



Maritime and Coastguard Agency

## MSN 1698 (M)

# The Merchant Shipping (Passenger Ship Construction: Ships of Classes I, II and II(A)) Regulations 1998

Notice to Shipowners, Certifying Authorities, Shipbuilders, Shiprepairers, Ship Masters and Surveyors

### *Summary*

This Notice advises all Shipowners, Shipbuilders, Ship Repairers, Ship Masters, Certifying Authorities and Surveyors of the new 1998 Passenger Ship Construction Regulations.

#### Key Points:-

- This Notice forms an integral part of the Merchant Shipping (Passenger Ship Construction: Ships of Classes I, II and II(A)) Regulations 1998.
- Schedules contained in this Notice are invoked by those Regulations and are therefore a statutory obligation.

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In this Merchant Shipping Notice -

- (1) references in the Schedules to regulations, unless otherwise stated, refer to regulations in the Merchant Shipping (Passenger Ship Construction : Ships of Classes I, II and II(A)) Regulations 1998;
- (2) a reference in a Schedule to a numbered paragraph is, unless otherwise stated, a reference to the paragraph of that number in that Schedule;
- (3) a reference in a Schedule to a numbered section is, unless otherwise stated, a reference to the section of that number in that Schedule;
- (4) a reference to a numbered Schedule is, unless otherwise stated, a reference to the Schedule of that number in this Merchant Shipping Notice.

In this Merchant Shipping Notice the following expressions have the following meanings respectively, except where the context requires otherwise -

**“approved”** means approved by the Secretary of State or, in relation to any equipment or arrangement mentioned in Merchant Shipping Notice No. M.1645, any persons specified in that Notice in relation to such equipment or arrangement;

**“breadth of the ship”** means the greatest moulded breadth at or below the ship’s deepest subdivision load waterline;

**“bulkhead deck”** means the uppermost deck up to which transverse watertight bulkheads are carried;

**“Certifying Authority”** means the Secretary of State or any person authorised by the Secretary of State;

**“crew space”** means crew accommodation within the meaning of section 43 in the Merchant Shipping Act 1995;

**“criterion numeral”** in relation to any ship means the criterion numeral of the ship determined in accordance with such provisions of Schedule 2 as apply to that ship;

**“draught”** unless stated otherwise, means the vertical distance from the underside of keel amidships to a subdivision load waterline;

**“factor of subdivision”** in relation to any ship or portion thereof means the factor of subdivision determined in accordance with such provisions of Schedule 2 as apply to that ship or portion as the case may be;

**“floodable length”** in relation to any portion of a subdivided ship at any draught means the maximum length of that portion having its centre at a given point in the ship which, at the draught and under such of the assumption of permeability set out in sections 2 and 3 of Schedule 2 as are applicable in the circumstances, can be flooded without submerging any part of the ship’s margin line when the ship has no list;

**“forward perpendicular”** means the forward extremity of the length of the ship as defined below;

**“length”** in relation to a ship, unless otherwise defined, means the length of a ship measured between perpendiculars taken at the extremities of the deepest subdivision load waterline;

**“lightweight”** means the displacement of a ship in tonnes without cargo, fuel, lubricating oil, ballast water, fresh water and feed water in tanks, consumable stores and passengers and crew and their effects;

**“machinery space”** means any space extending from the moulded base line of the ship to the bulkhead deck and between the extreme transverse watertight bulkheads bounding the spaces containing the main and auxiliary propelling machinery, generators and boilers serving the needs of propulsion, when installed;

**“machine spaces of Category A”** means a machinery space which contains -

- (a) internal combustion type machinery used either for main propulsion purposes or for other purposes where such machinery has in the aggregate a total power output of not less than 373 kilowatts; or
- (b) any oil fired boiler or oil fuel unit;

**“margin line”** means a line at least 76 millimetres below the upper surface of the bulkhead deck at the side of a subdivided ship;

**“maximum astern speed”** means the greatest speed which it is estimated the ship can attain at the designed maximum astern power at the deepest seagoing draught;

**“nominated surveyor”** means a surveyor nominated by the Secretary of State to undertake the surveys required by Regulations and includes a marine surveyor of the Maritime and Coastguard Agency;

**“passenger”** means any person carried in a ship except -

- (a) a person employed or engaged in any capacity on board the ship on the business of the ship;

- (b) a person on board the ship either in pursuance of the obligation laid upon the master to carry shipwrecked, distressed or other persons, or by reason of any circumstances that neither the master nor the owner nor the charterer (if any) could have prevented; and
- (c) a child under one year of age;

**“passenger ship”** means a ship carrying more than 12 passengers and propelled by electricity or other mechanical power;

**“passenger space”** means a space provided for the use of passengers, except as otherwise defined in paragraph 1(4) of section 1 of Schedule 2;

**“permeability”** in relation to a space means the percentage of that space, on the assumption that it is in use for the purpose for which it was appropriated, that can be occupied by water;

**“permissible length”** of a compartment, having its centre at any point in the length of a ship, means the product of the floodable length at that point and the factor of subdivision of the ship;

**“stability information”** means the information required to be provided in compliance with regulation 38;

**“steering gear power unit”** means -

- (a) in the case of electric steering gear, the electric motor and its associated electrical equipment; or
- (b) in the case of electro-hydraulic steering gear, the electric motor, its associated electrical equipment and connected pump; or
- (c) in the case of steam-hydraulic or pneumatic-hydraulic steering gear, the driving engine and connected pump;

**“subdivision load waterline”** means the waterline assumed in determining the subdivision of the ship;

**“suitable”** in relation to material means approved as suitable for the purpose for which it is used;

**“summer load waterline”** has the same meaning as in the Merchant Shipping (Load Line) Regulations 1998;

**“superstructure”** means a decked structure situated on or above the bulkhead deck which either extends from side to side of the ship or is such that its side plating is not inboard of the shell plating of the ship by more than 4 per cent of the breadth of the ship and, where the bulkhead deck of the ship consists of a lower deck, includes that part of the hull of the ship which extends above the bulkhead deck;

**“watertight”** in relation to a structure means capable of preventing the passage of water through the structure in any direction under the maximum head of water which it might have to sustain in the event of damage to the ship, but for structures below the bulkhead deck at least the head of water up to the ship’s bulkhead deck;

**“weathertight”** in relation to a structure means capable of preventing the passage of sea water through the structure in the worst sea and weather conditions likely to be encountered by the ship.

## SCHEDULE 1

### INTACT STABILITY STANDARD

1. After correcting for the effect of free surface of liquids in tanks -
  - (1) the area under the curve of righting levers (GZ curve) shall not be less than -
    - (a) 0.055 metre-radian up to an angle of 30 degrees;
    - (b) 0.090 metre-radian up to an angle of either 40 degrees or the angle at which the lower edges of any openings in the hull, superstructures or deckhouses, being openings which cannot be closed weathertight, are immersed if that angle be less; or
    - (c) 0.030 metre-radian between the angles of heel of 30 degrees and 40 degrees or such lesser angle as is referred to in subparagraph (b).
  - (2) The righting lever (GZ) shall be at least 0.20 metre at an angle of heel equal to greater than 30 degrees.
  - (3) The maximum righting lever (GZ) shall occur at an angle of heel not less than 30 degrees, provided that this angle may be permitted to be reduced to 25 degrees, having regard to the design of a particular ship.
  - (4) The initial transverse metacentric height (GM) shall not be less than 0.15 metre.
2. Where it is not possible, due to the particular design or operating conditions of a particular ship, to comply with the criteria of this Schedule, the application of alternative criteria may be permitted if it gives a standard of stability at least as effective.

regs 2, 8, 44 &amp; 45

## SCHEDULE 2

### CALCULATION OF MAXIMUM LENGTH OF WATERTIGHT COMPARTMENTS

#### Section 1 - Preliminary

##### 1. General

In this Schedule, except where otherwise specified -

- (1) all linear measurements shall be in metres;
- (2) all volumes shall be in cubic metres and shall be calculated from measurements taken to moulded lines;
- (3) the symbol "L" denotes the length of the ship; and
- (4) the expression "passenger spaces" includes galleys, laundries and other similar spaces provided for the service of passengers, in addition to space provided for the use of passengers.

## 2. Maximum length of compartment

Subject to the provisions of paragraph 6, the maximum length of a compartment shall not exceed its permissible length.

