-60	A-0	A-0	A-60	A-60	A-60	A-60
Store-rooms, workshops, pantries, etc.	(13)	A-60	A-60 A-15	A-30 A-0	A-15	A-0	A-15 A-0	A-30 A-0	A-60 A-15	A-0	A-0	A-0	A-30	A-0	A-30
Other spaces in which flammable liquids are stowed	(14)	A-60	A-60	A-60	A-60	A-0	A-60	A-60	A-60	A-0	A-0	A-60	A-60	A-60	A-60

TABLE 26.4 – DECKS NOT FORMING STEPS IN MAIN VERTICAL ZONES NOR BOUNDING HORIZONTAL ZONES

Space below →	Space above →	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Control stations	(1)	A-30 A-0	A-30 A-0	A-15 A-0	A-0	A-0 B-0	A-0 B-0	A-15 A-0	A-30 A-0	A-0	A-0	A-0	A-60 A-0	A-0	A-60 A-15
Stairways	(2)	A-0	A-0	A-0	A-0	A-0 B-0	A-0 B-0	A-0 B-0	A-0 B-0	A-0	A-0	A-0	A-30 A-0	A-0	A-30 A-0
Corridors	(3)	A-15 A-0	A-0	A-0 ^{a/} B-0 ^{a/}	A-0	A-0 B-0	A-0 B-0	A-15 B-0	A-15 B-0	A-0	A-0	A-0	A-30 A-0	A-0	A-30 A-0
Lifeboat and liferaft handling and embarkation stations	(4)	A-0	A-0	A-0	A-0	-	A-0 B-0	A-0 B-0	A-0 B-0	A-0	A-0	A-0	A-0	A-0	A-0
Open deck spaces	(5)	A-0	A-0	A-0	A-0	-	A-0 B-0	A-0 B-0	A-0 B-0	A-0	A-0	A-0	A-0	A-0	A-0
Accommodation spaces of minor fire risk	(6)	A-60	A-15 A-0	A-0	A-0	A-0 B-0	A-0 B-0	A-0 B-0	A-0 B-0	A-0	A-0	A-0	A-15 A-0	A-0	A-15 A-0
Accommodation spaces of moderate fire risk	(7)	A-60	A-30 A-0	A-15 A-0	A-15 A-0	A-0 B-0	A-0 B-0	A-15 B-0	A-30 B-0	A-0	A-0	A-15 A-0	A-30 A-0	A-0	A-30 A-0
Accommodation spaces of greater fire risk	(8)	A-60	A-60 A-15	A-60 A-0	A-30 A-0	A-0 B-0	A-15 B-0	A-30 B-0	A-60 B-0	A-0	A-0	A-30 A-0	A-30 A-0	A-0	A-30 A-0
Sanitary spaces and similar spaces	(9)	A-0	A-0	A-0	A-0	A-0 B-0	A-0 B-0	A-0 B-0	A-0 B-0	A-0	A-0	A-0	A-0	A-0	A-0
Tanks, voids and auxiliary machinery spaces having little or no fire risk	(10)	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0 ^{a/}	A-0	A-0	A-0	A-0
Auxiliary machinery spaces, cargo spaces, cargo and other oil tanks and other similar spaces of moderate fire risk	(11)	A-60	A-60 A-15	A-60 A-15	A-30 A-0	A-0	A-0	A-15 A-0	A-30 A-0	A-0	A-0	A-0 ^{a/}	A-0	A-0	A-30 ^{b/} A-15
Machinery spaces and main galleys	(12)	A-60	A-60	A-60	A-60	A-0	A-60	A-60	A-60	A-0	A-0	A-30	A-30 ^{a/}	A-0	A-60
Store-rooms, workshops, pantries, etc.	(13)	A-60	A-30 A-0	A-15 A-0	A-15 A-0	A-0 B-0	A-15 A-0	A-30 A-0	A-30 A-0	A-0	A-0	A-0	A-0	A-0	A-15 ^{b/} A-0
Other spaces in which flammable liquids are stowed	(14)	A-60	A-60 A-30	A-60 A-30	A-60	A-0	A-30 A-0	A-60 A-15	A-60 A-15	A-0	A-0	A-30 ^{b/} A-0	A-30 ^{b/} A-0	A-0	A-30 ^{b/} A-0

Notes: To be applied to tables 26.1 to 26.4, as appropriate.

a/ Where adjacent spaces are in the same numerical category and superscript a/ appears, a bulkhead or deck between such spaces need not be fitted if deemed unnecessary by the Administration. For example, in category (12) a bulkhead need not be required between a galley and its annexed pantries provided the pantry bulkheads and decks maintain the integrity of the galley boundaries. A bulkhead is, however, required between a galley and a machinery space even though both spaces are in category (12).

b/ Where superscript b/ appears the lesser insulation value may be permitted only if at least one of the adjoining spaces is protected by an automatic sprinkler system complying with the provisions of Regulation 12.

whether the insulation values in table 26.3 or 26.4 shall apply to weather decks. In no case shall the requirements of category (5) of tables 26.1 to 26.4 necessitate enclosure of spaces which in the opinion of the Administration need not be enclosed.

3. Continuous "B" class ceilings or linings, in association with the relevant decks or bulkheads, may be accepted as contributing wholly or in part, to the required insulation and integrity of a division.

4. In approving structural fire protection details, the Administration shall have regard to the risk of heat transmission at intersections and terminal points of required thermal barriers.

**Regulation 27. FIRE INTEGRITY OF BULKHEADS AND DECKS IN SHIPS CARRYING
NOT MORE THAN 36 PASSENGERS**

1. In addition to complying with the specific provisions for fire integrity of bulkheads and decks mentioned elsewhere in this part, the minimum fire integrity of bulkheads and decks shall be as prescribed in table 27.1 and table 27.2.

2. The following requirements shall govern application of the tables:

1. Tables 27.1 and 27.2 shall apply respectively to the bulkheads and decks separating adjacent spaces.
2. For determining the appropriate fire integrity standards to be applied to divisions between adjacent spaces, such spaces are classified according to their fire risk as shown in categories (1) to (11) below. The title of each category is intended to be typical rather than restrictive. The number in parentheses preceding each category refers to the applicable column or row in the tables.
 - (1) Control stations
 - Spaces containing emergency sources of power and lighting.
 - Wheelhouse and chartroom.
 - Spaces containing the ship's radio equipment.
 - Fire-extinguishing rooms, fire control [rooms] and fire-recording stations.
 - Control room for propulsion machinery when located outside the machinery space.
 - Spaces containing centralized fire alarm equipment.
 - (2) Corridors
 - Passenger and crew corridors and lobbies.
 - (3) Accommodation spaces
 - Spaces as defined in regulation 3.10 excluding corridors.
 - (4) Stairways
 - Interior stairways, lifts and escalators (other than those wholly contained within the machinery spaces) and enclosures thereto.
 - In this connexion, a stairway which is enclosed only at one level shall be regarded as part of the space from which it is not separated by a fire door.
 - (5) Service spaces (low risk)
 - Lockers and store-rooms having areas of less than 2 m², drying rooms and laundries.
 - (6) Machinery spaces of category A
 - Spaces as defined in regulation 3.19.
 - (7) Other machinery spaces
 - Spaces as defined in regulation 3.20 excluding machinery spaces of category A.

TABLE 27.1 – FIRE INTEGRITY OF BULKHEADS SEPARATING ADJACENT SPACES

Spaces	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Control stations (1)	A-0 ^c	A-0	A-60	A-0	A-15	A-60	A-15	A-60	A-60	*	A-60
Corridors (2)		C ^e	B-0 ^e	A-0 ^a B-0 ^e	B-0 ^e	A-60	A-0	A-0	A-15 A-0 ^d	*	A-15
Accommodation spaces (3)			C ^e	A-0 ^a B-0 ^e	B-0 ^e	A-60	A-0	A-0	A-15 A-0 ^d	*	A-30 A-0 ^d
Stairways (4)				A-0 ^a B-0 ^e	A-0 ^a B-0 ^e	A-60	A-0	A-0	A-15 A-0 ^d	*	A-15
Service spaces (low risk) (5)					C ^e	A-60	A-0	A-0	A-0	*	A-0
Machinery spaces (6) of category A						*	A-0	A-0	A-60	*	A-60
Other machinery spaces (7)							A-0 ^b	A-0	A-0	*	A-0
Cargo spaces (8)								*	A-0	*	A-0
Service spaces (high risk) (9)									A-0 ^b	*	A-30
Open decks (10)										-	A-0
Special category (11) spaces											A-0

Notes: To be applied to both tables 27.1 and 27.2, as appropriate.

^a For clarification as to which applies see Regulations 25 and 29.

^b Where spaces are of the same numerical category and superscript b appears, a bulkhead or deck of the ratings shown in the tables is only required when the adjacent spaces are for a different purpose, e.g. in category (9). A galley next to a galley does not require a bulkhead but a galley next to a paint room requires an "A-0" bulkhead.

^c Bulkheads separating the wheelhouse and chartroom from each other may be "B-0" rating.

^d See 2.3 and 2.4 of this Regulation.

^e For the application of Regulation 24.1.2, "B-0" and "C", where appearing in table 27.1, shall be read as "A-0".

^f Fire insulation need not be fitted if the machinery space of category (7), in the opinion of the Administration, has little or no fire risk.

* Where an asterisk appears in the tables, the division is required to be of steel or other equivalent material but is not required to be of "A" class standard.

For the application of Regulation 24.1.2 an asterisk, where appearing in table 27.2, except for categories (8) and (10), shall be read as "A-0".

TABLE 27.2 – FIRE INTEGRITY OF DECKS SEPARATING ADJACENT SPACES

Space below ↓ Space above →		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Control stations (1)		A-0	A-0	A-0	A-0	A-0	A-60	A-0	A-0	A-0	*	A-30
Corridors (2)		A-0	*	*	A-0	*	A-60	A-0	A-0	A-0	*	A-0
Accommodation spaces (3)		A-60	A-0	*	A-0	*	A-60	A-0	A-0	A-0	*	A-30 A-0 _d /
Stairways (4)		A-0	A-0	A-0	*	A-0	A-60	A-0	A-0	A-0	*	A-0
Service spaces (low risk) (5)		A-15	A-0	A-0	A-0	*	A-60	A-0	A-0	A-0	*	A-0
Machinery spaces of category A (6)		A-60	A-60	A-60	A-60	A-60	*	A-60 f/	A-30	A-60	*	A-60
Other machinery spaces (7)		A-15	A-0	A-0	A-0	A-0	A-0	*	A-0	A-0	*	A-0
Cargo spaces (8)		A-60	A-0	A-0	A-0	A-0	A-0	A-0	*	A-0	*	A-0
Service spaces (high risk) (9)		A-60	A-30 A-0 _d /	A-30 A-0 _d /	A-30 A-0 _d /	A-0	A-60	A-0	A-0	A-0	*	A-30
Open decks (10)		*	*	*	*	*	*	*	*	*	—	A-0
Special category spaces (11)		A-60	A-15	A-30 A-0 _d /	A-15	A-0	A-30	A-0	A-0	A-30	A-0	A-0

(8) Cargo spaces

- All spaces used for cargo (including cargo oil tanks) and trunkways and hatchways to such spaces, other than special category spaces.

(9) Service spaces (high risk)

- Galleys, pantries containing cooking appliances, paint and lamp rooms, lockers and store-rooms having areas of 2 m² or more and workshops other than those forming part of the machinery spaces.

(10) Open decks

- Open deck spaces and enclosed promenades having no fire risk. Air spaces (the space outside superstructures and deckhouses).

(11) Special category spaces

- Spaces as defined in regulation 3.18.

3. In determining the applicable fire integrity standard of a boundary between two spaces within a main vertical zone or horizontal zone which is not protected by an automatic sprinkler system complying with the provisions of regulation 12 or between such zones neither of which is so protected, the higher of the two values given in the tables shall apply.
4. In determining the applicable fire integrity standard of a boundary between two spaces within a main vertical zone or horizontal zone which is protected by an automatic sprinkler system complying with the provisions of regulation 12 or between such zones both of

which are so protected, the lesser of the two values given in the tables shall apply. Where a sprinklered zone and a non-sprinklered zone meet within accommodation and service spaces, the higher of the two values given in the tables shall apply to the division between the zones.

3. Continuous "B" class ceilings or linings, in association with the relevant decks or bulkheads, may be accepted as contributing, wholly or in part, to the required insulation and integrity of a division.

4. External boundaries which are required in regulation 23.1 to be of steel or other equivalent material may be pierced for the fitting of windows and sidescuttles provided that there is no requirement for such boundaries to have "A" class integrity elsewhere in [this part]. Similarly, in such boundaries which are not required to have "A" class integrity, doors may be of materials to the satisfaction of the Administration.

Regulation 28. MEANS OF ESCAPE

1. Stairways and ladders shall be arranged to provide ready means of escape to the lifeboat and liferaft embarkation deck from all passenger and crew spaces and from spaces in which the crew is normally employed, other than machinery spaces. In particular, the following provisions shall be complied with:

1. Below the bulkhead deck two means of escape, at least one of which shall be independent of watertight doors, shall be provided from each watertight compartment or similarly restricted space or group of spaces. Exceptionally, the Administration may dispense with one of the means of escape, due regard being paid to the nature and location of spaces and to the number of persons who might normally be accommodated or employed there.
2. Above the bulkhead deck there shall be at least two means of escape from each main vertical zone or similarly restricted space or group of spaces at least one of which shall give access to a stairway forming a vertical escape.
3. If a radiotelegraph station has no direct access to the open deck, two means of escape from or access to such station shall be provided, one of which may be a porthole or window of sufficient size or another means to the satisfaction of the Administration.
4. A corridor or part of a corridor from which there is only one route of escape shall not exceed:
 - 13 m in length for ships carrying more than 36 passengers, and 7 m in length for ships carrying not more than 36 passengers.
5. At least one of the means of escape required by paragraphs 1.1 and 1.2 shall consist of a readily accessible enclosed stairway, which shall provide continuous fire shelter from the level of its origin to the appropriate lifeboat and liferaft embarkation decks or the highest level served by the stairway, whichever level is the highest. However, where the Administration has granted dispensation under the provisions of paragraph 1.1 the sole means of escape shall provide safe escape to the satisfaction of the Administration. The width, number and continuity of the stairways shall be to the satisfaction of the Administration.
6. Protection of access from the stairway enclosures to the lifeboat and liferaft embarkation areas shall be to the satisfaction of the Administration.
7. Stairways serving only a space and a balcony in that space shall not be considered as forming one of the required means of escape.

2.1. In special category spaces the number and disposition of the means of escape both below and above the bulkhead deck shall be to the satisfaction of the Administration and in general the safety of access to the embarkation deck shall be at least equivalent to that provided for under paragraphs 1.1, 1.2, 1.5 and 1.6.

2.2. One of the escape routes from the machinery spaces where the crew is normally employed shall avoid direct access to any special category space.

3.1. Two means of escape shall be provided from each machinery space. In particular, the following provisions shall be complied with:

1. Where the space is below the bulkhead deck the two means of escape shall consist of either:
 - 1.1. Two sets of steel ladders as widely separated as possible, leading to doors in the upper part of the space similarly separated and from which access is provided to the appropriate lifeboat and liferaft embarkation decks. One of these ladders shall provide continuous fire shelter from the lower part of the space to a safe position outside the space; or
 - 1.2. One steel ladder leading to a door in the upper part of the space from which access is provided to the embarkation deck and additionally, in the lower part of the space and in a position well separated from the ladder referred to, a steel door capable of being operated from each side and which provides access to a safe escape route from the lower part of the space to the embarkation deck.
2. Where the space is above the bulkhead deck, the two means of escape shall be as widely separated as possible and the doors leading from such means of escape shall be in a position from which access is provided to the appropriate lifeboat and liferaft embarkation decks. Where such means of escape require the use of ladders, these shall be of steel.
 - 3.2. In a ship of less than 1,000 tons gross tonnage, the Administration may dispense with one of the means of escape, due regard being paid to the width and disposition of the upper part of the space, and in a ship of 1,000 tons gross tonnage and above, the Administration may dispense with one means of escape from any such space so long as either a door or a steel ladder provides a safe escape route to the embarkation deck, due regard being paid to the nature and location of the space and whether persons are normally employed in that space.
4. In no case shall lifts be considered as forming one of the required means of escape.

Regulation 29. PROTECTION OF STAIRWAYS AND LIFTS IN ACCOMMODATION AND SERVICE SPACES

1. All stairways shall be of steel frame construction except where the Administration sanctions the use of other equivalent material, and shall be within enclosures formed of "A" class divisions, with positive means of closure at all openings, except that:
 1. A stairway connecting only two decks need not be enclosed, provided the integrity of the deck is maintained by proper bulkheads or doors in one 'tweendeck space. When a stairway is closed in one 'tweendeck space, the stairway enclosure shall be protected in accordance with the tables for decks in regulations 26 or 27;
 2. Stairways may be fitted in the open in a public space, provided they lie wholly within such public space.
2. Stairway enclosures shall have direct communication with the corridors and be of sufficient area to prevent congestion, having in view the number of persons likely to use them in an emergency. In so far as is practicable, stairway enclosures shall not give direct access to cabins, service lockers, or other enclosed spaces containing combustibles in which a fire is likely to originate.
3. Lift trunks shall be so fitted as to prevent the passage of smoke and flame from one 'tweendeck to another and shall be provided with means of closing so as to permit the control of draught and smoke.

Regulation 30. OPENINGS IN "A" CLASS DIVISIONS

1. Except for hatches between cargo, special category, store, and baggage spaces, and between such spaces and the weather-decks, all openings shall be provided with permanently attached means of closing which shall be at least as effective for resisting fires as the divisions in which they are fitted.