**Section 2 - Ships of Class I and Ships of Classes II and II(A) other than those which comply with section 3 and in accordance with the Merchant Shipping (Life-Saving Appliances) Regulations 1980 or the Merchant Shipping (Life-Saving Appliances) Regulations 1986 as applicable**

## 3. Assumptions of permeability

The assumptions of permeability which shall be taken into account in determining the floodable length shall be as follows -

(1) machinery space -

(a) the assumed average permeability throughout the machinery space shall be determined by the following formula -

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

where a = volume of the passenger spaces and crew spaces which are situated below the margin line within the limits of the machinery space;

c = volume of the between-deck spaces below the margin line within the limits of the machinery space which are appropriated for cargo or stores; and

v = volume of the machinery space below the margin line.

(b) in any case in which the average permeability throughout the machinery space, as determined by detailed calculation, is less than that given by this formula, the calculated value may be substituted;

(2) portions before and abaft the machinery space -

(a) the assumed average permeability throughout the portions of the ship forward and abaft the machinery space shall be determined-

(i) by the following formula -

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

where a = volume of the passenger spaces and crew spaces which are situated below the margin line before or abaft the machinery space, as the case may be; and

v = volume of the portion of the ship below the margin line forward or abaft the machinery space, as the case may be;

(ii) or, if the Secretary of State so requires, by detailed calculation for the purpose of which the permeability of individual spaces within that portion of the ship shall be assumed to be as follows -

passenger spaces .....	.95%
crew spaces .....	.95%
spaces appropriated for machinery .....	.85%
spaces appropriated for cargo, stores or baggage rooms .....	.60%
tanks forming part of the structure of the ship and double bottoms .....	.95%, or such lesser figure as may be permitted in the case of any ship.

- (b) 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.

#### 4. Factor of subdivision

- (1) Subject to the provision of subparagraph (5), in the case of ships of 131 metres in length or over, the factor of subdivision F shall be determined by the following formula -

$$F = A - \frac{(A - B)(Cs - 23)}{100}$$

where A and B are respectively determined in accordance with the provisions of subparagraph (6) and Cs is the criterion numeral determined in accordance with the provisions of paragraph 5.

Provided that -

- (a) where the criterion numeral is equal to 45 or more and simultaneously the computed factor of subdivision F as given by the preceding formula is 0.65 or less, but more than 0.5, the subdivision abaft the forepeak shall be governed by the factor 0.5; and
- (b) where the factor of subdivision F is less than 0.4 and it is impracticable to apply the factor of subdivision F in determining the permissible length of a compartment appropriated for machinery, an increased factor not exceeding 0.4 may be allowed to be applied to that compartment.
- (2) Subject to the provisions of subparagraph (5), in the case of ships the length of which is less than 131 metres but not less than 79 metres having a criterion numeral of not less than S, where -

$$S = \frac{3574 - 25L}{13}$$

The factor of subdivision F shall be determined by the following formula -

$$F = 1 - \frac{(1 - B)(Cs - S)}{123 - S}$$

where B is the factor determined in accordance with the provisions of subparagraph (6) and Cs is the criterion numeral determined in accordance with the provisions of paragraph 5.

- (3) In the case of a ship the length of which is less than 131 metres but not less than 79 metres and having a criterion numeral less than S the factor of subdivision F shall be unity
- (4) In the case of a ship the length of which is less than 79 metres the factor of subdivision F shall be unity.
- (5) In the case of a ship of any length which is intended to carry a number of passengers exceeding 12 but not exceeding -

$$\frac{L^2}{650} \text{ or } 50$$

whichever is the lower, the factor of subdivision F shall be determined in the manner provided in subparagraphs (3) or (4);

- (6) For the purposes of this paragraph the factors A and B shall be determined by the following formulae -

$$A = \frac{58.2}{L-60} + 0.18 \text{ (where } L = 131 \text{ metres and upwards)}$$

$$B = \frac{30.3}{L-42} + 0.18 \text{ (where } L = 79 \text{ metres and upwards)}$$

## 5. Criterion of service

The criterion numeral for ships to which this section applies shall be determined by the following formulae -

- (1) when  $P_1$  is greater than P

$$C_s = 72 \frac{M + 2P_1}{V + P_1 - P}$$

- (2) and in all other cases

$$C_s = 72 \frac{M + 2P}{V}$$

where -

$C_s$  = the criterion numeral;

L = the length of the ship (metres) as defined;

M = the volume of the machinery space with the addition thereto of the volume of any permanent oil fuel bunkers which may be situated above the inner bottom and before or abaft the machinery space;

V = the volume of ship below the margin line;

N = number of passengers for which the ship is certified;



- $P_1 = 0.056LN$ ;  
 $P =$  the whole volume of the passenger and crew spaces below the margin line ( $m^3$ );

- (3) Provided that -
- (a) where the value of  $0.056LN$  is greater than the sum of  $P$  and the whole volume of the passenger spaces above the margin line, the figure to be taken as  $P_1$  shall be that sum or  $0.037LN$  whichever is the greater;
  - (b) values of  $C_s$  less than 23 shall be taken as 23; and
  - (c) values of  $C_s$  greater than 123 shall be taken as 123.

## 6. Special rules for subdivision

### *Compartments exceeding the permissible length*

- (1) (a) A compartment may exceed its permissible length provided that 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 less.
- (b) If one compartment of either of such pairs of adjacent compartments is situated inside the machinery space, and the other compartment is situated outside the machinery space, the combined length of the two compartments shall be adjusted in accordance with the mean average permeability of the two portions of the ship in which the compartments are situated.
- (c) Where the length of two adjacent compartments are governed by different factors of subdivision, the combined length of the two compartments shall be determined proportionately.
- (d) Where, in any portion of a ship, bulkheads which are required by the Regulations to be watertight are carried to a higher deck than in the remainder of the ship, separate margin lines may be used for calculating the floodable length of that portion of the ship, if -
- (i) the two compartments adjacent to the resulting 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 determined by reference to the lower margin line of such compartments; or
  - (ii) the sides of the ship are extended throughout the ship's length to the deck corresponding to the uppermost margin line and all openings in the shell plating below that deck throughout the length of the ship comply with the intact stability standards of the Regulations as if they were openings below the margin line.

### *Additional subdivision at forward end*

- (2) In ships of 100 metres in length or over, the watertight bulkhead abaft the collision bulkhead shall be fitted at a distance from the forward perpendicular, or where any part of the ship below the waterline extends forward of the forward perpendicular from an equivalent point permitted in the Regulations where applicable, which is not greater than the permissible length appropriate to a compartment bounded by the forward perpendicular and such a bulkhead.

### *Steps in bulkheads*

- (3) If a bulkhead required to be watertight is stepped one of the following conditions shall be satisfied -

- (a) in ships having a factor of subdivision not greater than 0.9, the combined length of the two compartments separated by such a bulkhead shall not exceed 90 per cent of the floodable length, or twice the permissible length whichever is the less. In ships having a factor of subdivision greater than 0.9, the combined length of the two compartments shall not exceed the permissible length; or
- (b) additional subdivision is provided in way of the step to maintain the same measure of safety as that secured by a plane bulkhead; or
- (c) the compartment over which the step extends does not exceed the permissible length corresponding to a margin line taken 76 millimetres below the step.

*Recesses in bulkheads*

- (4) If any part of a recess lies outside vertical surfaces on either side of the ship situated at a distance from the shell plating equal to one-fifth of the breadth of the ship and measured at right angles to the centreline at the level of the deepest subdivision load waterline, the whole of such recess shall be deemed to be a step in a bulkhead for the purposes of subparagraph (3).

*Equivalent plane bulkheads*

- (5) Where a bulkhead required to be watertight is recessed or stepped an equivalent plane bulkhead shall be assumed in determining the subdivision.

*Minimum spacing of bulkheads*

- (6) If the distance between the two adjacent main transverse bulkheads required to be watertight, 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 metres plus 3 per cent of the length of this ship or 11 metres, whichever is the least, only one of these bulkheads shall be regarded as forming part of the subdivision of the ship.

*Allowances for local subdivision*

- (7) Where in a ship a main transverse watertight compartment contains local subdivision and it can be shown that, after any assumed side damage extending over a length of 3 metres plus 3 per cent of the length of the ship, or 11 metres, whichever is the least, 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. Allowance under this paragraph will be made only if it can be shown that such an allowance is not likely to prevent compliance with subparagraph 2(2)b of Schedule 3 Section 2 as appropriate.

*Combined lengths of two adjacent compartments*

- (8) Where in any ship the required factor of subdivision is 0.5 or less, the combined length of any two adjacent compartments shall not exceed the floodable length or twice the permissible length whichever is the less.

**Section 3 - Ships of Classes II and II(A) other than those which comply with section 2 and in accordance with the Merchant Shipping (Life-Saving Appliances) Regulations 1980 or the Merchant Shipping (Life-Saving Appliances) Regulations 1986 as applicable**

**7. General rules for subdivision**

Subject to the modifications set out in this section, the maximum length of compartments in ships to which this section applies shall be determined as if they were ships to which section 2 of this Schedule applies.

**8. Assumptions of permeability in portions before and abaft the machinery space**

(1) The assumed average permeability throughout the portions of the ship forward and abaft the machinery space shall be determined -

(a) by the formula -

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

where b = the volume of the spaces which are situated below the margin line forward or abaft the machinery space, as the case may be, and above the tops of floors, inner bottom or peak tanks, and which are appropriated for use as oil fuel bunkers, store rooms, baggage rooms, mail rooms, chain lockers or fresh water tanks and of spaces appropriated for cargo if the greater part of the volume of the space is intended to be occupied by cargo; and

v = volume of the portion of the ship below the margin line forward or abaft the machinery space, as the case may be;

(b) or by detailed calculation for the purpose of which the permeability of individual spaces within that portion of the ship shall be assumed as follows -

passenger spaces .....	.95%
crew spaces .....	.95%
spaces appropriated for machinery .....	.85%
spaces appropriated for cargo, stores or baggage rooms .....	.60%
tanks forming part of the structure of the ship and double bottoms .....	.95%, or such a lesser figure if it can be shown to be appropriate.

(2) 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.

**9. Factor of subdivision**

(1) Subject to the provisions of this paragraph, the factor of subdivision shall be as determined by paragraph 4, or 0.5, whichever is the less. Provided that in the case of a ship the length of which is less than 91.5 metres if it is impracticable to apply that factor to any compartment, a higher factor may be applied to it.

(2) If it is shown that the quantity of cargo to be carried in the ship will be such as to render impracticable the application abaft the collision bulkhead of a factor of subdivision not exceeding 0.5, the factor of subdivision of the ship shall be determined as follows -

(a) in the case of a ship 131 metres in length and upwards, by the formula -

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

- (b) in the case of a ship less than 131 metres in length but not less than 55 metres, and having a criterion numeral not less than  $S_i$ , by the formula -

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

For the purposes of the above formulae -

$$A = \frac{58.2}{L - 60} + 0.18 \text{ (where } L = 131 \text{ metres and upwards)}$$

$$BB = \frac{17.6}{L - 33} + 0.20 \text{ (where } L = 55 \text{ metres and upwards)}$$

$$S_i = \frac{3712 - 25L}{19}$$

$C_s$  = the criterion numeral determined in accordance with paragraph 5 where  $P_1$  has the following values -

- (i) 0.056LN or 3.5N whichever is the greater for berthed passengers; or
  - (ii) 3.5N for unberthed passengers;
- (c) in the case of a ship less than 131 metres in length but not less than 55 metres and having a criterion numeral less than  $S_i$ , the factor of subdivision F shall be unity;
- (d) in the case of a ship the length of which is less than 55 metres the factor of subdivision F shall be unity.

regs 44 & 45

### SCHEDULE 3

#### STABILITY IN THE DAMAGED CONDITION

##### Section 1 - Assumptions on which the calculations are to be based

1. The sufficiency of intact stability of every ship following damage and flooding shall be determined by calculation which has regard to the design and construction of the ship, and the damaged compartments, and which is in accordance with the following assumptions -
  - (1) the ship shall be assumed to be in the worst service conditions as regards stability which is likely to be experienced having regard to the intended service of the ship, or damage calculations shall be made over the operational draught range as a basis for a curve of required metacentric heights;

(2) the volume permeabilities and surface permeabilities shall be assumed to be as follows -

(a) Space	Permeability
Occupied by vehicular cargo . . . . .	90%
Occupied by other cargo or stores . . . . .	60%
(in ships carrying goods vehicles and accompanying personnel other values of permeability of the cargo spaces are given in the Regulations)	
Appropriated as accommodation for passengers and crew . . . . .	95%
Appropriated for machinery . . . . .	85%
Appropriated for liquids . . . . .	0 or 95%,
	whichever results in the more onerous requirements.

(b) Higher surface permeabilities shall be assumed in respect of spaces which, in the vicinity of the damaged water plane, contain no substantial quantity of accommodation or machinery and spaces which are not generally occupied by any substantial quantity of cargo or stores.

(3) The extent of damage shall be assumed to be as follows -

- (a) longitudinal extent: 3 metres plus 3 per cent of the length of the ship, or 11 metres, whichever is less. Provided that where the required factor of subdivision is 0.33 or less, the assumed longitudinal extent of damage shall be increased as necessary so as to include any two consecutive main transverse watertight bulkheads;
- (b) transverse extent: 20 per cent of the breadth of the ship, measured inboard from the ship's side at right angles to the centreline at the level of the deepest subdivision load waterline taken parallel to the keel;
- (c) vertical extent: from the base line upwards without limit;
- (d) if any damage of lesser extent than that indicated in subparagraphs (a), (b) and (c) would result in a more severe condition regarding heel or loss of metacentric height, such damage shall be assumed for the purposes of the calculation;

(4) Where the ship is fitted with decks, inner skins or longitudinal bulkheads of sufficient tightness to restrict the flow of water, regard shall be had to such restrictions in the calculation.

**Section 2 - Sufficiency of stability in the damaged condition of ships constructed before 29th April 1990**

2. The intact stability of the ship shall be deemed to be sufficient if the calculations in paragraph 1 show that, after the assumed damage, the condition of the ship is as follows -

- (1) In the event of symmetrical flooding -
  - (a) at all stages of flooding there is sufficient positive residual stability;
  - (b) at intermediate stages of flooding, or during equalisation if applicable, the margin line is not submerged, unless partial subdivision above the margin line limits sufficiently the spread of water along the bulkhead deck and results in an angle of heel not exceeding 20 degrees. In the case of ships carrying vehicles on the bulkhead deck, the angle of heel at intermediate stages of flooding is not greater than that which will submerge the margin line; and

- (c) at the final stage of flooding the margin line is not submerged and there is a positive residual metacentric height of at least 50 millimetres as calculated by the constant displacement method;
- (2) In the event of asymmetrical flooding -
- (a) the provisions of subparagraph (1)(a) apply;
  - (b) the provisions of subparagraph (1)(b) apply;
  - (c) at the final stage of flooding, and after equalization measures, if any, have been taken, the angle of heel is not to exceed 7 degrees and the margin line is not to be submerged.
- (3) The range of stability in the damaged condition shall be to the satisfaction of the Secretary of State.

**Section 3 - Sufficiency of stability in the damaged condition of ships constructed on or after 29th April 1990**

3. The intact stability of the ship shall be deemed to be sufficient if the calculations in paragraph 1 show that, after the assumed damage, the condition of the ship is as follows -

- (1) In the final stage after damage, and after equalisation where provided -
- (a) the positive residual righting lever curve has a range of at least 15 degrees beyond the angle of equilibrium; this range may be reduced to a minimum of 10 degrees in the case where the area under the righting lever curve is that specified in subparagraph (b) is increased by the ratio 15/Range, where Range is expressed in degrees;
  - (b) the area under the righting lever curve is at least 0.015 metre-radians, measured from the angle of equilibrium to the lesser of -
    - (i) the angle at which progressive flooding occurs; or
    - (ii) 22 degrees (measured from the upright) in the case of one compartment flooding, or 27 degrees (measured from the upright) in the case of simultaneous flooding of two or more adjacent compartments;
  - (c) a residual righting lever (GZ) value, is to be obtained within the range specified in subparagraph (1)(a), when determined by the formula -

$$GZ(m) = \frac{\text{heeling moment (t.m)}}{\text{displacement (t)}} + 0.04$$

where the heeling moment is to be taken as the greatest value resulting from any one of the following effects -

- (i) the crowding of all passengers towards one side of the ship;
- (ii) the launching of all fully-loaded davit-launched survival craft on one side of the ship; or
- (iii) the pressure of the wind on one side of the ship;

where in no case shall the GZ value so determined be less than 0.10 metres;