2. The construction of all doors and door frames in "A" class divisions, with the means of securing them when closed, shall provide resistance to fire as well as to the passage of smoke and flame, as far as practicable, equivalent to that of the bulkheads in which the doors are situated. Such doors and door frames shall be constructed of steel or other equivalent material. Watertight doors need not be insulated.

3. It shall be possible for each door to be opened and closed from each side of the bulkhead by one person only.

4. Fire doors in main vertical zone bulkheads and stairway enclosures, other than power-operated watertight doors and those which are normally locked, shall be of the self-closing type capable of closing against an inclination of 3.5° opposing closure. The speed of door closure shall, if necessary, be controlled so as to prevent undue danger to persons. All such doors, except those that are normally closed, shall be capable of release from a control station, either simultaneously or in groups, and also individually from a position at the door. The release mechanism shall be so designed that the door will automatically close in the event of disruption of the control system; however, approved power-operated watertight doors will be considered acceptable for this purpose. Hold-back hooks not subject to control station release will not be permitted. When double swing doors are permitted, they shall have a latch arrangement which is automatically engaged by the operation of the door release system.

5. Where a space is protected by an automatic sprinkler system complying with the provisions of regulation 12 or fitted with a continuous "B" class ceiling, openings in decks not forming steps in main vertical zones nor bounding horizontal zones shall be closed reasonably tight and such decks shall meet the "A" class integrity requirements in so far as is reasonable and practicable in the opinion of the Administration.

6. The requirements for "A" class integrity of the outer boundaries of a ship shall not apply to glass partitions, windows and sidescuttles. Similarly, the requirements for "A" class integrity shall not apply to exterior doors in superstructures and deckhouses.

Regulation 31. OPENINGS IN "B" CLASS DIVISIONS

1. Doors and door frames in "B" class divisions and means of securing them shall provide a method of closure which shall have resistance to fire as far as practicable equivalent to that of the divisions except that ventilation openings may be permitted in the lower portion of such doors. Where such opening is in or under a door the total net area of any such opening or openings shall not exceed 0.05 m². When such opening is cut in a door it shall be fitted with a grill made of non-combustible material. Doors shall be non-combustible.

2. The requirements for "B" class integrity of the outer boundaries of a ship shall not apply to glass partitions, windows and sidescuttles. Similarly, the requirements for "B" class integrity shall not apply to exterior doors in superstructures and deckhouses. For ships carrying not more than 36 passengers, the Administration may permit the use of combustible materials in doors separating cabins from the individual interior sanitary spaces such as showers.

3. Where an automatic sprinkler system complying with the provisions of regulation 12 is fitted:

1. Openings in decks not forming steps in main vertical zones nor bounding horizontal zones shall be closed reasonably tight and such decks shall meet the "B" class integrity requirements in so far as is reasonable and practicable in the opinion of the Administration; and
2. Openings in corridor bulkheads of "B" class materials shall be protected in accordance with the provisions of regulation 25.

Regulation 32. VENTILATION SYSTEMS

1. Passenger ships carrying more than 36 passengers

1.1. The ventilation system of a passenger ship carrying more than 36 passengers shall, in addition to this part of this regulation, also be in compliance with the requirements of regulation 16.2 to 16.9.

1.2. In general, the ventilation fans shall be so disposed that the ducts reaching the various spaces remain within the main vertical zone.

1.3. Where ventilation systems penetrate decks, precautions shall be taken, in addition to those relating to the fire integrity of the deck required by regulations 18.1.1 and 30.5, to reduce the likelihood of smoke and hot gases passing from one 'tweendeck space to another through the system. In addition to insulation requirements contained in this regulation, vertical ducts shall, if necessary, be insulated as required by the appropriate tables in regulation 26.

1.4. Except in cargo spaces, ventilation ducts shall be constructed of the following materials:

1. Ducts not less than 0.075 m² in sectional area and all vertical ducts serving more than a single 'tweendeck space shall be constructed of steel or other equivalent material;
2. Ducts less than 0.075 m² in sectional area other than the vertical ducts referred to in paragraph 1.4.1, shall be constructed of non-combustible materials. Where such ducts penetrate "A" or "B" class divisions due regard shall be given to ensuring the fire integrity of the division;
3. Short lengths of duct, not in general exceeding 0.02 m² in sectional area nor 2 m in length, need not be non-combustible provided that all of the following conditions are met:
 - 3.1. The duct is constructed of a material of [low] fire risk to the satisfaction of the Administration;
 - 3.2. The duct is used only at the terminal end of the ventilation system; and
 - 3.3. The duct is not located closer than 600 mm measured along its length to a penetration of an "A" or "B" class division, including continuous "B" class ceilings.

1.5. Where a stairway enclosure is ventilated, the duct or ducts shall be taken from the fan room independently of other ducts in the ventilation system and shall not serve any other space.

1.6. All power ventilation, except machinery space and cargo space ventilation and an alternative system which may be required under regulation 16.6, shall be fitted with controls so grouped that all fans may be stopped from either of two separate positions which shall be situated as far apart as practicable. Controls provided for the power ventilation serving machinery spaces shall also be grouped so as to be operable from two positions, one of which shall be outside such spaces. Fans serving power ventilation systems to cargo spaces shall be capable of being stopped from a safe position outside such spaces.

2. Passenger ships carrying not more than 36 passengers

2.1. The ventilation system of passenger ships carrying not more than 36 passengers shall be in compliance with regulation 16.

Regulation 33. WINDOWS AND SIDESCUTTLES

1. All windows and sidescuttles in bulkheads within accommodation and service spaces and control stations other than those to which the provisions of regulation 30.6 and of regulation 31.2 apply, shall be so constructed as to preserve the integrity requirements of the type of bulkheads in which they are fitted.

2. Notwithstanding the requirements of the tables in regulations 26 and 27:
1. All windows and sidescuttles in bulkheads separating accommodation and service spaces and control stations from weather shall be constructed with frames of steel or other suitable material. The glass shall be retained by a metal glazing bead or angle;
2. Special attention shall be given to the fire integrity of windows facing open or enclosed lifeboat and liferaft embarkation areas and to the fire integrity of windows situated below such areas in such a position that their failure during a fire would impede the launching of, or embarkation into, lifeboats or liferafts.

Regulation 34. RESTRICTED USE OF COMBUSTIBLE MATERIALS

1. Except in cargo spaces, mail rooms, baggage rooms, or refrigerated compartments of service spaces, all linings, grounds, ceilings and insulations shall be of non-combustible materials. Partial bulkheads or decks used to subdivide a space for utility or artistic treatment shall also be of non-combustible material.
2. Vapour barriers and adhesives used in conjunction with insulation, as well as insulation of pipe fittings, for cold service systems need not be non-combustible, but they shall be kept to the minimum quantity practicable and their exposed surfaces shall have qualities of resistance to the propagation of flame to the satisfaction of the Administration.
3. The following surfaces shall have low flame-spread characteristics:*
1. Exposed surfaces in corridors and stairway enclosures, and of bulkheads, wall and ceiling linings in all accommodation and service spaces and control stations;
2. Concealed or inaccessible spaces in accommodation, service spaces and control stations.
4. The total volume of combustible facings, mouldings, decorations and veneers in any accommodation and service space shall not exceed a volume equivalent to 2.5 mm veneer on the combined area of the walls and ceilings. In the case of ships fitted with an automatic sprinkler system complying with the provisions of regulation 12, the above volume may include some combustible material used for erection of "C" class divisions.
5. Veneers used on surfaces and linings covered by the requirements of paragraph 3 shall have a calorific value not exceeding 45 MJ/m² of the area for the thickness used.
6. Furniture in the corridors and stairway enclosures shall be kept to a minimum.
7. Paints, varnishes and other finishes used on exposed interior surfaces shall not be capable of producing excessive quantities of smoke and toxic products.
8. Primary deck coverings, if applied within accommodation and service spaces and control stations, shall be of approved material which will not readily ignite, or give rise to toxic or explosive hazards at elevated temperatures.**

Regulation 35. DETAILS OF CONSTRUCTION

1. In accommodation and service spaces, control stations, corridors and stairways:
1. Air spaces enclosed behind ceilings, panelling or linings shall be suitably divided by close-fitting draught stops not more than 14 m apart;
2. In the vertical direction, such enclosed air spaces, including those behind linings of stairways, trunks, etc. shall be closed at each deck.

* Reference is made to Guideline on the Evaluation of Fire Hazard Properties of Materials, adopted by the Organization by resolution A.166(ES.IV) .

** Reference is made to Improved Provisional Guidelines on Text Procedures for Primary Deck Coverings, adopted by the Organization by resolution A.214(VII) .

2. The construction of ceiling and bulkheading shall be such that it will be possible, without impairing the efficiency of the fire protection, for the fire patrols to detect any smoke originating in concealed and inaccessible places, except where in the opinion of the Administration there is no risk of fire originating in such places.

Regulation 36. AUTOMATIC SPRINKLER, FIRE DETECTION AND FIRE ALARM SYSTEMS OR [FIXED] FIRE DETECTION AND FIRE ALARM SYSTEMS

1. In any ship to which this part applies there shall be installed throughout each separate zone, whether vertical or horizontal, in all accommodation and service spaces and, where it is considered necessary by the Administration, in control stations, except spaces which afford no substantial fire risk (such as void spaces, sanitary spaces, etc.) either:

1. An automatic sprinkler, fire detection and fire alarm system of an approved type, complying with the provisions of regulation 12 and so installed and arranged as to protect such spaces; or
2. A fixed fire detection and fire alarm system of an approved type, complying with the provisions of regulation 13 and so installed and arranged as to detect the presence of fire in such spaces, except that the smoke detectors required by regulation 13.2.2 need not be provided.

Regulation 37. PROTECTION OF SPECIAL CATEGORY SPACES

1. *Provisions applicable to special category spaces whether above or below the bulkhead deck*

1.1. General

1.1.1. The basic principle underlying the provisions of this regulation is that as normal main-vertical zoning may not be practicable in special category spaces, equivalent protection must be obtained in such spaces on the basis of a horizontal zone concept and by the provision of an efficient fixed fire-extinguishing system. Under this concept a horizontal zone for the purpose of this regulation may include special category spaces on more than one deck provided that the total overall clear height for vehicles does not exceed 10 m.

1.1.2. The requirements of regulations 16, 18, 30 and 32 for maintaining the integrity of vertical zones shall be applied equally to decks and bulkheads forming the boundaries separating horizontal zones from each other and from the remainder of the ship.

1.2. Structural protection

1.2.1. Boundary bulkheads of special category spaces shall be insulated as required for category (11) spaces in table 26.1 or in table 27.1 and the horizontal boundaries as required for category (11) spaces in table 26.3 or in table 27.2.

1.2.2. Indicators shall be provided on the navigating bridge which shall indicate when any fire door leading to or from the special category spaces is closed.

1.3. Fixed fire-extinguishing system*

Each special category space shall be fitted with an approved fixed pressure water-spraying system for manual operation which shall protect all parts of any deck and vehicle platform in such space, provided that the Administration may permit the use of any other fixed fire-extinguishing system that has been shown by full-scale test in conditions simulating a flowing petrol fire in a special category space to be not less effective in controlling fires likely to occur in such a space.

* Reference is made to Recommendation on Fixed Fire-Extinguishing Systems for Special Category Spaces, adopted by the Organization by resolution A.123(V) .

1.4. Patrols and detection

1.4.1. An efficient patrol system shall be maintained in special category spaces. In any such space in which the patrol is not maintained by a continuous fire watch at all times during the voyage there shall be provided [a fixed] fire detection system of an approved type.

1.4.2. Manually operated call points shall be provided as necessary throughout the special category spaces and one shall be placed close to each exit from such spaces.

1.5. Fire-extinguishing equipment

There shall be provided in each special category space:

1. At least three water fog applicators;
2. One portable foam applicator unit complying with the provisions of regulation 6.4, provided that at least two such units are available in the ship for use in such spaces; and
3. Such number of portable fire extinguishers as the Administration may deem sufficient, provided that at least one portable extinguisher is located at each access to such spaces.

1.6. Ventilation system

1.6.1. There shall be provided an effective power ventilation system for the special category spaces sufficient to give at least 10 air changes per hour. The system for such spaces shall be entirely separated from other ventilation systems and shall be operating at all times when vehicles are in such spaces. The Administration may require an increased number of air changes when vehicles are being loaded and unloaded. Ventilation ducts serving special category spaces capable of being effectively sealed shall be separated for each such space. The system shall be capable of being controlled from a position outside such spaces.

1.6.2. The ventilation shall be such as to prevent air stratification and the formation of air pockets.

1.6.3. Means shall be provided to indicate on the navigating bridge any loss or reduction of the required ventilating capacity.

1.6.4. Arrangements shall be provided to permit a rapid shut-down and effective closure of the ventilation system in case of fire, taking into account the weather and sea conditions.

1.6.5. Ventilation ducts, including dampers, shall be made of steel and their arrangement shall be to the satisfaction of the Administration.

2. *Additional provisions applicable only to special category spaces above the bulkhead deck*

2.1. Scuppers

In view of the serious loss of stability which could arise due to large quantities of water accumulating on the deck or decks consequent on the operation of the fixed pressure water-spraying system, scuppers shall be fitted so as to ensure that such water is rapidly discharged directly overboard.

2.2. Precautions against ignition of flammable vapours

2.2.1. On any deck on which vehicles are carried and on which explosive vapours might be expected to accumulate, equipment which may constitute a source of ignition of flammable vapours and, in particular, electrical equipment and wiring, shall be installed at least 450 mm above the deck. Electrical equipment installed at more than 450 mm above the deck shall be of a type so enclosed and protected as to prevent the escape of sparks. However, if the Administration is satisfied that the installation of electrical equipment and wiring at less than 450 mm above the deck is necessary for the safe operation of the ship, such electrical equipment and wiring may be installed provided that it is of a type approved for use in an explosive petrol and air mixture.

2.2.2. Electrical equipment and wiring, if installed in an exhaust ventilation duct, shall be of a type approved for use in explosive petrol and air mixtures and the outlet from any exhaust duct shall be sited in a safe position, having regard to other possible sources of ignition.

3. Additional provisions applicable only to special category spaces below the bulkhead deck

3.1. Bilge pumping and drainage

In view of the serious loss of stability which could arise due to large quantities of water accumulating on the deck or tank top consequent on the operation of the fixed pressure water-spraying system, the Administration may require pumping and drainage facilities to be provided additional to the requirements of regulation 11-1/21.

3.2. Precautions against ignition of flammable vapours

3.2.1. Electrical equipment and wiring, if fitted, shall be of a type suitable for use in explosive petrol and air mixtures. Other equipment which constitute a source of ignition of flammable vapours shall not be permitted.

3.2.2. Electrical equipment and wiring, if installed in an exhaust ventilation duct, shall be of a type approved for use in explosive petrol and air mixtures and the outlet from any exhaust duct shall be sited in a safe position, having regard to other possible sources of ignition.

Regulation 38. PROTECTION OF CARGO SPACES, OTHER THAN SPECIAL CATEGORY SPACES, INTENDED FOR THE CARRIAGE OF MOTOR VEHICLES WITH FUEL IN THEIR TANKS FOR THEIR OWN PROPULSION

In any cargo space (other than special category spaces) containing motor vehicles with fuel in their tanks for their own propulsion the following provisions shall be complied with.

1. Fire detection

There shall be provided an approved automatic fire detection and fire alarm system. The design and arrangements of this system shall be considered in conjunction with the ventilation requirements referred to in paragraph 3.

2. Fire-extinguishing arrangements

2.1. There shall be fitted a fixed fire-extinguishing system which shall comply with the provisions of regulation 5, except that, if a carbon dioxide system is fixed, the quantity of gas available shall be at least sufficient to give a minimum volume of free gas equal to 45 per cent of the gross volume of the largest such cargo space which is capable of being sealed, and the arrangements shall be such as to ensure that at least two thirds of the gas required for the relevant space shall be introduced during 10 minutes. Any other fixed gas fire-extinguishing system or fixed high expansion foam fire-extinguishing system may be fitted provided it gives equivalent protection. Furthermore, any cargo space designated only for vehicles which are not carrying any cargo may be fitted with fixed halogenated hydrocarbon fire-extinguishing systems which shall comply with the provisions of regulation 5.

2.2. As an alternative, a system meeting the requirements of regulation 37.1.3 may be fitted, provided that regulation 37.2.1 or 37.3.1, as appropriate, is also complied with.

2.3. There shall be provided for use in any such space such number of portable fire extinguishers as the Administration may deem sufficient. At least one portable extinguisher shall be located at each access to such spaces.

3. Ventilation system

3.1. There shall be provided an effective power ventilation system sufficient to give at least 10 air changes per hour for ships carrying more than 36 passengers, and 6 air changes per hour for ships carrying not more than 36 passengers. The system for such cargo spaces shall be entirely separate from other ventilation systems and shall be operating at all times when vehicles are in such spaces. Ventilation ducts serving such cargo spaces capable of being effectively sealed shall be separated for each such space. The system shall be capable of being controlled from a position outside such spaces.

3.2. The ventilation shall be such as to prevent air stratification and the formation of air pockets.

3.3. Means shall be provided to indicate on the navigating bridge any loss or reduction of the required ventilating capacity.

3.4. Arrangements shall be provided to permit a rapid shut-down and effective closure of the ventilation system in case of fire, taking into account the weather and sea conditions.

3.5. Ventilation ducts, including dampers, shall be made of steel and their arrangement shall be to the satisfaction of the Administration.

4. *Precautions against ignition of flammable vapours*

4.1. Electrical equipment and wiring, if fitted, shall be of a type suitable for use in explosive petrol and air mixtures. Other equipment which may constitute a source of ignition of flammable vapours shall not be permitted.