- (d) for the purpose of calculating the heeling moments in subparagraph (1)(c), the following assumptions shall be made -
- (i) moments due to crowding of passengers -
    - (aa) 4 persons per square metre;
    - (bb) a mass of 75 kilogrammes for each passenger; and
    - (cc) passengers shall be distributed on available deck areas towards one side of the ship on the decks where muster stations are located and in such a way that they produce the most adverse heeling moment;
  - (ii) moments due to launching of all fully loaded davit-launched survival craft on one side -
    - (aa) all lifeboats and rescue boats fitted on the side to which the ship has heeled after having sustained damage shall be assumed to be swung out fully loaded and ready for lowering;
    - (bb) for lifeboats which are arranged to be launched fully loaded from the stowed position, the maximum heeling moment during launching should be taken;
    - (cc) a fully loaded davit-launched lifecraft attached to each davit on the side to which the ship has heeled after having sustained damage shall be assumed to be swung out ready for lowering;
    - (dd) persons not in the life-saving appliances which are swung out shall not provide either additional heeling or righting moment;
    - (ee) life-saving appliances on the side of the ship opposite to the side to which the ship has heeled shall be assumed to be in a stowed position;
  - (iii) moments due to wind pressure -
    - (aa) a wind pressure of  $120\text{N/m}^2$  to be applied;
    - (bb) the area applicable shall be the projected lateral area of the ship above the waterline corresponding to the intact condition; and
    - (cc) the moment arm shall be the vertical distance from a point at one half of the mean draught corresponding to the intact condition to the centre of gravity of the lateral area;
  - (e) in intermediate stages of flooding, or during equalisation where applicable the maximum righting lever shall be at least 0.05 metres and the range of positive righting levers shall be at least 7 degrees. In all cases only one breach in the hull and only one free surface need to be assumed;
- (2) The final condition of the ship after damage and, in the case of asymmetrical flooding, after equalisation measures have been taken shall be as follows -
- (a) in the case of symmetrical flooding there shall be a positive residual metacentric height of at least 50 millimetres as calculated by the constant displacement method;
  - (b) in the case of asymmetrical flooding the angle of heel for one-compartment flooding shall not exceed 7 degrees. For the simultaneous flooding of two or more adjacent compartments a heel of 12 degrees may be permitted; and



- (c) in no case shall the margin line be submerged in the final stage of flooding.

At intermediate stages of flooding the margin line is not to be submerged unless partial subdivision above the margin line in accordance with regulation 13 limits sufficiently the spread of water along the bulkhead deck and results in an angle of heel not exceeding 15 degrees. In the case of ships carrying vehicles on the bulkhead deck, the angle of heel at intermediate stages of flooding shall not be greater than that which will submerge the margin line;

- (3) For the purpose of the requirements in this section -
- (a) when major progressive flooding occurs, that is when it causes rapid reduction in the righting lever of 0.04 metres or more, the righting lever curve is to be considered as terminated at the angle at which the progressive flooding occurs, and the range and area referred to in subparagraphs (1)(a) and (b) should be measured to that angle; and
- (b) in cases where the progressive flooding is of a limited nature that does not continue unabated and causes an acceptable slow reduction in righting lever of less than 0.04 metres, the remainder of this curve shall be partially truncated by assuming that the progressively flooded space is so flooded from the beginning.

#### **Section 4 - Presentation of limiting stability information**

4. The master of the ship shall be supplied with the data necessary to maintain sufficient intact stability under the 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.
5. The data referred to in paragraph 4 to enable the master to maintain sufficient stability shall include information which indicates the maximum permissible height of the ship's centre of gravity above keel (KG), or alternatively the minimum permissible metacentric height (GM), for a range of draughts or displacements sufficient to include all service conditions. The information shall show the influence of various trims taking into account the operational limits.

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### **SCHEDULE 4**

#### **CONSTRUCTION OF WATERTIGHT SUBDIVISION**

##### **Section 1 - Construction of watertight bulkheads etc**

###### **1. Strength and construction**

- (1) Every bulkhead and other parts of the internal structure forming part of the watertight subdivision of the ship shall be of such strength and be so constructed as to be capable of supporting, with an adequate 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 not being less than the pressure due to a head of water up to the margin line.
- (2) Every such bulkhead and its parts shall be constructed of steel and -
- (a) in the case of a ship which is classed with a Certifying Authority, and built to its survey requirements, it shall be sufficient for compliance with the requirements of subparagraph (1);

if that Authority certifies that the watertight bulkheads and parts thereof are constructed in accordance with the requirements of its Rules; and



- (b) in the case of a ship which is not classed with a Certifying Authority and built to the survey requirements of the Maritime and Coastguard Agency, compliance with subparagraph (1) will be met if the bulkhead scantlings comply with the appropriate rules of a Certifying Authority.

## 2. Watertight decks, steps and flats

The horizontal plating of decks, steps and flats required to be watertight shall be as strong as the bulkhead at the place where each occurs.

## 3. Watertight recesses and trunkways

Every recess and trunkway required to be watertight shall be so constructed as to provide strength and stiffness at all parts not less than that required for watertight bulkheads at a corresponding level.

## 4. Watertight tunnels

Every tunnel required to be watertight shall be constructed with plating of thickness not less than that required for bulkheads, other than the collision bulkhead.

## 5. Initial tests of bulkheads, watertight and flats

All main watertight compartments are to be tested as follows -

- (1) they should be filled with water or, alternatively, must be hose tested. The hose test must 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;
- (2) the forepeak, double bottom, duct keel and inner skin must be subjected to a head of water up to the margin line; and
- (3) tanks which are intended to hold liquids, and which form part of the subdivision of the ship, must be tested for tightness with water to a head up to the deepest subdivision load line, or up to a head corresponding to two-thirds of the depth from the keel to the margin line in way of the tanks, whichever is the greater, provided that in no case should the test head be less than 900 millimetres above the top of the tank.

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## Section 2 - Construction and initial testing of watertight doors

6. In every ship constructed on or after 1st September 1984, every watertight door shall be tested either before or after the door is fitted by water pressure to a head of water measured from the bottom of the door up to the bulkhead deck or the freeboard deck whichever is higher in way of the bulkhead to which the door is to be fitted.

regs 3, 6 & 22

## Section 3 - Means of closing openings in watertight bulkheads - requirements for ships constructed before 1st February 1992

7. Every door provided for closing and making watertight all openings in bulkheads shall be a sliding watertight door provided that -
- (1) in a ship constructed before 1st September 1984 and not required to be subdivided in accordance with section 3 of Schedule 2, hinged watertight doors may be fitted in the following positions -

- (a) in passenger, crew and working spaces above any deck the underside of which at its lowest point is at least 2.13 metres above the deepest subdivision load water line; and
  - (b) in any bulkhead not being a collision bulkhead which divides two cargo between-deck spaces.
- (2) in a ship *constructed on or after 1st September 1984* any door permitted to be fitted in any bulkhead in accordance with regulation 14(4) may be a hinged or a rolling watertight door subject to the requirements of paragraph 10.

8. Sliding watertight doors may have a horizontal or vertical motion and shall be either -

- (1) hand operated; or
- (2) power operated and hand operated.

9. Hinged and rolling watertight doors fitted in accordance with paragraph 7 shall be fitted with catches, or similar quick action closing devices, capable of being operated from each side of the bulkhead in which the door is fitted.

10. Any watertight door in a ship *constructed on or after 1st September 1984* which is -

- (1) fitted in any bulkhead, not being a collision bulkhead, which separates two cargo between-deck spaces; or
- (2) fitted, pursuant to regulation 19(1) in a watertight bulkhead at any level

shall be capable of being opened and closed from a local position only; and every hinged, rolling or sliding watertight door which is fitted in such a position shall be fitted with efficient locking arrangements.

11. (1) Every door required to be watertight shall be capable of being secured by means other than bolts and being closed by means other than by gravity.
- (2) (a) Watertight doors fitted in bulkheads between permanent and reserve bunkers shall always be accessible except as provided in paragraph (b). Satisfactory arrangements shall be made by means of screens or otherwise to prevent the coal from interfering with the closing of watertight bunker doors.
  - (b) Sliding watertight doors fitted between coal bunkers in the between-decks below the bulkhead deck may be permitted to be open at sea for the purpose of trimming coal. The opening and closing of these doors shall be recorded in the log-book.

## 12. Means of operating sliding watertight doors

- (1) If a sliding watertight door is required to be operated by power from a single position on the navigating bridge, the power system shall be so arranged that the door can also be operated by power at the door itself. The arrangement shall be such that the door will close automatically if opened at the door itself after being closed from the single position on the navigating bridge and it shall be capable of keeping the door closed even if an attempt is made to open it from this single position. Handles for controlling the power system shall be provided on both sides of the bulkhead in which the door is located and shall be so arranged that any person passing through the doorway is able to hold both handles in the open position simultaneously without being able to set the closing mechanism in operation accidentally.

- (2) Watertight doors shall be capable of closing as expeditiously as possible, but the rate of closing shall not be so rapid as to be a danger to persons passing through the opening, provided that the maximum period for closure in paragraph 13(1) shall not be exceeded.
13. (1) There shall be at least two independent sources of power for opening and closing all sliding watertight doors which are required to be operated by power, and each power source shall be sufficient to operate simultaneously all such doors in the ship. The power shall be controlled from a single position on the navigating bridge, and there shall be provided at this position suitable indicators for checking that each of the two sources of power is capable of giving the required service satisfactorily. The watertight doors shall be capable of being closed simultaneously from the navigating bridge in not more than 60 seconds.
- (2) Where the sources of power are hydraulic, there shall be two pumps each of which shall be capable of closing all watertight doors simultaneously in not more than 60 seconds. In addition, there shall be for the whole installation hydraulic accumulators of sufficient capacity to operate all such doors at least three times, that is to say from the open to the closed position, from the closed to the open position and from the open to the closed position. The fluid used shall be one which does not freeze at any temperature liable to be encountered by the ship during her service.
14. Every sliding watertight door whether or not it is required by the Regulations to be operated by power shall be provided with efficient hand-operating gear having an all-round crank motion, or some other movement providing the same guarantee of safety, capable of being operated on each side of the door itself and at an accessible position above the bulkhead deck.
15. (1) The time necessary for the complete closure of any door by means of hand-operating gear with the vessel upright shall not exceed 90 seconds.
- (2) The hand-operating gear shall be of such a design that the doors can be closed and opened from each of the required operating positions.
16. The hand-operating gear for operating the sliding watertight doors in the machinery space from above the bulkhead deck shall be placed outside the machinery space.
17. The means of operation of any watertight door, whether power operated or not, shall be capable of closing the door when the ship is listed 15 degrees either way.

**Requirements for ships constructed before 1st September 1984**

18. If a ship is not required to be subdivided in accordance with section 3 of Schedule 2, and any sliding watertight door fitted in a bulkhead is in a position which may require it to be opened at sea and the sill thereof is below the deepest subdivision load waterline, the following provisions shall apply -
- (1) when the number of such doors (excluding doors at entrances to shaft tunnels) exceeds five, all such doors and those at the entrances to shaft tunnels, ventilation, forced draught or similar ducts shall be power operated and shall be capable of being simultaneously closed from a single position 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 -
- (a) where the ship has no passenger spaces below the bulkhead deck, all such doors may be hand operated;
- (b) where the ship has passenger spaces below the bulkhead deck all such doors and those at the entrances to shaft tunnels, ventilation or forced draught or similar ducts, shall be power operated and shall be capable of being simultaneously closed from a single position situated on the navigating bridge;

(c) in any such ship where there are only two such doors and they lead into or are within the space containing machinery, they may be hand operated only.

19. If a trunkway being part of a refrigeration, ventilation or forced draught system, is carried through more than one transverse watertight bulkhead and the sills of the openings of such trunkways are less than 2.13 metres above the deepest subdivision load waterline, the sliding watertight doors at such openings shall be operated by power.
20. In every ship of Class II or II(A) which is subdivided in accordance with section 3 of Schedule 2 all sliding watertight doors shall be operated by power and shall be capable of being simultaneously closed from a single position situated on the navigating bridge. Provided that if in any such ship there is only one such door and it is in the space containing machinery it shall not be required to be operated by power.
21. Watertight doors, the sills of which are above the deepest subdivision load waterline and below the line specified in subparagraph 7(1)(a) shall be sliding doors and may be hand operated, except in vessels to which paragraph 20 applies.
22. Where hand-operating gear is fitted in accordance with paragraph 14, it may be permissible for any door to be operated on one side only, if the requirements of the said paragraph cannot be met owing to the layout of the spaces.

**Requirements for ships constructed on or after 1st September 1984**

23. All sliding watertight doors, except sliding watertight doors which are fitted in accordance with regulation 14(4) shall be operated by power and shall be capable of being simultaneously closed from a single position situated on the navigating bridge.
24. The watertight door controls, including hydraulic piping and electric cables, shall be kept as close as practicable to the bulkhead in which the doors are fitted, in order to minimise the likelihood of them being involved in any damage which the ship may sustain. The positioning of watertight doors and their controls shall be such that if the ship sustains damage to the extent described in subparagraph 1(3) of Schedule 3, the operation of the watertight doors clear of the damaged portion of the ship is not impaired.

**Watertight doors: signals and communications**

25. If in a ship, any door required to be watertight is not capable of being operated from a single position on the navigating bridge, means of communication by telegraph, telephone or any other direct means shall be provided whereby the officer of the watch may communicate with the person responsible for closing the door.
26. There shall be provided in connection with every such door which is operated by power a means of giving an audible warning signal at the door itself when the door is about to be closed. The arrangement shall be such that one movement of the operating handle at the position from which the door is about to be closed will be sufficient to actuate the signal and to close the door, the signal preceding the movement of the door by an interval of about 10 seconds in order to allow the movement of persons and articles away from the door. The signal shall continue to operate until the door is completely closed. Additionally, in passenger areas and areas of high ambient noise an audible alarm may be required to be supplemented by an intermittent visual signal at the door.
27. Every sliding watertight door shall be provided with an indicator at each position from which the door may be closed, other than at the door itself, showing when the door is open and when it is closed.

## Section 4 - Means of closing openings in watertight bulkheads - Requirements for ships constructed on or after 1st February 1992

### 28. Watertight doors

- (1) Watertight doors fitted in bulkheads between permanent and reserve bunkers shall always be accessible, except as provided in paragraph 33(4) for between-deck bunker doors.
  - (2) Satisfactory arrangements shall be made by means of screens or otherwise to prevent coal from interfering with the closing of watertight bunker doors.
29. Subject to paragraph 35, not more than one door, apart from the doors to coal bunkers and shaft tunnels, may be fitted in each main transverse bulkhead within spaces containing the main and auxiliary propulsion machinery including boilers serving the needs of propulsion and all permanent bunkers. 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.
30. (1) Watertight doors shall be power-operated sliding doors complying with the requirements of paragraph 31 capable of being closed simultaneously from the central operating console at the navigating bridge in not more than 60 seconds with the ship in the upright position.
- (2) The means of operation, whether by power or by hand, of any power-operated sliding watertight door shall be capable of closing the door with the ship listed to 15 degrees either way taking into account the forces which may act on either side of the door as may be experienced when water is flowing through the opening applying a static head equivalent to a water height of at least 1 metre above the sill on the centreline of the door.
  - (3) Watertight door controls, including hydraulic piping and electric cables, shall be kept as close as practicable to the bulkhead in which the doors are fitted, in order to minimise the possibility of them being involved in any damage which the ship may sustain. The positioning of watertight doors and their controls shall be such that if the ship sustains damage within one fifth of the breadth of the ship, such distance being measured at right angles to the centreline of the ship at the level of the deepest subdivision load line, the operation of the watertight doors clear of the damaged portion of the ship is not impaired.
  - (4) All power-operated sliding watertight doors shall be provided with means of indication which will show at all remote operating positions whether the doors are open or closed. Remote operating positions shall only be at the navigating bridge as required by subparagraph 31(1)(e) and, at the location where hand operation above the bulkhead deck is required by subparagraph 31(1)(d).
31. (1) Each power-operated sliding watertight door -
- (a) shall have a vertical or horizontal motion;
  - (b) shall, subject to paragraph 8, be normally limited to a maximum clear opening width of 1.2 metres. Larger doors may be permitted only to the extent considered necessary for the effective operation of the ship provided that other safety measures, including the following, are taken into consideration -
    - (i) special consideration shall be given to the strength of the door and its closing appliances in order to prevent leakages;