4.2. Electrical equipment and wiring, if installed in an exhaust ventilation duct, shall be of a type approved for use in explosive petrol and air mixtures and the outlet from any exhaust duct shall be sited in a safe position, having regard to other possible sources of ignition.

4.3. Scuppers shall not be led to machinery or other spaces where sources of ignition may be present.

Regulation 39. FIXED FIRE-EXTINGUISHING ARRANGEMENTS IN CARGO SPACES

1. Except as provided for in paragraph 3, the cargo spaces of ships of 1,000 tons gross tonnage and upwards shall be protected by a fixed gas fire-extinguishing system complying with the provisions of regulation 5, or by a fixed high expansion foam fire-extinguishing system which gives equivalent protection.

2. Where it is shown to the satisfaction of the Administration that a ship is engaged on voyages of such short duration that it would be unreasonable to apply the requirements of paragraph 1 and also in ships of less than 1,000 tons gross tonnage, the arrangements in cargo spaces shall be to the satisfaction of the Administration.

3. A ship engaged in the carriage of dangerous goods shall be provided in any cargo spaces with a fixed gas fire-extinguishing system complying with the provisions of regulation 5 or with a fire-extinguishing system which in the opinion of the Administration gives equivalent protection for the cargoes carried.

Regulation 40. FIRE PATROLS, DETECTION, ALARMS AND PUBLIC ADDRESS SYSTEMS

1. [Manually operated call points] shall be fitted throughout the accommodation and service spaces to transmit an alarm immediately to the navigating bridge or main fire control station.

2. An approved fire detection or fire alarm system shall be provided which will automatically indicate at one or more suitable points or stations the presence or indication of fire and its location in any cargo space which, in the opinion of the Administration, is not accessible except where it is shown to the satisfaction of the Administration that the ship is engaged on voyages of such short duration that it would be unreasonable to apply this requirement.

3. All ships shall at all times when at sea, or in port (except when out of service), be so manned or equipped as to ensure that any initial fire alarm is immediately received by a responsible member of the crew.

4. A special alarm, operated from the navigating bridge or fire control station, shall be fitted to summon the crew. This alarm may be part of the ship's general alarm system but it shall be capable of being sounded independently of the alarm to the passenger spaces.

5. A public address system or other effective means of communication shall be available throughout the accommodation and service spaces and control stations.

6. For ships carrying more than 36 passengers an efficient patrol system shall be maintained so that an outbreak of fire may be promptly detected. Each member of the fire patrol shall be trained to be familiar with the arrangements of the ship as well as the location and operation of any equipment he may be called upon to use.

Regulation 41. SPECIAL REQUIREMENTS FOR SHIPS CARRYING DANGEROUS GOODS

The requirements of regulation 54 shall apply, as appropriate, to passenger ships carrying dangerous goods.

PART C. FIRE SAFETY MEASURES FOR CARGO SHIPS

(Regulation 54 of this part also applies to passenger ships as appropriate.)

Regulation 42. STRUCTURE

1. Subject to the provisions of paragraph 4, the hull, superstructure, structural bulkheads, [decks] and deckhouses shall be constructed of steel or other equivalent material.

2. The insulation of aluminium alloy components of "A" or "B" class divisions, except structure which in the opinion of the Administration is non-load-bearing, shall be such that the temperature of the structural core does not rise more than 200°C above the ambient temperature at any time during the applicable exposure to the standard fire test.

3. Special attention shall be given to the insulation of aluminium alloy components of columns, stanchions and other structural members required to support lifeboat and liferaft stowage, launching and embarkation areas, and "A" and "B" class divisions, to ensure:

1. That for such members supporting lifeboat and liferaft areas and class divisions, the temperature rise limitation specified in paragraph 2 shall apply at the end of one hour; and
2. That for such members required to support "B" class divisions, the temperature rise limitation specified in paragraph 2 shall apply at the end of half an hour.

4. Crowns and casings of machinery spaces of category A shall be of steel construction adequately insulated and openings therein, if any, shall be suitably arranged and protected to prevent the spread of fire.

5. One of the following methods of protection shall be adopted in accommodation and service areas:

1. Method IC: The construction of all internal divisional bulkheading of non-combustible "B" or "C" class divisions generally without the installation of an automatic sprinkler, fire detection and fire alarm system in the accommodation and service spaces, except as required by regulation 52.1; or
2. Method IIC: The fitting of an automatic sprinkler, fire detection and fire alarm system as required by regulation 52.2 for the detection and extinction of fire in all spaces in which fire might be expected to originate, generally with no restriction on the type of internal divisional bulkheading; or
3. Method IIIC: The fitting of a fixed fire detection and fire alarm system, as required by regulation 52.3, in all spaces in which a fire might be expected to originate, generally with no restriction on the type of internal divisional bulkheading, except that in no case must the area of any accommodation space or spaces bounded by an "A" or "B" class division exceed 50 m². Consideration may be given by the Administration to increasing this area for public spaces.

6. The requirements for the use of non-combustible materials in construction and insulation of the boundary bulkheads of machinery spaces, control stations, service spaces, etc., and the protection of stairway enclosures and corridors will be common to all three methods outlined in paragraph 5.

Regulation 43. BULKHEADS WITHIN THE ACCOMMODATION AND SERVICE SPACES

1. All bulkheads required to be "B" class divisions shall extend from deck to deck and to the shell or other boundaries, unless continuous "B" class ceilings or linings are fitted on both sides of the bulkhead in which case the bulkhead may terminate at the continuous ceiling or lining.

2. *Method IC:* All bulkheads not required by this or other regulations of this Part to be "A" or "B" class divisions, shall be of at least "C" class construction.

3. *Method IIC:* There shall be no restriction on the construction of bulkheads not required by this or other regulations of this part to be "A" or "B" class divisions except in individual cases where "C" class bulkheads are required in accordance with table 44.1.

4. *Method IIIC:* There shall be no restriction on the construction of bulkheads not required by this Part to be "A" or "B" class divisions except that the area of any accommodation space or spaces bounded by a continuous "A" or "B" class division must in no case exceed 50 m² except in individual cases where "C" class bulkheads are required in accordance with table 44.1. Consideration may be given by the Administration to increasing this area for public space.

Regulation 44. FIRE INTEGRITY OF BULKHEADS AND DECKS

1. In addition to complying with the specific provisions for fire integrity of bulkheads and decks mentioned elsewhere in this part, the minimum fire integrity of bulkheads and decks shall be as prescribed in tables 44.1 and 44.2.

2. The following requirements shall govern application of the tables:

1. Tables 44.1 and 44.2 shall apply respectively to the bulkheads and decks separating adjacent spaces.

2. For determining the appropriate fire integrity standards to be applied to divisions between adjacent spaces, such spaces are classified according to their fire risk as shown in categories (1) to (11) below. The title of each category is intended to be typical rather than restrictive. The number in parentheses preceding each category refers to the applicable column or row in the tables.

(1) Control stations

- Spaces containing emergency sources of power and lighting.
- Wheelhouse and chartroom.
- Spaces containing the ship's radio equipment.
- Fire-extinguishing rooms, fire control rooms and fire-recording stations.
- Control room for propulsion machinery when located outside the machinery space.
- Spaces containing centralized fire alarm equipment.

(2) Corridors

- Corridors and lobbies.

(3) Accommodation spaces

- Spaces as defined in regulation 3.10, excluding corridors.

(4) Stairways

- Interior stairways, lifts and escalators (other than those wholly contained within the machinery spaces) and enclosures thereto.
- In this connexion, a stairway which is enclosed only at one level shall be regarded as part of the space from which it is not separated by a fire door.

(5) Service spaces (low risk)

- Lockers and store-rooms having an area of less than 2 m², drying rooms and laundries.

TABLE 44.1 – FIRE INTEGRITY OF BULKHEADS SEPARATING ADJACENT SPACES

Spaces	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Control stations (1)	A-0 ^{b/}	A-0	A-60	A-0	A-15	A-60	A-15	A-60	A-60	*	A-60
Corridors (2)		C	B-0	B-0 A-0 ^{c/}	B-0	A-60	A-0	A-0	A-0	*	A-30
Accommodation spaces (3)			C ^{a,b/}	B-0 A-0 ^{c/}	B-0	A-60	A-0	A-0	A-0	*	A-30
Stairways (4)				B-0 A-0 ^{c/}	B-0 A-0 ^{c/}	A-60	A-0	A-0	A-0	*	A-30
Service spaces (low risk) (5)					C	A-60	A-0	A-0	A-0	*	A-0
Machinery spaces (6) of category A						*	A-0	A-0 ^{d/}	A-60	*	A-60 ^{f/}
Other machinery spaces (7)							A-0 ^{d/}	A-0	A-0	*	A-0
Cargo spaces (8)								*	A-0	*	A-0
Service spaces (high risk) (9)									A-0 ^{d/}	*	A-30
Open decks (10)										–	A-0
Ro/ro cargo spaces (11)											^{a,h/}

Notes: To be applied to both tables 44.1 and 44.2, as appropriate.

^a No special requirements are imposed upon bulkheads in methods IIC and IIIC fire protection.

^b In case of method IIIC "B" class bulkheads of "B-0" rating shall be provided between spaces or groups of spaces of 50 m² and over in area.

^c For clarification as to which applies, see Regulations 43 and 46.

^d Where spaces are of the same numerical category and superscript d appears, a bulkhead or deck of the rating shown in the tables is only required when the adjacent spaces are for a different purpose, e.g. in category (9). A galley next to a galley does not require a bulkhead but a galley next to a paint room requires an "A-0" bulkhead.

^e Bulkheads separating the wheelhouse, chartroom and radio room from each other may be "B-0" rating.

^f A-0 rating may be used if no dangerous goods are intended to be carried or if such goods are stowed not less than 3 m horizontally from such bulkhead.

^g For cargo spaces in which dangerous goods are intended to be carried, Regulation 54.2.8 applies.

^h Bulkheads and decks separating ro/ro cargo spaces shall be capable of being closed reasonably gastight and such divisions shall have "A" class integrity in so far as is reasonable and practicable in the opinion of the Administration.

ⁱ Fire insulation need not be fitted if the machinery space in category (7) in the opinion of the Administration has little or no fire risk.

* Where an asterisk appears in the tables, the division is required to be of steel or other equivalent material but is not required to be of "A" class standard.

TABLE 44.2 – FIRE INTEGRITY OF DECKS SEPARATING ADJACENT SPACES

Space below ↓ Space above →	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Control stations (1)	A-0	A-0	A-0	A-0	A-0	A-60	A-0	A-0	A-0	*	A-60
Corridors (2)	A-0	*	*	A-0	*	A-60	A-0	A-0	A-0	*	A-30
Accommodation spaces (3)	A-60	A-0	*	A-0	*	A-60	A-0	A-0	A-0	*	A-30
Stairways (4)	A-0	A-0	A-0	*	A-0	A-60	A-0	A-0	A-0	*	A-30
Service spaces (low risk) (5)	A-15	A-0	A-0	A-0	*	A-60	A-0	A-0	A-0	*	A-0
Machinery spaces (6) of category A	A-60	A-60	A-60	A-60	A-60	*	A-60 i/	A-30	A-60	*	A-60
Other machinery spaces (7)	A-15	A-0	A-0	A-0	A-0	A-0	*	A-0	A-0	*	A-0
Cargo spaces (8)	A-60	A-0	A-0	A-0	A-0	A-0	A-0	*	A-0	*	A-0
Service spaces (high risk) (9)	A-60	A-0	A-0	A-0	A-0	A-60	A-0	A-0	A-0 d/	*	A-30
Open decks (10)	*	*	*	*	*	*	*	*	*	–	*
Ro/ro cargo spaces (11)	A-60	A-30	A-30	A-30	A-0	A-60	A-0	A-0	A-30	*	*h/

- (6) Machinery spaces of category A
 - Spaces as defined in regulation 3.19.
- (7) Other machinery spaces
 - Spaces as defined in regulation 3.20 excluding machinery spaces of category A.
- (8) Cargo spaces
 - All spaces used for cargo (including cargo oil tanks) and trunkways and hatchways to such spaces.
- (9) Service spaces (high risk)
 - Galleys, pantries containing cooking appliances, paint and lamp rooms, lockers and store-rooms having an area of 2 m² or more, workshops other than those forming part of the machinery spaces.
- (10) Open decks
 - Open deck spaces and enclosed promenades having no fire risk. Air spaces (the space outside superstructures and deck houses).
- (11) Ro/ro cargo spaces
 - Spaces as defined in regulation 3.14. Cargo spaces intended for the carriage of motor vehicles with fuel in their tanks for their own propulsion.

3. Continuous “B” class ceilings or linings, in association with the relevant decks or bulkheads, may be accepted as contributing, wholly or in part, to the required insulation and integrity of a division.

4. External boundaries which are required in regulation 42.1 to be of steel or other equivalent material may be pierced for the fitting of windows and sidescuttles provided that there is no requirement for such boundaries to have "A" class integrity elsewhere in this part. Similarly, in such boundaries which are not required to have "A" class integrity, doors may be of materials to the satisfaction of the Administration.

Regulation 45. MEANS OF ESCAPE

1. Stairways and ladders shall be so arranged as to provide, from all accommodation spaces and from spaces in which the crew is normally employed, other than machinery spaces, ready means of escape to the open deck and thence to the lifeboats and liferafts. In particular the following general provisions shall be complied with:

1. At all levels of accommodation there shall be provided at least two widely separated means of escape from each restricted space or group of spaces.
 - 2.1. Below the lowest open deck the main means of escape shall be a stairway and the second escape may be a trunk or a stairway.
 - 2.2. Above the lowest open deck the means of escape shall be stairways or doors to an open deck or a combination thereof.
3. Exceptionally the Administration may dispense with one of the means of escape, due regard being paid to the nature and location of spaces and to the numbers of persons who normally might be quartered or employed there.
4. No dead-end corridors having a length of more than 7 m shall be accepted. A dead-end corridor is a corridor or part of a corridor from which there is only one escape route.
5. The width and continuity of the means of escape shall be to the satisfaction of the Administration.
6. If a radiotelegraph station has no direct access to the open deck, two means of access to or egress from such station shall be provided, one of which may be a porthole or window of sufficient size or other means to the satisfaction of the Administration, to provide an emergency escape.

2. In all ro/ro cargo spaces where the crew is normally employed the number and locations of escape routes to the open deck shall be to the satisfaction of the Administration, but shall in no case be less than two and shall be widely separated.

3. Except as provided in paragraph 4, two means of escape shall be provided from each machinery space of category A. In particular, one of the following provisions shall be complied with:

1. Two sets of steel ladders as widely separated as possible leading to doors in the upper part of the space similarly separated and from which access is provided to the open deck. In general, one of these ladders shall provide continuous fire shelter from the lower part of the space to a safe position outside the space. However, the Administration may not require the shelter if, due to the special arrangement or dimensions of the machinery space, a safe escape route from the lower part of this space is provided. This shelter shall be of steel, insulated, where necessary, to the satisfaction of the Administration and be provided with a self-closing steel door at the lower end; or
2. One steel ladder leading to a door in the upper part of the space from which access is provided to the open deck and additionally, in the lower part of the space and in a position well separated from the ladder referred to, a steel door capable of being operated from each side and which provides access to a safe escape route from the lower part of the space to the open deck.

4. In a ship of less than 1,000 tons gross tonnage, the Administration may dispense with one of the means of escape required under paragraph 3, due regard being paid to the dimension and disposition of the upper part of the space.

5. From machinery spaces other than those of category A, escape routes shall be provided to the satisfaction of the Administration having regard to the nature and location of the space and whether persons are normally employed in that space.

6. Lifts shall not be considered as forming one of the required means of escape as required by this regulation.

Regulation 46. PROTECTION OF STAIRWAYS AND LIFT TRUNKS IN ACCOMMODATION SPACES, SERVICE SPACES AND CONTROL STATIONS

1. Stairways which penetrate only a single deck shall be protected at least at one level by at least "B-0" class divisions and self-closing doors. Lifts which penetrate only a single deck shall be surrounded by "A-0" class divisions with steel doors at both levels. Stairways and lift trunks which penetrate more than a single deck shall be surrounded by at least "A-0" class divisions and be protected by self-closing doors at all levels.

2. On ships having accommodation for 12 persons or less, where stairways penetrate more than a single deck and where there are at least two escape routes direct to the open deck at every accommodation level, consideration may be given by the Administration to reducing the "A-0" requirements of paragraph 1 to "B-0".

3. All stairways shall be of steel frame construction except where the Administration sanctions the use of other equivalent material.

Regulation 47. DOORS IN FIRE RESISTING DIVISIONS

1. The fire resistance of doors shall, as far as practicable, be equivalent to that of the division in which they are fitted. Doors and door frames in "A" class divisions shall be constructed of steel. Doors in "B" class divisions shall be non-combustible. Doors fitted in boundary bulkheads of machinery spaces of category A shall be reasonably gastight and self-closing. In ships constructed according to method 1C, an Administration may permit the use of combustible materials in doors separating cabins from individual interior sanitary accommodation such as showers.

2. Doors required to be self-closing shall not be fitted with hold-back hooks. However, hold-back arrangements fitted with remote release devices of the fail-safe type may be utilized.

3. In corridor bulkheads ventilation openings may be permitted only in and under the doors of cabins and public spaces. The openings shall be provided only in the lower half of a door. Where such opening is in or under a door the total net area of any such opening or openings shall not exceed 0.05 m². When such opening is cut in a door it shall be fitted with a grille made of non-combustible material.

4. Watertight doors need not be insulated.

Regulation 48. VENTILATION SYSTEMS

The ventilation systems of cargo ships shall be in compliance with the provisions of regulation 16, except paragraph 8.

Regulation 49. RESTRICTED USE OF COMBUSTIBLE MATERIALS

1. All exposed surfaces in corridors and stairway enclosures and surfaces including grounds in concealed or inaccessible spaces in accommodation and service spaces and control stations shall have low flame-spread characteristics.* Exposed surfaces of ceilings in accommodation and service spaces and control stations shall have low flame-spread characteristics.

2. Paints, varnishes and other finishes used on exposed interior surfaces shall not offer an undue fire hazard in the judgement of the Administration and shall not be capable of producing excessive quantities of smoke.

* Reference is made to Guidelines on the Evaluation of Fire Hazard Properties of Materials, adopted by the Organization by resolution A.166(ES.IV).

3. Primary deck coverings, if applied [] in accommodation and service spaces and control stations shall be of an approved material which will not readily ignite.*

Regulation 50. DETAILS OF CONSTRUCTION

1. *Method IC:* In accommodation and service spaces and control stations all linings, draught stops, ceilings and their associated grounds shall be of non-combustible materials.

2. *Methods IIC and IIIC:* In corridors and stairway enclosures serving accommodation and service spaces and control stations, ceilings, linings, draught stops and their associated grounds shall be of non-combustible materials.

3. *Methods IC, IIC and IIIC*

3.1. Except in cargo spaces or refrigerated compartments of service spaces, insulating materials shall be non-combustible. Vapour barriers and adhesives used in conjunction with insulation, as well as the insulation of pipe fittings, for cold service systems, need not be of non-combustible materials, but they shall be kept to the minimum quantity practicable and their exposed surfaces shall have qualities of resistance to the propagation of flame to the satisfaction of the Administration.

3.2. Where non-combustible bulkheads, linings and ceilings are fitted in accommodation and service spaces they may have a combustible veneer not exceeding 2.0 mm in thickness within any such space except corridors, stairway enclosures and control stations, where the veneer shall not exceed 1.5 mm in thickness.

3.3. Air spaces enclosed behind ceilings, panellings, or linings, shall be divided by close-fitting draught stops spaced not more than 14 m apart. In the vertical direction, such air spaces, including those behind linings of stairways, trunks, etc., shall be closed at each deck.

Regulation 51. ARRANGEMENT FOR GASEOUS FUEL FOR DOMESTIC PURPOSES

Where gaseous fuel is used for domestic purposes the arrangements [for the] storage, distribution and utilization of the fuel shall be such that, having regard to the hazards of fire and explosion which the use of such fuel may entail, the safety of the ship and the persons on board is preserved.

**Regulation 52. FIXED FIRE DETECTION AND FIRE ALARM SYSTEMS
AUTOMATIC SPRINKLER, FIRE DETECTION AND FIRE ALARM SYSTEMS**

1. In ships in which method IC is adopted, a smoke detection system in accordance with the relevant provisions of regulation 13 shall be so installed and arranged as to protect all corridors, stairways and escape routes within accommodation spaces.

2. In ships in which method IIC is adopted, an automatic sprinkler, fire detection and fire alarm system of an approved type and complying relevant provisions of regulation 12 shall be so installed and arranged as to protect accommodation spaces, galleys and other service spaces, except spaces which afford no substantial fire risk such as void spaces, sanitary spaces, etc. In addition, a smoke detection system in accordance with the relevant provisions of regulation 13 shall be so arranged and installed as to protect corridors, stairways and escape routes within accommodation spaces.

3. In ships in which method IIIC is adopted, a fixed fire detection and fire alarm system of an approved type and complying with the relevant provisions of regulation 13 shall be so installed and arranged as to detect the presence of fire in all accommodation spaces and service spaces, except spaces which afford no substantial fire risk such as void spaces, sanitary spaces, etc.

* Reference is made to Improved Provisional Guidelines on Test Procedures for Primary Deck Coverings, adopted by the Organization by resolution A.214(VII).

4. Notwithstanding the provisions of the above, the Administration need not require the installation of detectors required in accordance with the provisions of regulation 13.2.2 until 1 September 1985.

Regulation 53. FIRE PROTECTION ARRANGEMENTS IN CARGO SPACES

1. *General*

1.1. Except for cargo spaces covered in paragraphs 2 and 3, cargo spaces of ships of 2,000 tons gross tonnage and upwards shall be protected by a fixed gas fire-extinguishing system complying with the provisions of regulation 5 or by a fire-extinguishing system which gives equivalent protection.

1.2. The Administration may exempt from the requirements of paragraph 1.1 cargo spaces of any ship if constructed and solely intended for carrying ore, coal, grain, unseasoned timber and non-combustible cargoes or cargoes which, in the opinion of the Administration, constitute a low fire risk. Such exemptions may be granted only if the ship is fitted with steel hatch covers and effective means of closing all ventilators and other openings leading to the cargo spaces.

1.3. Notwithstanding the provisions of paragraph 1.1, any ship engaged in the carriage of dangerous goods shall be provided in any cargo spaces with a fixed gas fire-extinguishing system complying with the provisions of regulation 5 or [with] a fire-extinguishing system which in the opinion of the Administration gives equivalent protection for the cargoes carried.

2. *Ro/ro cargo spaces*

2.1. *Fire detection*

There shall be provided [a fixed] fire detection and fire alarm system. The design and arrangements of this system shall be considered in conjunction with the ventilation requirements referred to in 2.3.

2.2. *Fire-extinguishing arrangements*

2.2.1. Ro/ro cargo spaces capable of being sealed shall be fitted with a fixed gas fire-extinguishing system which shall comply with the provisions of regulation 5, except that:

1. If a carbon dioxide system is fitted, the quantity of gas available shall be at least sufficient to give a minimum volume of free gas equal to 45 per cent of the gross volume of the largest such cargo space which is capable of being sealed, and the arrangements shall be such as to ensure that at least two thirds of the gas required for the relevant space shall be introduced during 10 minutes;
2. A halogenated hydrocarbon system may be used only for spaces designated only for vehicles which are not carrying any cargo;
3. Any other fixed gas fire-extinguishing system or fixed high expansion foam fire-extinguishing system may be fitted provided the Administration is satisfied that an equivalent protection is achieved;
4. As an alternative, a system meeting the requirements of regulation 37.1.3 may be fitted. However, the drainage and pumping arrangements shall be such as to prevent the build-up of free surfaces. If this is not possible the adverse effect upon stability of the added weight and free surface of water shall be taken into account to the extent deemed necessary by the Administration in its approval of the stability information.* Such information shall be included in the stability information supplied to the master as required by regulation 11-1/22.

2.2.2. Ro/ro cargo spaces not capable of being sealed shall be fitted with a system meeting the requirements of regulation 37.1.3. However, the drainage and pumping arrangements shall be such as to prevent the build-up of free surfaces. If this is not possible the

* Reference is made to Recommendation on Fixed Fire-Extinguishing Systems for Special Category Spaces, adopted by the Organization by resolution A.123(V).

adverse effect upon stability of the added weight and free surface of water shall be taken into account to the extent deemed necessary by the Administration in its approval of the stability information*. Such information shall be included in the stability information supplied to the master as required by regulation II-1/22.

2.2.3. There shall be provided for use in any ro/ro cargo space such number of portable fire extinguishers as the Administration may deem sufficient. At least one portable extinguisher shall be located at each access to such a cargo space.

2.2.4. Each ro/ro cargo space intended for the carriage of motor vehicles with fuel in their tanks for their own propulsion shall be provided with:

1. At least three water fog applicators;
2. One portable foam applicator unit complying with the provisions of regulation 6.4 provided that at least two such units are available in the ship for use in such ro/ro cargo spaces.

2.3. Ventilation system

2.3.1. Closed ro/ro cargo spaces shall be provided with an effective power ventilation system sufficient to provide at least six air changes per hour based on an empty hold. Ventilation fans shall normally be run continuously whenever vehicles are on board. Where this is impracticable, they shall be operated for a limited period daily as weather permits and in any case for a reasonable period prior to discharge, after which period the ro/ro cargo space shall be proved gas free. One or more portable combustible gas detecting instruments shall be carried for this purpose. The system shall be entirely separate from other ventilating systems. Ventilation ducts serving ro/ro cargo spaces capable of being effectively sealed shall be separated for each cargo space. The Administration may require an increased number of air changes when vehicles are being loaded or unloaded. The system shall be capable of being controlled from a position outside such spaces.

2.3.2. The ventilation shall be so arranged as to prevent air stratification and the formation of air pockets.

2.3.3. Means shall be provided to indicate any loss of the required ventilating capacity on the navigating bridge.

2.3.4. Arrangements shall be provided to permit a rapid shut-down and effective closure of the ventilation system in case of fire, taking into account the weather and sea conditions.

2.3.5. Ventilation ducts, including dampers, shall be made of steel and their arrangement shall be to the satisfaction of the Administration.

2.4. Precautions against ignition of flammable vapours

Closed ro/ro cargo spaces carrying motor vehicles with fuel in their tanks for their own propulsion shall comply with the following additional provisions:

1. Except as provided in paragraph 2.4.2, electrical equipment and wiring shall be of a type suitable for use in explosive petrol and air mixtures.
2. Above a height of 450 mm from the deck, electrical equipment of a type so enclosed and protected as to prevent the escape of sparks shall be permitted as an alternative on condition that the ventilating system is so designed and operated as to provide continuous ventilation of the cargo spaces at the rate of at least ten air changes per hour whenever vehicles are on board.
3. Other equipment which may constitute a source of ignition of flammable vapours shall not be permitted.

* Reference is made to Recommendation on Fixed Fire-Extinguishing Systems for Special Category Spaces, adopted by the Organization by resolution A.123(V).

4. Electrical equipment and wiring in an exhaust ventilation duct shall be of a type approved for use in explosive petrol and air mixtures and the outlet from any exhaust duct shall be sited in a safe position, having regard to other possible sources of ignition.
5. Scuppers shall not be led to machinery or other spaces where sources of ignition may be present.

3. *Cargo spaces, other than ro/ro cargo spaces, intended for the carriage of motor vehicles with fuel in their tanks for their own propulsion*

Spaces intended for the carriage of motor vehicles with fuel in their tanks for their own propulsion shall comply with requirements of paragraph 2, except that paragraph 2.2.4 need not be complied with.

Regulation 54. SPECIAL REQUIREMENTS FOR SHIPS CARRYING DANGEROUS GOODS

1. General

1.1. In addition to complying with the requirements of regulation 53 for cargo ships and with the requirements of regulations 38 and 39 for passenger ships as appropriate, ship types and cargo spaces, referred to in paragraph 1.2, intended for the carriage of dangerous goods shall comply with the requirements of this regulation, as appropriate, except when carrying dangerous goods in limited quantities* unless such requirements have already been met by compliance with the requirements elsewhere in this chapter. The types of ships and modes of carriage of dangerous goods are referred to in paragraph 1.2 and in table 54.1, where the numbers appearing in paragraph 1.2 are referred to in the top line.

1.2. The following ship types and cargo spaces shall govern the application of tables 54.1 and 54.2:

1. Ships and cargo spaces not specifically designed for the carriage of freight containers but intended for the carriage of dangerous goods in packaged form including goods in freight containers and portable tanks.
2. Purpose built container ships and cargo spaces intended for the carriage of dangerous goods in freight containers and portable tanks.
3. Ro/ro ships and ro/ro cargo spaces intended for the carriage of dangerous goods.
4. Ships and cargo spaces intended for the carriage of solid dangerous goods in bulk.
5. Ships and cargo spaces intended for carriage of dangerous goods other than liquids and gases in bulk in shipborne barges.

2. *Special requirements*

Unless otherwise specified the following requirements shall govern the application of tables 54.1, 54.2 and 54.3 to both "on deck" and "under deck" stowage of dangerous goods where the numbers of the following paragraphs are indicated in the first column.

2.1. Water supplies

2.1.1. Arrangements shall be made to ensure immediate availability of a supply of water from the fire main at the required pressure either by permanent pressurization or by suitably placed remote starting arrangements for the fire pumps.

2.1.2. The quantity of water delivered shall be capable of supplying four nozzles of a size and at pressures as specified in regulation 4, capable of being trained on any part of the cargo space when empty. This amount of water may be applied by equivalent means to the satisfaction of the Administration.

2.1.3. Means of effectively cooling the designated under deck cargo space by copious quantities of water, either by a fixed arrangement of spraying nozzles, or flooding the cargo space with water, shall be provided. Hoses may be used for this purpose in small cargo spaces

* Reference is made to Section 18 of the General Introduction to the International Maritime Dangerous Goods Code (the IMDG Code) for a definition of the term "limited quantities".

**TABLE 54.1 – APPLICATION OF THE REQUIREMENTS TO DIFFERENT
MODES OF CARRIAGE OF DANGEROUS GOODS
IN SHIPS AND CARGO SPACES**

Wherever “x” appears in table 54.1 it means that this requirement is applicable to all classes of dangerous goods as given in the appropriate line of table 54.3, except as indicated by the notes.

Regulation 54.1.2 Regulation 54.2	.1 Not specifically designed	.2 Container cargo spaces	.3			.4 Solid dangerous goods in bulk	.5 Shipborne barges
			Closed ro/ro cargo spaces	Open ro/ro cargo spaces	Weather decks		
.1.1	x	x	x	x	x	For application of requirements of Regulation 54 to different classes of dangerous goods – see Table 54.2	x
.1.2	x	x	x	x	x		—
.1.3	x	x	x	x	—		x
.1.4	x	x	x	x	—		x
.2	x	x	x	x	—		x ^{d/}
.3	x	x	x	—	—		x ^{d/}
.4.1	x	x ^{a/}	x	—	—		x ^{d/}
.4.2	x	x ^{a/}	x	—	—		x ^{d/}
.5	x	x	x	—	—		—
.6.1	x	x	x	x	x		—
.6.2	x	x	x	x	x		—
.7	x	—	—	x	x		—
.8	x	x ^{b/}	x	x	x		—
.9	—	—	x ^{c/}	x	—		—

Notes

^a For classes 4 and 5.1 not applicable to closed freight containers.

For classes 2, 3, 6.1 and 8 when carried in closed freight containers the ventilation rate may be reduced to not less than two air changes. For the purpose of this requirement a portable tank is a closed freight container.

^b Applicable to decks only.

^c Applies only to closed ro/ro cargo spaces, not capable of being sealed.

^d In the special case where the barges are capable of containing flammable vapours or alternatively if they are capable of discharging flammable vapours to a safe space outside the barge carrier compartment by means of ventilation ducts connected to the barges, these requirements may be reduced or waived to the satisfaction of the Administration.

**TABLE 54.2 – APPLICATION OF THE REQUIREMENTS TO DIFFERENT
CLASSES OF DANGEROUS GOODS FOR SHIPS AND
CARGO SPACES CARRYING SOLID DANGEROUS GOODS
IN BULK**

Class – Chapter VII Regulation 54.2	4.1	4.2	4.3^{f/}	5.1	6.1	8	9
.1.1	x	x	–	x	x ^{g/}	x ^{g/}	x
.1.2^{g/}	x	x	–	x	–	–	x
.2	x	x ^{g/}	x	x ^{g/}	–	–	x ^{g/}
.4.1^{h/}	x ^{g/}	x ^{g/}	x	x ^{g/}	–	–	x ^{g/}
.4.2^{h/}	x	x ^{g/}	x	x ^{g/}	–	–	x ^{g/}
.6	x	x	x	x	x	x	x
.8	x	x	x	x ^{g/}	x ^{g/}	x ^{g/}	x

Notes

^e This requirement is applicable when the characteristics of the substance call for large quantities of water for fire fighting.

^f The hazards of substances in this class which may be carried in bulk are such that special consideration must be given by the Administration to the construction and equipment of the ships involved in addition to [meeting the requirements] enumerated in this table.

^g Reference is made to the International Maritime Dangerous Goods Code (resolution A.81(IV) as amended) or the Code of Safe Practice for Solid Bulk Cargoes (resolution A.434(XI) as amended), as appropriate.

^h At least natural ventilation is required in enclosed cargo spaces intended for carriage of solid dangerous goods in bulk. In cases where power ventilation is required in the Code of Safe Practice for Solid Bulk Cargoes (resolution A.434(XI) as amended), the use of portable ventilation units (equipment) to the satisfaction of the Administration may suffice.

**TABLE 54.3 – APPLICATION OF THE REQUIREMENTS TO DIFFERENT
CLASSES OF DANGEROUS GOODS EXCEPT SOLID
DANGEROUS GOODS IN BULK**

Class – Chapter VII Regulation 54.2	I	2	3	4	5.1	5.2	6.1	8
.1.1	x	x	x	x ^{p/}	x	x ^{p/}	x	x
.1.2 ^{i/}	x	x	x	x ^{p/}	x	x ^{p/}	–	–
.1.3	x ^{k/}	–	–	–	–	–	–	–
.1.4	x ^{k/}	–	–	–	–	–	–	–
.2	x ^{k/}	x ^{l/}	x ^{m/}	–	–	–	x ^{m/} x ^{p/}	x ^{m/} x ^{p/}
.3	x	x	x	x	x	–	x	x
.4.1	–	x ^{j/}	x ^{m/}	x ^{p/}	x ^{p/}	–	x ^{m/} x ^{p/}	x ^{m/} x ^{p/}
.4.2	–	x ^{l/}	x ^{m/}	–	–	–	x ^{m/} x ^{p/}	x ^{m/} x ^{p/}
.5	–	–	x ^{m/}	–	–	–	x ^{n/}	x ^{m/}
.6	–	x	x	x	x	x ^{p/}	x	x
.7	–	–	x	x	x	x ^{p/}	x ^{p/}	x ^{p/}
.8	x ^{k/} x ^{q/}	x	x	x	x ^{p/}	–	x ^{p/}	x ^{p/}
.9	x	x	x ^{m/}	x ^{p/}	x	–	x ^{m/}	x ^{m/}

Notes

ⁱ This requirement is applicable when the characteristics of the substance call for large quantities of water for fire fighting.