- (ii) the door shall be located inboard of the B/5 line; and
  - (iii) the door shall be kept closed when the ship is at sea, except for limited periods when deemed to be absolutely necessary;
- (c) shall be fitted with the necessary equipment to open and close the door using electric power, hydraulic power, or any other acceptable form of power;
- (d) shall be provided with an individual hand-operating mechanism. It shall be possible to open and close the door by hand at the door itself from either side, and in addition, close the door from an accessible position above the bulkhead deck with an all-round crank motion or some other movement providing the same acceptable degree of safety. Direction of rotation or other movement is to be clearly indicated at all operating positions. The time necessary for the complete closure of the door, when operating by hand gear, shall not exceed 90 seconds with the ship in the upright position;
- (e) shall be provided with controls for opening and closing the door by power from both sides of the door and also for closing the door by power from the central operating console at the navigating bridge;
- (f) shall be provided with an audible alarm, distinct from any other alarm in the area, which will sound whenever the door is closed remotely by power and which shall sound for at least five seconds but no more than ten seconds before the door begins to move and shall continue sounding until the door is completely closed. In the case of remote hand operation it is sufficient for the audible alarm to sound only when the door is moving. Additionally, in passenger areas and areas of high ambient noise an audible alarm may be required to be supplemented by an intermittent visual signal at the door; and
- (g) shall have an approximately uniform rate of closure under power. The closure time, from the time the door begins to move to the time it reaches the completely closed position, shall in no case be less than 20 seconds or more than 40 seconds with the ship in the upright position.
- (2) The electrical power required for power-operated sliding watertight doors shall be supplied from the emergency switchboard either directly or by a dedicated distribution board situated above the bulkhead deck. The associated control, indication and alarm circuits shall be supplied from the emergency switchboard either directly or by a dedicated distribution board situated above the bulkhead deck and be capable of being automatically supplied by the transitional source of emergency electrical power required by subparagraph 3(2) in Schedule 7 in the event of failure of either the main or emergency source of electrical power.
- (3) Power-operated sliding watertight doors shall have either -
- (a) a centralised hydraulic system with two independent power sources each consisting of a motor and pump capable of simultaneously closing all doors. In addition, there shall be for the whole installation hydraulic accumulators of sufficient capacity to operate all the doors at least three times, that is, closed-open-closed, against an adverse list of 15 degrees. This operating cycle shall be capable of being carried out when the accumulator is at the pump cut-in pressure. The fluid used shall be chosen considering the temperatures liable to be encountered by the installation during its service. The power operating system shall be designed to minimise the possibility of having a single failure in the hydraulic piping which would adversely affect the operation of more than one door. The hydraulic system shall be provided with a low-level alarm for hydraulic fluid reservoirs serving the power-operated system and low gas pressure alarm or other effective means of monitoring loss of stored energy in hydraulic accumulators. These alarms are to be audible and visual and shall be situated on the central operating console at the navigating bridge; or



- (b) an independent hydraulic system for each door with each power source consisting of a motor and pump capable of opening and closing the door. In addition, there shall be a hydraulic accumulator of sufficient capacity to operate the door at least three times, ie. closed-open-closed, against an adverse list of 15 degrees. This operating cycle shall be capable of being carried out when the accumulator is at the pump cut-in pressure. The fluid used shall be chosen considering the temperatures liable to be encountered by the installation during its service. A low gas pressure group alarm or other effective means of monitoring loss of stored energy in hydraulic accumulators shall be provided at the central operating console on the navigating bridge. Loss of stored energy indication at each local operating position shall also be provided; or
  - (c) an independent electrical system and motor for each door with each power source consisting of a motor capable of opening and closing the door. The power source shall be capable of being automatically supplied by the transitional source of emergency electrical power as required by paragraph 3(2) in Schedule 7, in the event of failure of either the main or emergency source of electrical power and with sufficient capacity to operate the door at least three times, ie. closed-open-closed against an adverse list of 15 degrees.
- (4) For the systems specified in subparagraphs 31(3)(a), (b) and (c), power systems for power-operated watertight sliding doors shall be separate from any other power system and a single failure in the electric or hydraulic power-operated systems, excluding the hydraulic actuator, shall not prevent the hand operation of any door.
  - (5) Control handles shall be provided at each side of the bulkhead at a minimum height of 1.6 metres above the floor 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 power closing mechanism in operation accidentally. The direction of movement of the handles in opening and closing the door shall be in the direction of door movement and shall be clearly indicated.
  - (6) As far as practicable, electrical equipment and components for watertight doors shall be situated above the bulkhead deck and outside hazardous areas and spaces.
  - (7) The enclosures of electrical components necessarily situated below the bulkhead deck shall provide protection against the ingress of water in accordance with BS EN 60529.
  - (8) Electric power, control, indication and alarm circuits shall be protected against fault in such a way that a failure in one door circuit will not cause a failure in any other door circuit. Short circuits or other faults in the alarm or indicator circuits of a door shall not result in a loss of power operation of that door. Arrangements shall be such that leakage of water into the electrical equipment located below the bulkhead deck will not cause the door to open.
  - (9) A single electrical failure in the power operating or control system of a power-operated sliding watertight door shall not result in a closed door opening. Availability of the power supply shall be continuously monitored at a point in the electrical circuit as near as practicable to each of the motors required by subparagraph 31(3). Loss of any such power supply shall activate an audible and visual alarm at the central operating console at the navigating bridge.
32. (1) The central operating console at the navigating bridge shall have a "master mode" switch with two modes of control. A "local control" mode which shall allow any door to be locally opened and locally closed after use without automatic closure, and a "doors closed" mode which shall automatically close any door that is open. The "doors closed" mode shall permit doors to be opened locally and shall automatically re-close the doors upon release of the local control mechanism. The "master mode" switch shall normally be in the "local control" mode. The "doors closed" mode shall only be used in an emergency or for testing purposes. Special consideration shall be given to the reliability of the "master mode" switch.

- (2) The central operating console at the navigating bridge shall be provided with a diagram showing the location of each door, with visual indicators to show whether each door is open or closed. A red light shall indicate that a door is fully open and a green light shall indicate that a door is fully closed. When the door is closed remotely the red light shall indicate the intermediate position by flashing. The indicating circuit shall be independent of the control circuit for each door.
  - (3) It shall not be possible to remotely open any door from the central operating console.
33. (1) All watertight doors shall be kept closed during navigation except that they may be opened during navigation as specified in subparagraphs (2), (3) and (4). Watertight doors of a width of more than 1.2 metres permitted by subparagraph 31(1)(b) may only be opened in the circumstances detailed in that paragraph. Any door which is opened in accordance with this paragraph shall thereafter be kept in readiness for immediate closure.
- (2) A watertight door may be opened during navigation to permit the passage of passengers or crew, or when work in the immediate vicinity of the door necessitates it being opened. The door must be immediately closed when transit through the door is complete or when the task which necessitated it being open is finished.
  - (3) Some watertight doors may be permitted to remain open during navigation only if considered absolutely necessary; that is, being open is determined essential to the safe and effective operation of the ship's machinery or to permit passengers normally unrestricted access throughout the passenger area. Such determination shall be made after careful consideration of the impact on ship operations and survivability. A watertight door permitted to remain thus open shall be clearly indicated in the ship's stability information book and shall always thereafter be kept in readiness for immediate closure.
  - (4) Sliding watertight doors fitted between coal bunkers in the between-decks below the bulkhead deck may be permitted to be open at sea for the purpose of trimming coal. The opening and closing of these doors shall be recorded in the log-book.
34. (1) If it can be shown to be 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, such distance being measured at right angles to the centreline of the ship at the level of the deepest subdivision load line.
- (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 unauthorised opening. When it is proposed to fit such doors the number and arrangements shall be approved.
35. 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 cases of urgent necessity at the discretion of the master. The times of removal and replacement of any such portable plates shall be recorded in the log-book, and the necessary precautions shall be taken in replacing them to ensure that the joints are watertight. The fitting of not more than one power-operated sliding watertight door in each main transverse bulkhead larger than those specified in subparagraph 31(1)(b) may be substituted for these portable plates, provided these doors are closed before the ship leaves port and remain closed during navigation except in case of urgent necessity at the discretion of the master. These doors need not meet the requirements of subparagraph 31(1)(d) regarding complete closure by hand-operated gear in 90 seconds. The time of opening and closing these doors, whether the ship is at sea or in port, shall be recorded in the log-book.



36. (1) Where trunkways or tunnels for access from crew accommodation to the stokehold for piping, or for any other purposes, are carried through main transverse watertight bulkheads, they shall be watertight. 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 bulkhead deck. 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.
- (2) Where it is proposed to fit tunnels piercing main transverse watertight bulkheads, these will require to be approved.
- (3) Where trunkways in connection with refrigerated cargo and ventilation or forced draught trunks are carried through more than one watertight bulkhead, the means of closure at such openings shall be operated by power and be capable of being closed from a central position situated above the bulkhead deck.