^j Applicable to flammable or poisonous gases.

^k Except goods of class 1 in division 1.4, compatibility group S.

^l All flammable gases.

^m All liquids having a flashpoint below 23°C (closed cup test).

ⁿ Liquids only.

^o Goods of class 1 shall be stowed 3 m horizontally away from the machinery space boundaries in all cases.

^p Reference is made to the International Maritime Dangerous Goods Code (resolution A.81(IV) as amended) or the Code of Safe Practice for Solid Bulk Cargoes (resolution A.434(XI) as amended), as appropriate.

and in small areas of larger cargo spaces at the discretion of the Administration. In any event the drainage and pumping arrangements shall be such as to prevent the build-up of free surfaces. If this is not possible the adverse effect upon stability of the added weight and free surface of water shall be taken into account to the extent deemed necessary by the Administration in its approval of the stability information.*

2.1.4. Provision to flood a designated under deck cargo space with suitable specified media may be substituted for the requirements in paragraph 2.1.3.

2.2. Sources of ignition

Electrical equipment and wiring shall not be fitted in enclosed cargo spaces, closed vehicle deck spaces, or open vehicle deck spaces unless it is essential for operational purposes in the opinion of the Administration. However, if electrical equipment is fitted in such spaces, it shall be of a certified safe type** for use in the dangerous environments to which it may be exposed unless it is possible to completely isolate the electrical system (by removal of links in the system, other than fuses). Cable penetrations of the decks and bulkheads shall be sealed against the passage of gas or vapour. Through runs of cables and cables within the cargo spaces shall be protected against damage from impact. Any other equipment which may constitute a source of ignition of flammable vapour shall not be permitted.

2.3. Detection system

An approved fire detection and fire alarm system shall be fitted to all enclosed cargo spaces including closed vehicle deck spaces. Where the detection system utilizes samples of atmosphere drawn from such cargo spaces provision shall be made to prevent, in the event of cargo leakage, the discharge of contaminated atmosphere through the sampling system into the space in which the detection apparatus is situated. A notice stating that the samples shall be discharged to the open air when cargoes giving off toxic fumes are being carried shall be permanently exhibited at the equipment.

2.4. Ventilation

2.4.1. Adequate power ventilation shall be provided in enclosed cargo spaces. The arrangement shall be such as to provide for at least six air changes per hour in the cargo space based on an empty cargo space and for removal of vapours from the upper or lower parts of the cargo space, as appropriate.

2.4.2. The fans shall be such as to avoid the possibility of ignition of flammable gas air mixtures. Suitable wire mesh guards shall be fitted over inlet and outlet ventilation openings.

2.5. Bilge pumping

Where it is intended to carry flammable or toxic liquids in enclosed cargo spaces the bilge pumping system shall be designed to ensure against inadvertent pumping of such liquids through machinery space piping or pumps. Where large quantities of such liquids are carried, consideration shall be given to the provision of additional means of draining those cargo spaces. These means shall be to the satisfaction of the Administration.

2.6. Personnel protection

2.6.1. Four sets of full protective clothing resistant to chemical attack shall be provided in addition to the fireman's outfits required by regulation 17. The protective clothing shall cover all skin, so that no part of the body is unprotected.

2.6.2. At least two self-contained breathing apparatuses additional to those required by regulation 17 shall be provided.

* Reference is made to Recommendation on Fixed Fire-Extinguishing Systems for Special Category Spaces, adopted by the Organization by resolution A.123(V).

** Reference is made to Recommendations published by the International Electrotechnical Commission and, in particular, Publication 92—Electrical Installations in Ships.

2.7. Portable fire extinguishers

Portable fire extinguishers with a total capacity of at least 12 kg of dry powder or equivalent shall be provided for the cargo spaces. These extinguishers shall be in addition to any portable fire extinguishers required elsewhere in this chapter.

2.8. Insulation of machinery space boundaries

Bulkheads forming boundaries between cargo spaces and machinery spaces of category A shall be insulated to "A-60" standard, unless the dangerous goods are stowed at least 3 m horizontally away from such bulkheads. Other boundaries between such spaces shall be insulated to "A-60" standard.

2.9. Water spray system

Each open ro/ro cargo space having a deck above it and each space deemed to be a closed ro/ro cargo space not capable of being sealed shall be fitted with an approved fixed pressure water-spraying system for manual operation which shall protect all parts of any deck and vehicle platform in such space, except that the Administration may permit the use of any other fixed fire-extinguishing system that has been shown by full-scale test to be no less effective. In any event the drainage and pumping arrangements shall be such as to prevent the build-up of free surfaces. If this is not possible the adverse effect upon stability of the added weight and free surface of water shall be taken into account to the extent deemed necessary by the Administration in its approval of the stability information.*

3. Document of compliance

The Administration shall provide the ship with an appropriate document as evidence of compliance of construction and equipment with the requirements of this regulation.

PART D. FIRE SAFETY MEASURES FOR TANKERS

(The requirements of this part are additional to those of part C except for regulations 53 and 54 which do not apply to tankers and except as provided otherwise in regulations 57 and 58.)

Regulation 55. APPLICATION

1. Unless expressly provided otherwise, this part shall apply to tankers carrying crude oil and petroleum products having a flashpoint not exceeding 60°C (closed cup test), as determined by an approved flashpoint apparatus, and a Reid vapour pressure which is below atmospheric pressure and other liquid products having a similar fire hazard.

2. Where liquid cargoes other than those referred to in paragraph 1 or liquefied gases which introduce additional fire hazards are intended to be carried, additional safety measures shall be required to the satisfaction of the Administration, having due regard to the provisions of the Bulk Chemical Code and the Gas Carrier Code.

3. This paragraph applies to all ships which are combination carriers. Such ships shall not carry solid cargoes unless all cargo tanks are empty of oil and gas freed or unless the arrangements provided in each case are to the satisfaction of the Administration and in accordance with the relevant operational requirements contained in the Guidelines for Inert Gas Systems.**

4. Tankers carrying petroleum products having a flashpoint exceeding 60°C (closed cup test) as determined by an approved flashpoint apparatus shall comply with the provisions of part C, except that in lieu of the fixed fire-extinguishing system required in regulation 53 they shall be fitted with a fixed deck foam system which shall comply with the provisions of regulation 61.

* Reference is made to Recommendation on Fixed Fire-Extinguishing Systems for Special Category Spaces, adopted by the Organisation by resolution A.123(V).

** Reference is made to Guidelines for Inert Gas Systems, adopted by the Maritime Safety Committee at its forty-second session in May 1980 (MSC/Circ.282).

5. The requirements for inert gas systems of regulation 60 need not be applied to all chemical tankers or gas carriers when carrying cargoes described in paragraph 1, provided that alternative arrangements, to be developed by the Organization, are fitted.*

6. Chemical tankers and gas carriers shall comply with the requirements of this part, except where alternative and supplementary arrangements are provided to the satisfaction of the Administration, having due regard to the provisions of the Bulk Chemical Code and the Gas Carrier Code.

Regulation 56. LOCATION AND SEPARATION OF SPACES

1. Machinery spaces of category A other than such spaces for bow thrusters and their associated equipment shall be positioned aft of cargo tanks and slop tanks; they shall also be situated aft of cargo pump rooms and cofferdams, but not necessarily aft of the oil fuel bunker tanks. Any machinery space of category A shall be isolated from cargo tanks and slop tanks by a cofferdam, a cargo pump room, or an oil fuel bunker tank. However, the lower portion of the pump room may be recessed into machinery spaces of category A to accommodate pumps provided that the deckhead of the recess is in general not more than one third of the moulded depth above the keel except that in the case of ships of not more than 25,000 tonnes deadweight, where it can be demonstrated that for reasons of access and satisfactory piping arrangements this is impracticable, the Administration may permit a recess in excess of such height, but not exceeding one half of the moulded depth above the keel.

2. Accommodation spaces, main cargo control stations, control stations and service spaces (excluding isolated cargo handling gear lockers) shall be positioned aft of all cargo tanks, slop tanks, cargo pump rooms and cofferdams which isolate cargo or slop tanks from machinery spaces of category A. Any common bulkheads separating a cargo pump room, including the cargo pump room entrance, from accommodation and service spaces and control stations shall be constructed to "A-60" standard. Where deemed necessary, accommodation spaces, control stations, machinery spaces other than those of category A, and service spaces may be permitted forward of all cargo tanks, slop tanks, cargo pump rooms and cofferdams subject to an equivalent standard of safety and appropriate availability of fire-extinguishing arrangements being provided to the satisfaction of the Administration.

3. Where the fitting of a navigation position above the cargo tank area is shown to be necessary it shall be for navigation purposes only and it shall be separated from the cargo tank deck by means of an open space with a height of at least 2 m. The fire protection of such navigation position shall in addition be as required for control spaces as set forth in regulation 58.1 and 58.2 and other provisions, as applicable, of this part.

4. Means shall be provided to keep deck spills away from the accommodation and service areas. This may be accomplished by provision of a permanent continuous coaming of a suitable height extending from side to side. Special consideration shall be given to the arrangements associated with stern loading.

5. Exterior boundaries of superstructures and deckhouses enclosing accommodation and service spaces and including any overhanging decks which support such accommodation, shall be insulated to "A-60" standard for the whole of the portions which face cargo oil tanks and for 3 m aft of the front boundary. In the case of the sides of these superstructures and deckhouses, such insulation shall be carried as high as is deemed necessary by the Administration.

6.1. Entrances, air inlets and openings to accommodation spaces, service spaces and control stations shall not face the cargo area. They shall be located on the end bulkhead not

* Reference is made to Interim Regulation for Inert Gas Systems on Chemical Tankers Carrying Petroleum Products, adopted by the Organization by resolution A.473(XII).

facing the cargo area and/or on the outboard side of the superstructure or deckhouse at a distance of at least [4] per cent of the length of the ship but not less than 3 m from the end of the superstructure or deckhouse facing the cargo area. This distance, however, need not exceed 5 m.

6.2. No doors shall be permitted within the limits mentioned in paragraph 6.1, except that doors to those spaces not having access to accommodation spaces, service spaces and control stations, such as cargo control stations, provision rooms and store-rooms may be permitted by the Administration. Where such doors are fitted, the boundaries of the space shall be insulated to "A-60" standard. Bolted plates for removal of machinery may be fitted within the limits specified in paragraph 6.1. [Wheelhouse] doors and wheelhouse windows may be located within the limits specified in paragraph 6.1 so long as they are so designed that a rapid and efficient gas and vapour tightening of the [wheelhouse] can be ensured.

6.3. Port lights facing the cargo area and on the sides of the superstructures and deckhouses within the limits specified in paragraph 6.1 shall be of the fixed (non-opening) type. Such port lights in the first tier on the main deck shall be fitted with inside covers of steel or other equivalent material.

**Regulation 57. STRUCTURE, BULKHEADS WITHIN ACCOMMODATION AND SERVICE SPACES
AND DETAILS OF CONSTRUCTION**

1. For the application of the requirements of regulations 42, 43 and 50 to tankers, only method IC as defined in regulation 42.5.1 shall be used.

2. Skylights to cargo pump rooms shall be of steel, shall not contain any glass and shall be capable of being closed from outside the pump room.

Regulation 58. FIRE INTEGRITY OF BULKHEADS AND DECKS

1. In lieu of regulation 44 and in addition to complying with the specific provisions for fire integrity of bulkheads and decks mentioned elsewhere in this part the minimum fire integrity of bulkheads and decks shall be as prescribed in tables 58.1 and 58.2.

2. The following requirements shall govern application of the tables:

1. Tables 58.1 and 58.2 shall apply respectively to the bulkhead and decks separating adjacent spaces.
2. For determining the appropriate fire integrity standards to be applied to divisions between adjacent spaces, such spaces are classified according to their fire risk as shown in categories (1) to (10) below. The title of each category is intended to be typical rather than restrictive. The number in parentheses preceding each category refers to the applicable column or row in the tables.
 - (1) Control stations
 - Spaces containing emergency sources of power and lighting.
 - Wheelhouse and chartroom.
 - Spaces containing the ship's radio equipment.
 - Fire-extinguishing rooms, fire control rooms and fire-recording stations.
 - Control room for propulsion machinery when located outside the machinery space.
 - Spaces containing centralized fire alarm equipment.
 - (2) Corridors
 - Corridors and lobbies.
 - (3) Accommodation spaces
 - Spaces as defined in regulation 3.10, excluding corridors.

TABLE 58.1 – FIRE INTEGRITY OF BULKHEADS SEPARATING ADJACENT SPACES

Spaces	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Control stations (1)	A-0 5 /	A-0	A-60	A-0	A-15	A-60	A-15	A-60	A-60	*
Corridors (2)		C	B-0	B-0 A-0 _a /	B-0	A-60	A-0	A-60	A-0	*
Accommodation spaces (3)			C	B-0 A-0 _a /	B-0	A-60	A-0	A-60	A-0	*
Stairways (4)				B-0 A-0 _a /	B-0 A-0 _a /	A-60	A-0	A-60	A-0	*
Service spaces (low risk) (5)					C	A-60	A-0	A-60	A-0	*
Machinery spaces of category A (6)						*	A-0	A-0 _b /	A-60	*
Other machinery spaces (7)							A-0 _b /	A-0	A-0	*
Cargo pump rooms (8)								*	A-60	*
Service spaces (high risk) (9)									A-0 _b /	*
Open decks (10)										—

Notes: To be applied to tables 58.1 and 58.2, as appropriate.

^a For clarification as to which applies, see Regulations 43 and 46 of this Chapter.

^b Where spaces are of the same numerical category and superscript [b] appears, a bulkhead or deck of the rating shown in the tables is only required when the adjacent spaces are for a different purpose, e.g. in category (9). A galley next to a galley does not require a bulkhead but a galley next to a paint room requires an "A-0" bulkhead.

^c Bulkheads separating the wheelhouse, chartroom and radio room from each other may be "B-0" rating.

^d Bulkheads and decks between cargo pump rooms and machinery spaces of category A may be penetrated by cargo pump shaft glands and similar glanded penetrations, provided that gastight seals with efficient lubrication or other means of ensuring the permanence of the gas seal are fitted in way of the bulkhead or deck.

^e Fire insulation need not be fitted if the machinery space in category (7), in the opinion of the Administration, has little or no fire risk.

* Where an asterisk appears in the tables, the division is required to be of steel or other equivalent material but is not required to be of "A" class standard.

TABLE 58.2 – FIRE INTEGRITY OF DECKS SEPARATING ADJACENT SPACES

Space below ↓ Space above →	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Control stations (1)	A-0	A-0	A-0	A-0	A-0	A-60	A-0	–	A-0	*
Corridors (2)	A-0	*	*	A-0	*	A-60	A-0	–	A-0	*
Accommodation spaces (3)	A-60	A-0	*	A-0	*	A-60	A-0	–	A-0	*
Stairways (4)	A-0	A-0	A-0	*	A-0	A-60	A-0	–	A-0	*
Service spaces (low risk) (5)	A-15	A-0	A-0	A-0	*	A-60	A-0	–	A-0	*
Machinery spaces of category A (6)	A-60	A-60	A-60	A-60	A-60	*	A-60 _{e/}	A-0	A-60	*
Other machinery spaces (7)	A-15	A-0	A-0	A-0	A-0	A-0	*	A-0	A-0	*
Cargo pump rooms (8)	–	–	–	–	–	A-0 _{d/}	A-0	*	–	*
Service spaces (high risk) (9)	A-60	A-0	A-0	A-0	A-0	A-60	A-0	–	A-0 _{b/}	*
Open decks (10)	*	*	*	*	*	*	*	*	*	–

(4) Stairways

- Interior stairways, lifts and escalators (other than those wholly contained within the machinery spaces) and enclosures thereto.
- In this connexion, a stairway which is enclosed only at one level shall be regarded as part of the space from which it is not separated by a fire door.

(5) Service spaces (low risk)

- Lockers and store-rooms having areas of less than 2 m², drying rooms and laundries.

(6) Machinery spaces of category A

- Spaces as defined in regulation 3.19.

(7) Other machinery spaces

- Spaces as defined in regulation 3.20 excluding machinery spaces of category A.

(8) Cargo pump rooms

- Spaces containing cargo pumps and entrances and trunks to such spaces.

(9) Service spaces (high risk)

- Galleys, pantries containing cooking appliances, paint and lamp rooms, lockers and store-rooms having an area of 2 m² or more, workshops other than those forming part of the machinery spaces.

(10) Open decks

- Open deck spaces and enclosed promenades having no fire risk. Air spaces (the space outside superstructures and deckhouses).

3. Continuous "B" class ceilings or linings, in association with the relevant decks or bulkheads, may be accepted as contributing, wholly or in part, to the required insulation and integrity of a division.

4. External boundaries which are required in regulation 57.1 to be of steel or other equivalent material may be pierced for the fitting of windows and sidescuttles provided that there is no requirement for such boundaries to have "A" class integrity elsewhere in [this part]. Similarly, in such boundaries which are not required to have "A" class integrity, doors may be of materials to the satisfaction of the Administration.

5. Permanent approved gastight lighting enclosures for illuminating cargo pump rooms may be permitted in bulkheads and decks separating car rooms and other spaces provided they are of adequate strength and the integrity and gastightness of the bulkhead or deck is maintained.