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## SCHEDULE 5

### SUBDIVISION LOAD LINES

1. Every ship shall be marked on its side amidships with the subdivision load lines assigned to it. The marks shall consist of horizontal lines 25 millimetres in breadth and 230 millimetres in length. The marks shall be painted in white or yellow if the background is dark or in black if the background is light and, if the sides of the ship are of metal, they shall be cut in, centre punched or indicated by welded beads; if the sides of the ship are of wood, the marks shall be cut into the planking to a depth of not less than 3 millimetres; if the sides are of other materials to which the foregoing methods of marking cannot effectively be applied, the marks shall be permanently affixed to the sides of the ship by bonding or some other effective method.
2. (1) The subdivision load lines shall be identified with the letter C, and, in ships of Classes I and II, with consecutive numbers beginning from the deepest subdivision load line which shall be marked C1. In ships of Classes II(A) -
  - (a) if there is only one subdivision load line, it shall be identified with the letter C; and
  - (b) if there is more than one subdivision load line, the subdivision load lines shall be identified with the letter C and with consecutive letters beginning from the deepest subdivision load line, which shall be marked CA.
- (2) The identifying letters and numerals shall in every case be painted and cut in or centre punched or indicated by welded beads or otherwise marked as appropriate, on the sides of the ship in the same manner as the lines to which they relate.

## SCHEDULE 6

## BILGE PUMPS AND BILGE PIPING

1. (1) Every ship of Class I and II shall be provided with power pumps in accordance with the following table -

	Number of Pumps	
	Criterion Numeral (Less than 30)	Criterion Numeral (30 and over)
Main engine pump (which may be replaced by one independent power pump)	1	1
Independent power pumps	2	3

- (2) Such pumps shall be arranged as follows -

- (a) one of the pumps shall be an efficient emergency pump of a submersible type having its source of power and the necessary controls situated above the ship's bulkhead deck. Such pump and its source of power shall not be installed forward of the collision bulkhead; or
- (b) the power pumps in the ship and their sources of power shall be so disposed throughout the ship's length that under condition of flooding which the ship is required to withstand at least one such pump in an undamaged watertight compartment will be available.

**2. Number and type of bilge pumps: ships of Class II(A)**

- (1) Every ship of Class II(A) shall be provided with bilge pumps in accordance with the following table -

Number of Passengers	Number of Pumps			
	Main engine pump *	Independent power pump	Emergency bilge pump	Hand Pump †
Up to 50	1	-	-	One for each compartment
Over 50 up to 250	1	1	-	One for each compartment
Over 250	1	1	1	-

\* The main engine pump may be replaced by one independent power pump.

† The hand pumps specified in this column may be replaced by an independent pump.

- (2) To every such ship for which an emergency bilge pump is specified, or in which a hand pump is replaced by an independent pump subparagraph 1(2) shall apply as it applies to ships of Classes I and II.

### 3. Requirements for bilge pumps and bilge suction

- (1) Power bilge pumps shall, where practicable, be placed in separate watertight compartments and so arranged or situated as not to be readily flooded by the same damage, and if the machinery essential for propulsion is in two or more watertight compartments the bilge pumps there available shall be distributed between such compartments as far as possible.
- (2) Every bilge pump provided shall be self-priming unless efficient means of priming are provided. Every such pump, other than a hand pump or a pump provided for peak compartments only, shall, whether operated by hand or by power, be so arranged as to be capable of drawing water from any space required to be drained.
- (3) Every independent power bilge pump shall be capable of giving a speed of water of not less than 2 metres per second through the ship's main bilge pipe when its diameter is that determined by paragraph 6. Every such independent power bilge pump shall have a direct suction from the space in which it is situated, provided that not more than two direct suction shall be required in one space. Every machinery space direct suction shall be of a diameter not less than that of the ship's main bilge pipe. The direct suction in the ship's machinery space shall be so arranged that water may be pumped from each side of the space through direct suction to independent power bilge pumps.
- (4) A main engine circulating pump shall be fitted with direct suction connections, which shall be provided with non-return valves, to the lowest drainage level in the ship's machinery space, or as near thereto. Such connections in steamships shall be of a diameter at least two-thirds of that of the main circulating pump inlet, and in motor ships of the same diameter as the main seawater circulating pump inlet. Where any 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 a satisfactory amount. The open end of such suction or the strainer, if any, attached thereto shall be accessible for clearing. The spindles of the ship's main sea inlet and of the direct suction valves shall extend well above the engine room platform.

### 4. Arrangement of bilge pipes

- (1)
  - (a) All bilge suction piping up to the connection to the pumps shall be independent of other piping.
  - (b) All bilge pipes used in or under fuel storage tanks or in boiler or machinery spaces, including spaces in which oil-settling tanks or oil fuel pumping units are situated, shall be of steel or other suitable material.
- (2) Bilge suction pipes shall not be led through oil tanks unless the pipes are enclosed in an oiltight trunkway. Such pipes shall not be led through double bottom tanks. Where, in ships constructed on or after 1st September 1984 bilge suction pipes pass through deep ballast water tanks, such pipes should be of heavy gauge and the number of pipe joints kept to a minimum. The pipes shall be led above the line of the double bottom.

#### Additional requirements for ships constructed on or after 1st September 1984

- (3) The bilge pumping arrangements for cargo spaces containing flammable or toxic liquids shall be designed so that inadvertent pumping of such liquids through the main bilge system or any other system connected to a pump located in a machinery space can be prevented.

Additional means of draining such cargo spaces shall be provided if this is found to be necessary when taking into consideration the quantity and characteristics of the liquids and their location.

## 5. Diameter of bilge suction pipes

In every ship the internal diameter of main and branch bilge suction pipes shall be determined to the nearest size calculated according to the following formulae -

$$d_m = 25 + [1.68 \sqrt{L(B + D)}]$$

$$d_b = 25 + [2.15 \sqrt{l(B + D)}]$$

- where  $d_m$  is the internal diameter of the main bilge suction pipes in millimetres.  
 $d_b$  is the internal diameter of the branch bilge suction pipes in millimetres.  
 $L$  is the length of ship in metres measured between perpendiculars taken at extremities of the deepest subdivision load waterline.  
 $B$  is the greatest moulded breadth in metres at or below the ship's deepest subdivision load waterline.  
 $D^*$  is the moulded depth of ship amidships at bulkhead in metres.  
 $l$  is the length of compartment in metres.

\* For ships constructed on or after 1st February 1992 the definition of "D" shall be as follows -

D = moulded depth of ship amidships at the bulkhead deck in metres; provided that, in a ship having an enclosed cargo space on the bulkhead deck which is internally drained in accordance with the requirements of paragraph 8 and which extends for the full length of the ship, D shall be measured to the next deck above the bulkhead deck. Where the enclosed cargo spaces cover a lesser length, D shall be taken as the moulded depth to the bulkhead deck plus  $lh/L$ , where  $l$  and  $h$  are the aggregate length and height respectively of the enclosed cargo space in metres.

## 6. Precautions against flooding through bilge pipes

- (1) The bilge and ballast pumping systems shall be so arranged as to prevent water passing from the sea or from water ballast spaces into the ship's cargo spaces or into any part of the machinery space or from one watertight compartment in the ship to another. The bilge connection to any pump which effects suction from the sea or from water ballast spaces shall be made by means of either a non-return valve or a cock which cannot be opened at the same time to the bilges and to the sea or to the bilges and the water ballast spaces.
- (2) Provision shall be made to prevent the flooding of any watertight compartment served by a bilge suction pipe in the event of the pipe being severed or otherwise damaged in any watertight compartment through collision or grounding. Where any part of such pipe is situated nearer to the side of the ship than one-fifth of the breadth of the ship such a distance being measured at right angles to the centreline of the ship at the level of the deepest subdivision load waterline, or in any duct keel, a non-return valve shall be fitted to the pipe in the watertight compartment containing the open end of the pipe.

## 7. Drainage from cargo spaces

### Requirements for ships constructed before 1st February 1992

- (1) In every ship which is marked with a summer load line, efficient drainage from any enclosed cargo space on the bulkhead deck shall be provided. Every discharge shall be in compliance with the requirements of subparagraph 2(2)(a) and (b) of Schedule 10 provided that where the freeboard to the bulkhead deck is such that the deck edge is immersed when the ship

heels 5 degrees either way, other arrangements shall be provided to drain such spaces satisfactorily. Drainage need not be provided in any particular compartments of any ship if by reason of the size or internal subdivision of those spaces, the safety of the ship is not thereby impaired.