Regulation 59. VENTING, PURGING, GAS FREEING AND VENTILATION

1. *Cargo tank venting*

1.1. The venting systems of cargo tanks are to be entirely distinct from the air pipes of the other compartments of the ship. The arrangements and position of openings in the cargo tank deck from which emission of flammable vapours can occur shall be such as to minimize the possibility of flammable vapours being admitted to enclosed spaces containing a source of ignition, or collecting in the vicinity of deck machinery and equipment which may constitute an ignition hazard. In accordance with this general principle the criteria in paragraphs 1.2 to 1.10 will apply.

1.2. The venting arrangements shall be so designed and operated as to ensure that neither pressure nor vacuum in cargo tanks shall exceed design parameters and be such as to provide for:

1. The flow of the small volumes of vapour, air or inert gas mixtures caused by thermal variations in a cargo tank in all cases through pressure/vacuum valves; and
2. The passage of large volumes of vapour, air or inert gas mixtures during cargo loading and ballasting, or during discharging.

1.3.1. The venting arrangements in each cargo tank may be independent or combined with other cargo tanks and may be incorporated into the inert gas piping.

1.3.2. Where the arrangements are combined with other cargo tanks either stop valves or other acceptable means shall be provided to isolate each cargo tank. Where stop valves are fitted, they shall be provided with locking arrangements which shall be under the control of the responsible ship's officer. Any isolation must continue to permit the flow caused by thermal variations in a cargo tank in accordance with paragraph 1.2.1.

1.4. The venting arrangements shall be connected to the top of each cargo tank and shall be self-draining to the cargo tanks under all normal conditions of trim and list of the ship. Where it may not be possible to provide self-draining lines permanent arrangements shall be provided to drain the vent lines to a cargo tank.

1.5. The venting system shall be provided with devices to prevent the passage of flame into the cargo tanks. The design, testing and locating of these devices shall comply with the requirements established by the Administration which shall contain at least the standards adopted by the Organization.

1.6. Provision shall be made to guard against liquid rising in the venting system to a height which would exceed the design head of cargo tanks. This shall be accomplished by high level alarms or overflow control systems or other equivalent means, together with gauging devices and cargo tank filling procedures.

1.7. Openings for pressure release required by paragraph 1.2.1 shall:

1. Have as great a height as is practicable above the cargo tank deck to obtain maximum dispersal of flammable vapours but in no case less than 2 m above the cargo tank deck;
2. Be arranged at the furthest distance practicable but not less than 5 m from the nearest air intakes and openings to enclosed spaces containing a source of ignition and from deck machinery and equipment which may constitute an ignition hazard.

1.8. Pressure/vacuum valves required by paragraph 1.2.1 may be provided with a by-pass arrangement when they are located in a vent main or masthead riser. Where such an arrangement is provided there shall be suitable indicators to show whether the by-pass is open or closed.

1.9. Vent outlets for cargo loading, discharging and ballasting required by paragraph 1.2.2 shall:

- 1.1. Permit the free flow of vapour mixtures; or
- 1.2. Permit the throttling of the discharge of the vapour mixtures to achieve a velocity of not less than 30 m/sec;
2. Be so arranged that the vapour mixture is discharged vertically upwards;
3. Where the method is by free flow of vapour mixtures, be such that the outlet shall be not less than 6 m above the cargo tank deck or fore and aft gangway if situated within 4 m of the gangway and located not less than 10 m measured horizontally from the nearest air intakes and openings to enclosed spaces containing a source of ignition and from deck machinery and equipment which may constitute an ignition hazard;
4. Where the method is by high velocity discharge, be located at a height not less than 2 m above the cargo tank deck and not less than 10 m measured horizontally from the nearest air intakes and openings to enclosed spaces containing a source of ignition and from deck machinery and equipment which may constitute an ignition hazard. These outlets shall be provided with high velocity devices of an approved type;
5. Be designed on the basis of the maximum designed loading rate multiplied by a factor of at least 1.25 to take account of gas evolution, in order to prevent the pressure in any cargo tank from exceeding the design pressure. The master shall be provided with information regarding the maximum permissible loading rate for each cargo tank and in the case of combined venting systems, for each group of cargo tanks.

1.10. In combination carriers, the arrangement to isolate slop tanks containing oil or oil residues from other cargo tanks shall consist of blank flanges which will remain in position at all times when cargoes other than liquid cargoes referred to in regulation 55.1 are carried.

2. Cargo tank purging and/or gas freeing

Arrangements for purging and/or gas freeing shall be such as to minimize the hazards due to the dispersal of flammable vapours in the atmosphere and to flammable mixture in a cargo tank. Accordingly:

1. When the ship is provided with an inert gas system the cargo tanks shall first be purged in accordance with the provisions of regulation 62.13 until the concentration of hydrocarbon vapours in the cargo tanks has been reduced to less than 2 per cent by volume. Thereafter, venting may be at the cargo tank deck level.
2. When the ship is not provided with an inert gas system, the operation shall be such that the flammable vapour is initially discharged:
 - 2.1. Through the vent outlets as specified in paragraph 1.9; or
 - 2.2. With a vertical exit velocity of at least 20 m/sec through outlets at least 2 m above the cargo tank deck level and which are protected by suitable devices to prevent the passage of flame.

When the flammable [vapour] concentration in the outlet has been reduced to 30 per cent of the lower flammable limit the discharge of the [vapour] mixture may be at the cargo tank deck level.

3. Ventilation

3.1. Cargo pump rooms shall be mechanically ventilated and discharges from the exhaust fans shall be led to a safe place on the open deck. The ventilation of these rooms shall have sufficient capacity to minimize the possibility of accumulation of flammable vapours. The number of changes of air shall be at least 20 per hour, based upon the gross volume of the space. The air ducts shall be arranged so that all of the space is effectively ventilated. The ventilation shall be of the suction type using fans of the non-sparking type.

3.2. The arrangement of ventilation inlets and outlets and other deckhouse and superstructure boundary space openings shall be such as to complement the provisions of paragraph 1. Such vents especially for machinery spaces shall be situated as far aft as practicable. Due consideration in this regard should be given when the ship is equipped to load or discharge at the stern. Sources of ignition such as electrical equipment shall be so arranged as to avoid an explosion hazard.

3.3. In combination carriers all cargo spaces and any enclosed spaces adjacent to cargo spaces shall be capable of being mechanically ventilated. The mechanical ventilation may be provided by portable fans. An approved fixed gas warning system capable of monitoring flammable vapours shall be provided in cargo pump rooms and pipe ducts and cofferdams referred to in regulation 56.1 adjacent to slop tanks. Suitable arrangements shall be made to facilitate measurement of flammable vapours in all other spaces within the cargo [] area. Such measurements shall be made possible from open deck or easily accessible positions.

Regulation 60. CARGO TANK PROTECTION

1. For tankers of 20,000 tonnes deadweight and upwards the protection of the cargo tanks deck area and cargo tanks shall be achieved by a fixed deck foam system and a fixed inert gas system in accordance with the requirements of regulations 61 and 62, except that, in lieu of the above installations, the Administration, after having given consideration to the ship's arrangement and equipment, may accept other combinations of fixed installations if they afford protection equivalent to the above, in accordance with regulation 1/5.

2. To be considered equivalent, the system proposed in lieu of the deck foam system shall:

1. Be capable of extinguishing spill fires and also preclude ignition of spilled oil not yet ignited; and
2. Be capable of combating fires in ruptured tanks.

3. To be considered equivalent, the system proposed in lieu of the fixed inert gas system shall:

1. Be capable of preventing dangerous accumulations of explosive mixtures in intact cargo tanks during normal service throughout the ballast voyage and necessary in-tank operations; and
2. Be so designed as to minimize the risk of ignition from the generation of static electricity by the system itself.

4. Tankers of 20,000 tonnes deadweight and upwards constructed before 1 September 1984 which are engaged in the trade of carrying crude oil shall be fitted with an inert gas system, complying with the requirements of paragraph 1, not later than:

1. For a tanker of 70,000 tonnes deadweight and upwards 1 September 1984 or the date of delivery of the ship, whichever occurs later; and
2. For a tanker of less than 70,000 tonnes deadweight 1 May 1985 or the date of delivery of the ship, whichever occurs later except that for tankers of less than 40,000 tonnes

deadweight not fitted with tank washing machines having an individual throughput of greater than 60 m³/hour the Administration may exempt such tankers from the requirements of this paragraph, if it would be unreasonable and impracticable to apply these requirements, taking into account the ship's design characteristics.

5. Tankers of 40,000 tonnes deadweight and upwards constructed before 1 September 1984 which are engaged in the trade of carrying oil other than crude oil and any such tanker of 20,000 tonnes deadweight and upwards engaged in the trade of carrying oil other than crude oil fitted with tank washing machines having an individual throughput of greater than 60 m³/hour shall be fitted with an inert gas system, complying with the requirements of paragraph 1, not later than:

1. For a tanker of 70,000 tonnes deadweight and upwards 1 September 1984 or the date of delivery of the ship, whichever occurs later; and
2. For a tanker of less than 70,000 tonnes deadweight 1 May 1985 or the date of delivery of the ship, whichever occurs later.

6. All tankers operating with a cargo tank cleaning procedure using crude oil washing shall be fitted with an inert gas system complying with the requirements of regulation 62 and with fixed tank washing machines.

7. All tankers fitted with a fixed inert gas system shall be provided with a closed ullage system.

8. Tankers of less than 20,000 tonnes deadweight shall be provided with a deck foam system complying with the requirements of regulation 61.

Regulation 61. FIXED DECK FOAM SYSTEMS

1. The arrangements for providing foam shall be capable of delivering foam to the entire [cargo tanks deck area] as well as into any cargo tank the deck of which has been ruptured.

2. The deck foam system shall be capable of simple and rapid operation. The main control station for the system shall be suitably located outside the cargo [] area, adjacent to the accommodation spaces and readily accessible and operable in the event of fire in the areas protected.

3. The rate of supply of foam solution shall be not less than the greatest of the following:

1. 0.6 l/minute per square metre of cargo [tanks] deck area, where cargo [tanks] deck area means the maximum breadth of the ship multiplied by the total longitudinal extent of the cargo tank spaces;
2. 6 l/minute per square metre of the horizontal sectional area of the single tank having the largest such area; or
3. 3 l/minute per square metre of the area protected by the largest monitor, such area being entirely forward of the monitor, but not less than 1,250 l/minute.

4. Sufficient foam concentrate shall be supplied to ensure at least 20 minutes of foam generation in tankers fitted with an inert gas installation or 30 minutes of foam generation in tankers not fitted with an inert gas installation when using solution rates stipulated in paragraphs 3.1, 3.2 or 3.3, whichever is the greatest. The foam expansion ratio (i.e., the ratio of the volume of foam produced to the volume of the mixture of water and foam-making concentrate supplied) shall not generally exceed 12 to 1. Where systems essentially produce low expansion foam but at an expansion ratio slightly in excess of 12 to 1 the quantity of foam solution available shall be calculated as for 12 to 1 expansion ratio systems. When medium expansion ratio foam (between 50 to 1 and 150 to 1 expansion ratio) is employed the application rate of the foam and the capacity of a monitor installation shall be to the satisfaction of the Administration.

5. Foam from the fixed foam system shall be supplied by means of monitors and foam applicators. At least 50 per cent of the foam solution supply rate required in paragraphs 3.1 and 3.2 shall be delivered from each monitor. On tankers of less than 4,000 tonnes deadweight

the Administration may not require installation of monitors but only applicators. However, in such a case the capacity of each applicator shall be at least 25 per cent of the foam solution supply rate required in paragraphs 3.1 or 3.2.

6.1. The number and position of monitors shall be such as to comply with paragraph 1. The capacity of any monitor shall be at least 3 l/minute of foam solution per square metre of deck area protected by that monitor, such area being entirely forward of the monitor. Such capacity shall be not less than 1,250 l/minute.

6.2. The distance from the monitor to the farthest extremity of the protected area forward of that monitor shall not be more than 75 per cent of the monitor throw in still air conditions.

7. A monitor and hose connexion for a foam applicator shall be situated both port and starboard at the front of the poop or accommodation spaces facing the cargo deck. On tankers of less than 4,000 tonnes deadweight a hose connexion for a foam applicator shall be situated both port and starboard at the front of the poop or accommodation spaces facing the cargo deck.

8. Applicators shall be provided to ensure flexibility of action during fire-fighting operations and to cover areas screened from the monitors. The capacity of any applicator shall be not less than 400 l/minute and the applicator throw in still air conditions shall be not less than 15 m. The number of foam applicators provided shall be not less than four. The number and disposition of foam main outlets shall be such that foam from at least two applicators can be directed on to any [part of the] cargo [tanks] deck area.

9. Valves shall be provided in the foam main, and in the fire main when this is an integral part of the deck foam system, immediately forward of any monitor position to isolate damaged sections of those mains.

10. Operation of a deck foam system at its required output shall permit the simultaneous use of the minimum required number of jets of water at the required pressure from the fire main.

Regulation 62. INERT GAS SYSTEMS

1. The inert gas system referred to in regulation 60 shall be designed, constructed and tested to the satisfaction of the Administration. It shall be so designed and operated as to render and maintain the atmosphere of the cargo tanks* [non flammable] at all times, except when such tanks are required to be gas free. In the event that the inert gas system is unable to meet the operational requirement set out above and it has been assessed that it is impractical to effect a repair, then cargo discharge, deballasting and necessary tank cleaning shall only be resumed when the "emergency conditions" laid down in the Guidelines on Inert Gas Systems** are complied with.

2. The system shall be capable of:

1. Inerting empty cargo tanks by reducing the oxygen content of the atmosphere in each tank to a level at which combustion cannot be supported;
2. Maintaining the atmosphere in any part of any cargo tank with an oxygen content not exceeding 8 per cent by volume and at a positive pressure at all times in port and at sea except when it is necessary for such a tank to be gas free;
3. Eliminating the need for air to enter a tank during normal operations except when it is necessary for such a tank to be gas free;
4. Purging empty cargo tanks of hydrocarbon gas, so that subsequent gas freeing operations will at no time create a flammable atmosphere within the tank.

* Throughout this regulation the term "cargo tank" includes also "slop tanks".

** Reference is made to Guidelines for Inert Gas Systems, adopted by the Maritime Safety Committee at its forty-second session in May 1980 (MSC/Circ.282).

3.1. The system shall be capable of delivering inert gas to the cargo tanks at a rate of at least 125 per cent of the maximum rate of discharge capacity of the ship expressed as a volume.

3.2. The system shall be capable of delivering inert gas with an oxygen content of not more than 5 per cent by volume in the inert gas supply main to the cargo tanks at any required rate of flow.

4. The inert gas supply may be treated flue gas from main or auxiliary boilers. The Administration may accept systems using flue gases from one or more separate gas generators or other sources or any combination thereof, provided that an equivalent standard of safety is achieved. Such systems should, as far as practicable, comply with the requirements of this regulation. Systems using stored carbon dioxide shall not be permitted unless the Administration is satisfied that the risk of ignition from generation of static electricity by the system itself is minimized.

5. Flue gas isolating valves shall be fitted in the inert gas supply mains between the boiler uptakes and the flue gas scrubber. These valves shall be provided with indicators to show whether they are open or shut, and precautions shall be taken to maintain them gastight and keep the seatings clear of soot. Arrangements shall be made to ensure that boiler soot blowers cannot be operated when the corresponding flue gas valve is open.

6.1. A flue gas scrubber shall be fitted which will effectively cool the volume of gas specified in paragraph 3 and remove solids and sulphur combustion products. The cooling water arrangements shall be such that an adequate supply of water will always be available without interfering with any essential services on the ship. Provision shall also be made for an alternative supply of cooling water.

6.2. Filters or equivalent devices shall be fitted to minimize the amount of water carried over to the inert gas blowers.

6.3. The scrubber shall be located aft of all cargo tanks, cargo pump rooms and cofferdams separating these spaces from machinery spaces of category A.

7.1. At least two blowers shall be fitted which together shall be capable of delivering to the cargo tanks at least the volume of gas required by paragraph 3. In the system with gas generator the Administration may permit only one blower if that system is capable of delivering the total volume of gas required by paragraph 3 to the protected cargo tanks, provided that sufficient spares for the blower and its prime mover are carried on board to enable any failure of the blower and its prime mover to be rectified by the ship's crew.

7.2. Two fuel oil pumps shall be fitted to the inert gas generator. The Administration may permit only one fuel oil pump on condition that sufficient spares for the fuel oil pump and its prime mover are carried on board to enable any failure of the fuel oil pump and its prime mover to be rectified by the ship's crew.

7.3. The inert gas system shall be so designed that the maximum pressure which it can exert on any cargo tank will not exceed the test pressure of any cargo tank. Suitable shut-off arrangements shall be provided on the suction and discharge connexions of each blower. Arrangements shall be provided to enable the functioning of the inert gas plant to be stabilized before commencing cargo discharge. If the blowers are to be used for gas freeing, their air inlets shall be provided with blanking arrangements.

7.4. The blowers shall be located aft of all cargo tanks, cargo pump rooms and cofferdams separating these spaces from machinery spaces of category A.

8.1. Special consideration shall be given to the design and location of scrubber and blowers with relevant piping and fittings in order to prevent flue gas leakages into enclosed spaces.

8.2. To permit safe maintenance, an additional water seal or other effective means of preventing flue gas leakage shall be fitted between the flue gas isolating valves and scrubber or incorporated in the gas entry to the scrubber.

9.1. A gas regulating valve shall be fitted in the inert gas supply main. This valve shall be automatically controlled to close as required in paragraphs [19.3] and [19.4]. It shall also be capable of automatically regulating the flow of inert gas to the cargo tanks unless means are provided to automatically control the speed of the inert gas blowers required in paragraph 7.

9.2. The valve referred to in paragraph 9.1 shall be located at the forward bulkhead of the forwardmost gas safe space* through which the inert gas supply main passes.

10.1. At least two non-return devices, one of which shall be a water seal, shall be fitted in the inert gas supply main, in order to prevent the return of hydrocarbon vapour to the machinery space uptakes or to any gas safe spaces under all normal conditions of trim, list and motion of the ship. They shall be located between the automatic valve required by paragraph 9.1 and the aftermost connexion to any cargo tank or cargo pipeline.

10.2. The devices referred to in paragraph 10.1 shall be located in the cargo [] area on deck.

10.3. The water seal referred to in paragraph 10.1 shall be capable of being supplied by two separate pumps, each of which shall be capable of maintaining an adequate supply at all times.

10.4. The arrangement of the seal and its associated fittings shall be such that it will prevent backflow of hydrocarbon vapours and will ensure the proper functioning of the seal under operating conditions.

10.5. Provision shall be made to ensure that the water seal is protected against freezing, in such a way that the integrity of seal is not impaired by overheating.

10.6. A water loop or other approved arrangement shall also be fitted to each associated water supply and drain pipe and each venting or pressure-sensing pipe leading to gas safe spaces. Means shall be provided to prevent such loops from being emptied by vacuum.

10.7. The deck water seal and all loop arrangements shall be capable of preventing return of hydrocarbon vapours at a pressure equal to the test pressure of the cargo tanks.

10.8. The second device shall be a non-return valve or equivalent capable of preventing the return of vapours or liquids and fitted forward of the deck water seal required in paragraph 10.1. It shall be provided with positive means of closure. As an alternative to positive means of closure, an additional valve having such means of closure may be provided forward of the non-return valve to isolate the deck water seal from the inert gas main to the cargo tanks.

10.9. As an additional safeguard against the possible leakage of hydrocarbon liquids or vapours back from the deck main, means shall be provided to permit this section of the line between the valve having positive means of closure referred to in paragraph 10.8 and the valve referred to in paragraph 9 to be vented in a safe manner when the first of these valves is closed.

11.1. The inert gas main may be divided into two or more branches forward of the non-return devices required by paragraph 10.

11.2.1. The inert gas supply mains shall be fitted with branch piping leading to each cargo tank. Branch piping for inert gas shall be fitted with either stop valves or equivalent means of control for isolating each tank. Where stop valves are fitted, they shall be provided with locking arrangements, which shall be under the control of a responsible ship's officer.

11.2.2. In combination carriers, the arrangement to isolate the slop tanks containing oil or oil residues from other tanks shall consist of blank flanges which will remain in position at all times when cargoes other than oil are being carried except as provided for in the relevant section of the Guidelines on Inert Gas Systems.

11.3. Means shall be provided to protect cargo tanks against the effect of overpressure or vacuum caused by thermal variations when the cargo tanks are isolated from the inert gas mains.

* Gas safe space is a space in which the entry of hydrocarbon gases would produce hazards with regard to flammability or toxicity.

11.4. Piping systems shall be so designed as to prevent the accumulation of cargo or water in the pipelines under all normal conditions.

11.5. Suitable arrangements shall be provided to enable the inert gas main to be connected to an external supply of inert gas.

12. The arrangements for the venting of all vapours displaced from the cargo tanks during loading and ballasting shall comply with regulation 59.1 and shall consist of either one or more mast risers, or a number of high velocity vents. The inert gas supply mains may be used for such venting.

13. The arrangements for inerting, purging or gas freeing of empty tanks as required in paragraph 2 shall be to the satisfaction of the Administration and shall be such that the accumulation of hydrocarbon vapours in pockets formed by the internal structural members in a tank is minimized and that:

1. On individual cargo tanks the gas outlet pipe, if fitted, shall be positioned as far as practicable from the inert gas/air inlet and in accordance with regulation 59.1. The inlet of such outlet pipes may be located either at deck level or at not more than 1 m above the bottom of the tank;
2. The cross sectional area of such gas outlet pipe referred to in paragraph 13.1 shall be such that an exit velocity of at least 20 m/sec can be maintained when any three tanks are being simultaneously supplied with inert gas. Their outlets shall extend not less than 2 m above deck level;
3. Each gas outlet referred to in paragraph 13.2 shall be fitted with suitable blanking arrangements;
 - 4.1. If a connexion is fitted between the inert gas supply mains and the cargo piping system, arrangements shall be made to ensure an effective isolation having regard to the large pressure difference which may exist between the systems. This shall consist of two shut-off valves with an arrangement to vent the space between the valves in a safe manner or an arrangement consisting of a spool-piece with associated blanks;
 - 4.2. The valve separating the inert gas supply main from the cargo main and which is on the cargo main side shall be a non-return valve with a positive means of closure.

14.1. One or more pressure-vacuum breaking devices shall be provided on the inert gas supply main to prevent the cargo tanks from being subject to:

1. A positive pressure in excess of the test pressure of the cargo tank if the cargo were to be loaded at the maximum specified rate and all other outlets were left shut; or
2. A negative pressure in excess of 700 mm water gauge if cargo were to be discharged at the maximum rated capacity of the cargo pumps and the inert gas blowers were to fail.

14.2. The location and design of the devices referred to in paragraph 14.1 shall be in accordance with regulation 59.1.

15. Means shall be provided for continuously indicating the temperature and pressure of the inert gas at the discharge side of the gas blowers, whenever the gas blowers are operating.

16.1. Instrumentation shall be fitted for continuously indicating and permanently recording, when the inert gas is being supplied:

1. The pressure of the inert gas supply mains forward of the non-return devices required by paragraph 10.1; and
2. The oxygen content of the inert gas in the inert gas supply mains on the discharge side of the gas blowers.

16.2. The devices referred to in paragraph 16.1 shall be placed in the cargo control room where provided. But where no cargo control room is provided, they shall be placed in a position easily accessible to the officer in charge of cargo operations.

16.3. In addition, meters shall be fitted:

1. In the navigating bridge to indicate at all times the pressure referred to in paragraph 16.1.1 and the pressure in the slop tanks of combination carriers, whenever those tanks are isolated from the inert gas supply main; and
2. In the machinery control room or in the machinery space to indicate the oxygen content referred to in paragraph 16.1.2.

17. Portable instruments for measuring oxygen and flammable vapour concentration shall be provided. In addition, suitable arrangement shall be made on each cargo tank such that the condition of the tank atmosphere can be determined using these portable instruments.

18. Suitable means shall be provided for the zero and span calibration of both fixed and portable gas concentration measurement instruments, referred to in paragraphs 16 and 17.

19.1. Audible and visual alarms shall be provided to indicate:

1. Low water pressure or low water flow rate to the flue gas scrubber as referred to in paragraph 6.1;
2. High water level in the flue gas scrubber as referred to in paragraph 6.1;
3. High gas temperature as referred to in paragraph 15;
4. Failure of the inert gas blowers referred to in paragraph 7;
5. Oxygen content in excess of 8 per cent by volume as referred to in paragraph 16.1.2;
6. Failure of the power supply to the automatic control system for the gas regulating valve and to the indicating devices as referred to in paragraphs 9 and 16.1;
7. Low water level in the water seal as referred to in paragraph 10.1;
8. Gas pressure less than 100 mm water gauge as referred to in paragraph 16.1.1. The alarm arrangement shall be such as to ensure that the pressure in slop tanks in combination carriers can be monitored at all times; and
9. High gas pressure as referred to in paragraph 16.1.1.

19.2. In the system with gas generators audible and visual alarms shall be provided in accordance with 19.1.1, 19.1.3, 19.1.5 to 19.1.9 and additional alarms to indicate:

1. Insufficient fuel oil supply;
2. Failure of the power supply to the generator;
3. Failure of the power supply to the automatic control system for the generator.

19.3. Automatic shut-down of the inert gas blowers and gas regulating valve shall be arranged on predetermined limits being reached in respect of paragraphs 19.1.1, 19.1.2 and 19.1.3.

19.4. Automatic shut-down of the gas regulating valve shall be arranged in respect of paragraph 19.1.4.

19.5. In respect of paragraph 19.1.5, when the oxygen content of the inert gas exceeds 8 per cent by volume, immediate action shall be taken to improve the gas quality. Unless the quality of the gas improves, all cargo tank operations shall be suspended so as to avoid air being drawn in to the tanks and the isolation valve referred to in paragraph 10.8 shall be closed.

19.6. The alarms required in paragraphs 19.1.5, 19.1.6 and 19.1.8 shall be fitted in the machinery space and cargo control room, where provided, but in each case in such a position that they are immediately received by responsible members of the crew.

19.7. In respect of paragraph 19.1.7 the Administration shall be satisfied as to the maintenance of an adequate reserve of water at all times and the integrity of the arrangements to permit the automatic formation of the water seal when the gas flow ceases. The audible and visual alarm on the low level of water in the water seal shall operate when the inert gas is not being supplied.

19.8. An audible alarm system independent of that required in paragraph 19.1.8 or automatic shut-down of cargo pumps shall be provided to operate on predetermined limits of low pressure in the inert gas mains being reached.

20. Tankers constructed before 1 September 1984 which are required to have an inert gas system shall at least comply with the requirements of regulation 62 of chapter II-2 of the International Convention for the Safety of Life at Sea, 1974.* In addition they shall comply with the requirements of this regulation, except that:

1. Inert gas systems fitted on board such tankers before 1 June 1981 need not comply with the following paragraphs: 3.2, 6.3, 7.4, 8, 9.2, 10.2, 10.7, 10.9, 11.3, 11.4, [12, 13.1,] 13.2, 13.4.2 [, 14.2] and 19.8;
2. Inert gas systems fitted on board such tankers on or after 1 June 1981 need not comply with the following paragraphs: 3.2, 6.3, 7.4 [12, 13.1, 13.2 and 14.2.]

21. Detailed instruction manuals shall be provided on board, covering the operations, safety and maintenance requirements and occupational health hazards relevant to the inert gas system and its application to the cargo tank system.** The manuals shall include guidance on procedures to be followed in the event of a fault or failure of the inert gas system.

Regulation 63. CARGO PUMP ROOMS

1. Each cargo pump room shall be provided with one of the following fixed fire extinguishing systems operated from a readily accessible position outside the pump room. Cargo pump rooms should be provided with a system suitable for machinery spaces of category A.

1.1. Either a carbon dioxide or a halogenated hydrocarbon system complying with the provisions of regulation 5 and with the following:

1. The alarms referred to in regulation 5.1.6 shall be safe for use in a flammable cargo vapour/air mixture;
2. A notice shall be exhibited at the controls stating that due to the electrostatic ignition hazard, the system is to be used only for fire extinguishing and not for inerting purposes.

1.2. A high expansion foam system complying with the provisions of regulation 9, provided that the foam concentrate supply is suitable for extinguishing fires involving the cargoes carried.

1.3. A fixed pressure water-spraying system complying with the provisions of regulation 10.

2. Where the extinguishing medium used in the cargo pump room system is also used in systems serving other spaces, the quantity of medium provided or its delivery rate need not be more than the maximum required for the largest compartment.

CHAPTER III. LIFE-SAVING APPLIANCES, ETC.

Regulation 1. APPLICATION

The existing text of sub-paragraph (c)(iii)(2) is replaced by the following:

- (2) Regulations II-2/28.1.5 and II-2/28.1.6; and

Regulation 27. LIFEBOATS, LIFERAFTS AND BUOYANT APPARATUS

In sub-paragraph (c)(iii), reference to "paragraph (d) of regulation 1 of chapter II-1" is amended to read: regulation II-1/1.5

In sub-paragraph (c)(vii), the reference to "paragraph (d) of regulation 1 of chapter II-1" is amended to read: regulation II-1/1.5

* The text as adopted by the International Conference on Safety of Life at Sea, 1974.

** Reference is made to Guidelines for Inert Gas Systems, adopted by the Maritime Safety Committee at its forty-second session in May 1980 (MSC/Circ.282).

Regulation 30. LIGHTING FOR DECK, LIFEBOATS, LIFERAFTS, ETC.

In paragraph (a), the reference to "regulation 25 of chapter II-1" is amended to read: regulation II-1/42

Regulation 38. EMERGENCY LIGHTING

The reference to "regulation 26 of chapter II-1" is amended to read: regulation II-1/43

CHAPTER IV. RADIOTELEGRAPHY AND RADIOTELEPHONY

The following new regulation is added:

Regulation 4-1. VHF RADIOTELEPHONE INSTALLATION

(a) Passenger ships irrespective of size and cargo ships of 300 tons gross tonnage and upwards shall be fitted with a VHF radiotelephone installation complying with the provisions of regulation 17.

(b) The provisions of regulation 17 shall also apply for VHF radiotelephone installations required by a Contracting Government for all ships to which chapter V applies navigating in an area under its jurisdiction and for which a VHF radiotelephone installation is not made compulsory by paragraph (a).

The existing text of regulation 7 is replaced by the following:

Regulation 7. WATCHES — RADIOTELEPHONE

(a) Each ship which is fitted with a radiotelephone station in accordance with regulation 4 shall, for safety purposes while at sea, maintain continuous watch on the radiotelephone distress frequency in the place on board from which the ship is usually navigated, by use of a radiotelephone distress frequency watch receiver, using a loudspeaker, a filtered loudspeaker or radiotelephone auto alarm.

(b) Each ship referred to in paragraph (a) shall carry qualified radiotelephone operators (who may be the master, an officer or a member of the crew) as follows:

- (i) If of 300 tons gross tonnage and upwards but less than 500 tons gross tonnage, at least one operator;
- (ii) If of 500 tons gross tonnage and upwards but less than 1,600 tons gross tonnage, at least two operators. If such a ship carries one radiotelephone operator exclusively employed for duties related to radiotelephony, a second operator is not obligatory.

(c) Each ship which in accordance with regulation 3 or regulation 4 is fitted with a radiotelegraph station shall, while at sea, maintain continuous watch on the radiotelephone distress frequency in a place to be determined by the Administration, by use of a radiotelephone distress frequency watch receiver, using a loudspeaker, a filtered loudspeaker or radiotelephone auto alarm.

The existing text of regulation 8 is replaced by the following:

Regulation 8. WATCHES — VHF RADIOTELEPHONE

Each ship which is fitted with a VHF radiotelephone installation in accordance with regulation 4-1 shall at sea maintain a continuous listening watch on the navigating bridge:

- (i) On 156.8 MHz (channel 16) when practicable; and/or
- (ii) For such periods and on such channels as may be required by the Contracting Government referred to in regulation 4-1(b).

Regulation 10. RADIOTELEGRAPH INSTALLATIONS

The existing text of paragraph (g) is replaced by the following:

(g-1) The main and reserve transmitters shall, when connected to the main antenna, have a minimum normal range as specified below, that is to say, they must be capable of transmitting clearly perceptible signals from ship to ship by day and under normal conditions and circumstances over the specified type ranges.* (Clearly perceptible signals will normally be received if the R.M.S. value of the field strength at the receiver is at least 50 microvolts per metre.)

	Minimum normal range in miles	
	Main transmitter	Reserve transmitter
All passenger ships and cargo ships of 1,600 tons gross tonnage and upwards	150	100
Cargo ships below 1,600 tons gross tonnage	100	75

(g-2) The radiotelegraph installation shall include facilities for radiotelephone transmission and reception on the radiotelephone distress frequency. This requirement may be fulfilled by including such facilities in the main or reserve installation or other installed equipment. The transmitter power and receiver sensitivity of the radiotelephony part of the installation shall comply with regulation 16(c)(i) and (j) respectively if that part is fitted after 1 September 1986.

* In the absence of a direct measurement of the field strength the following data may be used as a guide for approximately determining the normal range:

A. In the case of antennae other than self-supporting types:

Normal range in miles	Metre-amperes ¹
200	128
175	102
150	76
125	58
100	45
75	34

¹ The product of the distance (in metres) from the highest part of the antenna to the deepest load water-line and the antenna current (in amperes).

The values given in the second column of the table correspond to an average value of the ratio

$$\frac{\text{effective antenna height}}{\text{maximum antenna height}} = 0.47$$

This ratio varies with local conditions of the antenna and may vary between about 0.3 and 0.7.

B. In the case of self-supporting transmitting antennae:

Normal range in miles	Metre-amperes ²
200	305
175	215
150	150
125	110
100	85
75	55

² The product of the distance (in metres) from the highest part of the antenna to the deepest load water-line and the current (in amperes) measured at the base of the radiating portion of the antenna. The values given in the second column are based on the propagation curves given in CCIR Recommendation 368-2 and also the method, experimental results and calculation in CCIR Report 502-1 and Opinion 43-1. The necessary value of metre-amperes varies considerably with local conditions of the antenna.

For installations fitted prior to that date, such transmitter power and receiver sensitivity shall be as determined by the Administration. The location and other conditions of the radiotelephony facilities required by this regulation shall be as determined by the Administration, except when they form part of the main or reserve radiotelegraph installation.

The existing text of sub-paragraph (h)(iv) is replaced by the following:

(h)(iv)(1) The radiotelephone transmitting facility required by paragraph (g-2) shall be fitted with an automatic device for generating the radiotelephone alarm signal, so designed as to prevent actuation by mistake, and complying with the requirements of regulation 16(e). The device shall be capable of being taken out of operation at any time in order to permit the immediate transmission of a distress message. For installations fitted prior to 1 September 1986, the fitting of automatic devices for generating the radiotelephone alarm signal shall be as determined by the Administration.

(2) Arrangements shall be made to check periodically the proper functioning of the automatic device for generating the radiotelephone alarm signal on frequencies other than the radiotelephone distress frequency using a suitable artificial antenna. An exception shall be made for radiotelephone emergency equipment having only the radiotelephone distress frequency in which case a suitable artificial antenna shall be employed.

NOTE: While all reasonable steps shall be taken to maintain the apparatus in an efficient condition, malfunction of the radiotelephone transmitting facilities required by this regulation shall not be considered as making the ship unseaworthy or as a reason for delaying the ship in ports where repair facilities are not readily available.

The existing text of sub-paragraph (l)(ii) is deleted.

The existing text of sub-paragraph (m)(iv) is replaced by the following:

(m)(iv) The VHF installation in accordance with the provisions of regulation 17(c);

Regulation 16. RADIOTELEPHONE INSTALLATIONS

The existing text of paragraph (b) is amended by deleting A3H, A3A and A3J.

The existing text of paragraph (c) is replaced by the following:

(c)(i) In the case of cargo ships of 300 tons gross tonnage and upwards but less than 1,600 tons gross tonnage the transmitter shall have a minimum normal range of 150 miles, i.e., it shall be capable of transmitting clearly perceptible signals from ship to ship by day and under normal conditions and circumstances over this range.* (Clearly perceptible signals will normally be received if the R.M.S. value of the field strength produced at the receiver by an unmodulated carrier is at least 25 microvolts per metre for double sideband and single sideband full carrier emissions.)

(ii) In the case of existing installations using double sideband emissions on cargo ships of 300 tons gross tonnage and upwards but less than 500 tons gross tonnage, the transmitter shall have a minimum normal range of at least 75 miles.

The existing text of sub-paragraph (j)(iv) is replaced by:

(iv) The VHF installation in accordance with the provisions of regulation 17(c).

The existing text of regulation 17 is replaced by the following:

Regulation 17. VHF RADIOTELEPHONE INSTALLATION

(a) The VHF radiotelephone installation shall be in the upper part of the ship complying with the provisions of this regulation and comprising a transmitter and receiver, a source of

* In the absence of field strength measurements, it may be assumed that this range will be obtained by power in the antenna of 15 watts (unmodulated carrier) with an antenna efficiency of 27 per cent for double sideband emissions or 60 watts peak envelope power for single sideband full carrier emissions when 100 per cent modulated by a single sinusoidal oscillation.

energy capable of actuating them at their rated power levels, and an antenna suitable for efficient radiating and receiving signals at the operating frequencies.

(b) On board passenger ships irrespective of size and cargo ships of 500 tons gross tonnage and upwards it shall be possible to operate the VHF radiotelephone installation from a source of energy which is situated in the upper part of the ship and has sufficient capacity for at least six hours of operation.

(c) The Administration may authorize the use of the reserve source of energy of the radiotelegraph installation or the radiotelephone installation respectively referred to in regulation 10(m) and regulation 16(j) to supply the VHF radiotelephone installation. In this case the reserve source of energy is required to be of a capacity sufficient to operate simultaneously the VHF radiotelephone installation and:

- (i) The reserve radiotelegraph transmitter and receiver for at least six hours unless a switching device is fitted to ensure alternate operation only; or
- (ii) The radiotelephone transmitter and receiver for at least six hours unless a switching device is fitted to ensure alternate operation only.

(d) The VHF radiotelephone installation shall conform to the requirements laid down in the Radio Regulations¹ for equipment used in the VHF maritime mobile radiotelephone service and shall be capable of operation on those channels specified by the Radio Regulations and as may be required by the Contracting Government referred to in regulation 4-1(b).

(e) The Contracting Government referred to in regulation 4-1(b) shall not require the transmitter R.F. carrier power output to be greater than 10 watts. The antenna shall, in so far as is practicable, have an unobstructed view in all directions.*

(f) Control of the channels required for navigational safety shall be immediately available on the navigating bridge convenient to the conning position and, where necessary, facilities should be available to permit radiocommunications from the wings of the navigating bridge.

Regulation 19. RADIO LOGS

The following paragraph is added to the existing text and the existing paragraph (c) is re-lettered as paragraph (d):

(c) On each ship fitted with a VHF radiotelephone installation in accordance with regulation 4-1:

- (i) The entries required by the Radio Regulations shall be recorded in the radio log in accordance with the requirements of the Administration;
- (ii) A summary of all communications relating to distress, urgency and safety traffic shall be recorded in the ship's log.

CHAPTER V. SAFETY OF NAVIGATION

The existing text of regulation 12 is replaced by the following:

Regulation 12. SHIPBORNE NAVIGATIONAL EQUIPMENT

(a) For the purpose of this regulation, "constructed" in respect of a ship means a stage of construction where:

- (i) The keel is laid; or
- (ii) Construction identifiable with a specific ship begins; or

* For guidance purposes, it is assumed that each ship is fitted with a vertically polarized unity gain antenna at a nominal height of 9.15 m above water, a transmitter R.F. power output of 10 watts, and a receiver sensitivity of 2 microvolts across the input terminals for 20 dB signal-to-noise ratio.

- (iii) Assembly of that ship has commenced comprising at least 50 tonnes or 1 per cent of the estimated mass of all structural material, whichever is less.
 - (b) (i) Ships of 150 tons gross tonnage and upwards shall be fitted with:
 - (1) A standard magnetic compass, except as provided in sub-paragraph (iv);
 - (2) A steering magnetic compass, unless heading information provided by the standard compass required under (1) is made available and is clearly readable by the helmsman at the main steering position;
 - (3) Adequate means of communication between the standard compass position and the normal navigation control position to the satisfaction of the Administration; and
 - (4) Means for taking bearings as nearly as practicable over an arc of the horizon of 360°.
 - (ii) Each magnetic compass referred to in sub-paragraph (i) shall be properly adjusted and its table or curve of residual deviations shall be available at all times.
 - (iii) A spare magnetic compass, interchangeable with the standard compass, shall be carried, unless the steering compass mentioned in sub-paragraph (i)(2) or a gyro compass is fitted.
 - (iv) The Administration, if it considers it unreasonable or unnecessary to require a standard magnetic compass, may exempt individual ships or classes of ships from these requirements if the nature of the voyage, the ship's proximity to land or the type of ship does not warrant a standard compass, provided that a suitable steering compass is in all cases carried.
- (c) Ships of less than 150 tons gross tonnage shall, as far as the Administration considers it reasonable and practicable, be fitted with a steering compass and have means for taking bearings.
 - (d) Ships of 500 tons gross tonnage and upwards constructed on or after 1 September 1984 shall be fitted with a gyro compass complying with the following requirements:
 - (i) The master gyro compass or a gyro repeater shall be clearly readable by the helmsman at the main steering position;
 - (ii) On ships of 1,600 tons gross tonnage and upwards a gyro repeater or gyro repeaters shall be provided and shall be suitably placed for taking bearings as nearly as practicable over an arc of the horizon of 360°.
 - (e) Ships of 1,600 tons gross tonnage and upwards, constructed before 1 September 1984 when engaged on international voyages, shall be fitted with a gyro compass complying with the requirements of paragraph (d).
 - (f) On ships provided with emergency steering positions, arrangements shall be made to supply heading information to such positions.
 - (g) Ships of 500 tons gross tonnage and upwards constructed on or after 1 September 1984 and ships of 1,600 tons gross tonnage and upwards constructed before 1 September 1984 shall be fitted with a radar installation.
 - (h) Ships of 10,000 tons gross tonnage and upwards shall be fitted with two radar installations, each capable of being operated independently* of the other.
 - (i) Facilities for plotting radar readings shall be provided on the navigating bridge of ships required by paragraph (g) or (h) to be fitted with a radar installation. In ships of 1,600 tons gross tonnage and upwards constructed on or after 1 September 1984 the plotting facilities shall be at least as effective as a reflection plotter.
 - (j) (i) An automatic radar plotting aid shall be fitted on:
 - (1) Ships of 10,000 tons gross tonnage and upwards, constructed on or after 1 September 1984;

* Reference is made to section 4 of the Recommendation on Performance Standards for Radar Equipment, adopted by the Organization by resolution A.477(XII).

- (2) Tankers constructed before 1 September 1984 as follows:
- (aa) If of 40,000 tons gross tonnage and upwards by 1 January 1985;
 - (bb) If of 10,000 tons gross tonnage and upwards but less than 40,000 tons gross tonnage, by 1 January 1986;
- (3) Ships constructed before 1 September 1984 that are not tankers, as follows:
- (aa) If of 40,000 tons gross tonnage and upwards by 1 September 1986;
 - (bb) If of 20,000 tons gross tonnage and upwards, but less than 40,000 tons gross tonnage, by 1 September 1987;
 - (cc) If of 15,000 tons gross tonnage and upwards, but less than 20,000 tons gross tonnage, by 1 September 1988.
- (ii) Automatic radar plotting aids fitted prior to 1 September 1984 which do not fully conform to the performance standards adopted by the Organization may, at the discretion of the Administration, be retained until 1 January 1991.
- (iii) The Administration may exempt ships from the requirements of this paragraph, in cases where it considers it unreasonable or unnecessary for such equipment to be carried, or when the ships will be taken permanently out of service within two years of the appropriate implementation date.
- (k) When engaged on international voyages ships of 1,600 tons gross tonnage and upwards constructed before 25 May 1980 and ships of 500 tons gross tonnage and upwards constructed on or after 25 May 1980 shall be fitted with an echo-sounding device.
- (l) When engaged on international voyages ships of 500 tons gross tonnage and upwards constructed on or after 1 September 1984 shall be fitted with a device to indicate speed and distance. Ships required by paragraph (j) to be fitted with an automatic radar plotting aid shall be fitted with a device to indicate speed and distance through the water.
- (m) Ships of 1,600 tons gross tonnage and upwards constructed before 1 September 1984 and [] ships of 500 tons gross tonnage and upwards constructed on or after 1 September 1984 shall be fitted with indicators showing the rudder angle, the rate of revolution of each propeller and in addition, if fitted with variable pitch propellers or lateral thrust propellers, the pitch and operational mode of such propellers. All these indicators shall be readable from the conning position.
- (n) Ships of 100,000 tons gross tonnage and upwards constructed on or after 1 September 1984 shall be fitted with a rate-of-turn indicator.
- (o) Except as provided in regulations I/7(b)(ii), I/8 and I/9, while all reasonable steps shall be taken to maintain the apparatus referred to in paragraphs (d) to (n) in efficient working order, malfunctions of the equipment shall not be considered as making a ship unseaworthy or as a reason for delaying the ship in ports where repair facilities are not readily available.
- (p) When engaged on international voyages ships of 1,600 tons gross tonnage and upwards shall be fitted with a radio direction-finding apparatus complying with the provisions of regulation IV/12(a). The Administration may, in areas where it considers it unreasonable or unnecessary for such apparatus to be carried, exempt any ship of less than 5,000 tons gross tonnage from this requirement, due regard being had to the fact that radio direction-finding apparatus is of value both as a navigational instrument and as an aid to locating ships, aircraft or survival craft.
- (q) When engaged on international voyages ships of 1,600 tons gross tonnage and upwards constructed on or after 25 May 1980 shall be fitted with radio equipment for homing on the radiotelephone distress frequency, complying with the relevant provisions of regulation IV/12(b).
- (r) All equipment fitted in compliance with this regulation shall be of a type approved by the Administration. Equipment installed on board ships on or after 1 September 1984 shall

conform to appropriate performance standards not inferior to those adopted by the Organization. Equipment fitted prior to the adoption of related performance standards may be exempted from full compliance with those standards at the discretion of the Administration, having due regard to the recommended criteria which the Organization might adopt in connexion with the standards concerned.

(s) A rigidly connected composite unit of a pushing vessel and associated pushed vessel, when designed as a dedicated and integrated tug and barge combination, shall be regarded as a single ship for the purpose of this regulation.

(t) If the application of the requirements of this regulation necessitates structural alterations to a ship constructed before 1 September 1984, the Administration may allow extension of the time limit for fitting the required equipment not later than 1 September 1989, taking into account the first scheduled dry-docking of such a ship required by the present regulations.

(u) Except as provided elsewhere in this regulation, the Administration may grant to individual ships exemptions of a partial or conditional nature, when any such ship is engaged on a voyage where the maximum distance of the ship from the shore, the length and nature of the voyage, the absence of general navigation hazards, and other conditions affecting safety are such as to render the full application of this regulation unreasonable or unnecessary. When deciding whether or not to grant exemptions to an individual ship, the Administration shall have regard to the effect that an exemption may have upon the safety of all other ships.

Regulation 16. LIFE-SAVING SIGNALS

The existing text of paragraph (d) is replaced by the following:

(d) Signals used by aircraft engaged on search and rescue operations to direct ships towards an aircraft, ship or person in distress:

(i) The following manoeuvres performed in sequence by an aircraft mean that the aircraft wishes to direct a surface craft towards an aircraft or a surface craft in distress:

- (1) Circling the surface craft at least once;
- (2) Crossing the projected course of the surface craft close ahead at low altitude, and:
 - Rocking the wings; or
 - Opening and closing the throttle; or
 - Changing the propeller pitch;

(Due to high noise level on board surface craft, the sound signals may be less effective than the visual signal and are regarded as alternative means of attracting attention.)

(3) Heading in the direction in which the surface craft is to be directed.

Repetition of such manoeuvres has the same meaning.

(ii) The following manoeuvre by an aircraft means that the assistance of the surface craft to which the signal is directed is no longer required:

- Crossing the wake of the surface craft close astern at a low altitude, and:
 - Rocking the wings; or
 - Opening and closing the throttle; or
 - Changing the propeller pitch.

(Due to high noise level on board surface craft, the sound signals may be less effective than the visual signal and are regarded as an alternative means of attracting attention.)

NOTE. Advance notification of changes in these signals will be given by the Organization as necessary.

Regulation 18. VHF RADIOTELEPHONE STATIONS

The existing text of this regulation is deleted (see regulation IV/4-1(b)).

Regulation 19. USE OF THE AUTOMATIC PILOT

The following paragraph is added to the existing text:

(d) The manual steering shall be tested after prolonged use of the automatic pilot, and before entering areas where navigation demands special caution.

The following regulations are added to this chapter:

Regulation 19-1. OPERATION OF STEERING GEAR

In areas where navigation demands special caution, ships shall have more than one steering gear power unit in operation when such units are capable of simultaneous operation.

Regulation 19-2. STEERING GEAR — TESTING AND DRILLS

(a) Within 12 hours before departure, the ship's steering gear shall be checked and tested by the ship's crew. The test procedure shall include, where applicable, the operation of the following:

- (i) The main steering gear;
 - (ii) The auxiliary steering gear;
 - (iii) The remote steering gear control systems;
 - (iv) The steering positions located on the navigating bridge;
 - (v) The emergency power supply;
 - (vi) The rudder angle indicators in relation to the actual position of the rudder;
 - (vii) The remote steering gear control system power failure alarms;
 - (viii) The steering gear power unit failure alarms; and
 - (ix) Automatic isolating arrangements and other automatic equipment.
- (b) The checks and tests shall include:
- (i) The full movement of the rudder according to the required capabilities of the steering gear;
 - (ii) A visual inspection of the steering gear and its connecting linkage; and
 - (iii) The operation of the means of communication between the navigating bridge and steering gear compartment.

(c) (i) Simple operating instructions with a block diagram showing the change-over procedures for remote steering gear control systems and steering gear power units shall be permanently displayed on the navigating bridge and in the steering gear compartment.

(ii) All ships' officers concerned with the operation or maintenance of steering gear shall be familiar with the operation of the steering systems fitted on the ship and with the procedures for changing from one system to another.

(d) In addition to the routine checks and tests prescribed in paragraphs (a) and (b), emergency steering drills shall take place at least once every three months in order to practise emergency steering procedures. These drills shall include direct control from within the steering gear compartment, the communications procedure with the navigating bridge and, where applicable, the operation of alternative power supplies.

(e) The Administration may waive the requirement to carry out the checks and tests prescribed in paragraphs (a) and (b) for ships which regularly engage on voyages of short duration. Such ships shall carry out these checks and tests at least once every week.

(f) The date upon which the checks and tests prescribed in paragraphs (a) and (b) are carried out and the date and details of emergency steering drills carried out under paragraph (d), shall be recorded in the log book as may be prescribed by the Administration.

CHAPTER VI. CARRIAGE OF GRAIN

PART A. GENERAL PROVISIONS

The existing text of regulation 1 is replaced by the following:

Regulation 1. APPLICATION

Unless expressly provided otherwise this chapter applies to the carriage of grain in all ships to which the present regulations apply and in cargo ships of less than 500 tons gross tonnage.

PART B. CALCULATION OF ASSUMED HEELING MOMENTS

Section V. *Alternative loading arrangements for existing ships*

(A) *General*

Amend the second paragraph to read:

For the purpose of this part the term "existing ship" means "a ship, the keel of which is laid before 25 May 1980."

(B) *Stowage of specially suitable ships*

The existing text of sub-paragraph (a)(ii)(2) is replaced by the following:

- (2) In partly filled compartments or holds free grain surfaces settle and shift as in subparagraph (1) or to such larger angle as may be deemed necessary by the Administration, or by a Contracting Government on behalf of the Administration, and grain surfaces, if overstowed, with the bulk grain levelled and topped off with bagged grain or other suitable cargo tightly stowed and extending to a height of not less than 1.22 m above the top of the bulk grain within spaces divided by a longitudinal bulkhead or shifting board, and not less than 1.52 m within spaces not so divided and the bagged grain or other suitable cargo supported on suitable platforms laid over the whole surface of the bulk grain, such platforms consisting of bearers spaced not more than 1.22 m apart and 25 mm boards laid thereon spaced not more than 0.10 m apart or of strong separation cloths with adequate overlapping, will shift to an angle of 8 degrees with the original levelled surfaces. For the purpose of this paragraph shifting boards, if fitted, will be considered to limit the transverse shift of the surface of the grain;