**Requirements for ships constructed on or after 1st February 1992**

- (2) (a) In every ship provision shall be made for the drainage of enclosed cargo spaces on the bulkhead deck; however the means of discharge may be dispensed with in any particular compartment of any ship if by reason of size or internal subdivision of those spaces the safety of the ship is not thereby impaired.
- (b) Where the freeboard to the bulkhead deck is such that the deck edge is immersed when the ship heels more than 5 degrees, the drainage shall be by means of a sufficient number of scuppers of suitable size discharging directly overboard. Every discharge shall be in compliance with the requirements of subparagraphs 2(2)(a) and (b) or 3 of Schedule 10.
- (c) Where the freeboard is such that the edge of the bulkhead deck is immersed when the ship heels 5 degrees or less, the drainage of the enclosed cargo spaces on the bulkhead deck shall be led to a suitable space, or spaces, of adequate capacity, having a high water level alarm and provided with suitable arrangements for discharge overboard. In addition it shall be ensured that -
- (i) the number, size and disposition of the scuppers is such as to prevent unreasonable accumulation of free water;
  - (ii) the pumping arrangements shall take account of the requirements for any fixed pressure water-spraying fire-extinguishing system;
  - (iii) water contaminated with petrol or other dangerous substances is not drained to machinery spaces or other spaces where sources of ignition may be present; and
  - (iv) where the enclosed cargo space is protected by a carbon dioxide fire-extinguishing system the deck scuppers are fitted with means to prevent the escape of the smothering gas.

**8. Bilge valves and cocks**

- (1) All distribution boxes, valves and cocks fitted in connection with the bilge pumping arrangements shall be in positions which are accessible at all times in ordinary circumstances and shall be so arranged that in the event of flooding, one of the bilge pumps may operate on any watertight compartment in the ship. If in any such ship there is only one system of pipes common to all such pumps, the necessary valves or cocks for controlling the bilge suctions shall be capable of being operated from above the ship's bulkhead deck. If an emergency bilge pumping system is provided in addition to the main bilge pumping system it shall be independent of the main system and shall be so arranged that a pump is capable of being operated on any watertight compartment under flooding conditions; in that case the cocks and the valves necessary for the operation of the emergency system shall be capable of being operated from above the bulkhead deck.
- (2) Every valve or cock which is required by this Schedule to be operated from above the bulkhead deck shall have its control at its place of operation clearly marked to show the purpose it serves and how it may be opened and closed and shall be provided with a means to indicate when it is open and when it is closed.

## SCHEDULE 7

EMERGENCY AND TRANSITIONAL SOURCE OF ELECTRICAL POWER  
AND EMERGENCY SWITCHBOARDS

Unless stated otherwise, this Schedule applies to all ships with the exception that 1(5), 4, 6(4) and 13(4)(b) shall not apply to ships constructed before 25th May 1980.

1. The emergency source of electrical power, the associated transforming equipment, any transitional source of emergency electrical power required by paragraph 3(2), the emergency switchboard and the emergency lighting switchboard shall all be -
  - (1) located above the uppermost continuous deck;
  - (2) readily accessible from the open deck;
  - (3) located aft of the collision bulkhead or its extension above the bulkhead deck when fitted above that deck;
  - (4) so arranged that a fire or other casualty in the spaces containing the main source of electrical power, the associated transforming equipment, the main switchboard or in any machinery space of Category A will not interfere with the supply, control and distribution of emergency electrical supplies; and
  - (5) located where practicable in a space which is not contiguous to the boundaries of a machinery space of Category A or any other space containing the main source of electrical power, the main switchboard or any associated transforming equipment.
2. The emergency source of electrical power shall be a generating set complying with the requirements of paragraph 3, or an accumulator battery complying with the requirements of paragraph 5.
3. Where the emergency source of electrical power is a generator it shall -
  - (1) be driven by internal combustion machinery with an independent fuel supply, having a flash point of not less than 43 degrees C (Closed Cup Test);
  - (2) be provided with a transitional source of emergency electrical power complying with paragraph 6; and
  - (3) *in ships constructed on or after 1st September 1984* be started automatically upon failure of the main source of electrical power and be automatically connected to the emergency switchboard; the services referred to in paragraph 6 shall thereupon 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, within a maximum of 45 seconds.
4. The emergency generating set may be used to supply services other than emergency supplies exceptionally for short periods provided that the independent operation of the emergency source of electrical power is safeguarded in all circumstances.
5. Where the emergency source of power is an accumulator battery it shall-
  - (1) if *constructed before 1st September 1984*, be such that the ship's emergency lighting system will come into operation automatically in the event of the failure of the main source of power for the ship's main lighting system; and

- (2) if constructed on or after 1st September 1984 -
- (a) be capable of supplying the emergency electrical load without being recharged, whilst maintaining the voltage of the battery throughout the required discharge period within 12 per cent of its nominal voltage;
  - (b) be automatically connected to the emergency switchboard in the event of the failure of the main source of electrical power; and
  - (c) be capable of immediately supplying the services specified in paragraph 6.
6. The transitional source of emergency electrical power shall -
- (1) consist of an accumulator battery capable of supplying the services required by subparagraphs (3) and (4) without being recharged, whilst maintaining the voltage of the battery throughout the required discharge period within 12 per cent of its nominal voltage;
  - (2) be arranged to supply automatically the services required by subparagraphs (3) and (4) for at least half an hour in the event of the failure of either the main or emergency source of electrical power;
  - (3) supply the lighting required by subparagraphs 13(1)(a) and (2)(a);
  - (4) supply the services required by subparagraph 13(3)(a), (c) and (d) unless a suitably located independent accumulator battery is provided capable of supplying such services for the period of time required by those subparagraphs; and
  - (5)
    - (a) supply power to close the watertight doors but not necessarily all of them simultaneously, together with their indicators and warning signals as required by paragraph 15(1), and
    - (b) if constructed on or after 1st February 1992, supply power to operate the power operated watertight doors, as required by subparagraph 31(3)(c) of section 4 of Schedule 4, but not necessarily all of them simultaneously, unless an independent temporary source of stored energy is provided, and supply power to the control, indication and alarm circuits as required by subparagraph 31(2) of section 4 of Schedule 4 for 30 minutes.
7. Means shall be provided for periodically testing the complete emergency electrical system including any automatic starting arrangements provided.
8. Discharge of accumulator batteries that constitute either the emergency source of electrical power or transitional source of electrical power shall be indicated on the main switchboard or in the machinery control room. Discharge of any independent accumulator batteries provided in compliance with subparagraph 13(3) shall be indicated at the appropriate control station.
9. The emergency switchboard shall be situated as near as practicable to the emergency source of electrical power. If the emergency source of electrical power is a generating set the emergency switchboard shall be situated in the same space as the generator unless the operation of the emergency switchboard would be thereby impaired. Any accumulator battery required by this regulation shall not be installed in the same space as the emergency generator.
10. The emergency switchboard shall be supplied during normal operation from the main switchboard by an interconnector feeder which shall be adequately protected at the main switchboard against overload and short circuit; and in the case of a ship constructed on or after 1st September 1984 -



- (1) disconnected automatically at the emergency switchboard upon the failure of the main source of electrical power; and
- (2) be at least protected against short circuit at the emergency switchboard if the system is arranged for the main switchboard to be supplied from the emergency switchboard.

11. In ships constructed on or after 1st September 1984 arrangements shall be made to disconnect non-emergency circuits from the emergency switchboard automatically, if necessary, to ensure that electric power is available for the required emergency supplies.

## 12. Starting arrangements for emergency generating sets

### Requirements for ships constructed on or after 1st September 1984

- (1) In every ship the emergency generating sets shall be capable of being readily started at a temperature of 0 degrees C. If temperatures below 0 degrees C are anticipated provision shall be made for heating the engine so that it will start readily.
- (2) The starting, charging and energy storing devices provided, which shall not be used for any purpose other than the operation of the emergency generating set, shall be located in the emergency generating set space except that the air receiver of the emergency generating set may be supplied from the main or auxiliary compressed air system through a non-return valve installed in the emergency generating set space.
- (3) The stored energy required for starting shall be maintained at all times -
  - (a) in electric and electro-hydraulic systems, from the emergency switchboard; and
  - (b) in compressed air systems, by the main or auxiliary compressed air system or by an emergency air compressor which, if it is electrically driven, shall be supplied from the emergency switchboard.
- (4) The emergency generating set shall -
  - (a) be equipped with a starting system having sufficient stored energy for three consecutive starts; and
  - (b) be provided with an additional source of stored energy independent of the starting system required by subparagraph (a) capable of producing a further three starts within 30 minutes unless an alternative and independent starting system is provided or effective manual starting can be demonstrated.
  - (c) For ships constructed on or after 1 October 1994, in lieu of sub-paragraph (b), the source of stored energy shall be protected to preclude critical depletion by the automatic starting system, unless a second independent means of starting is provided. In addition, 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.

## 13. Emergency electric power services supplies

In every ship, the emergency source of electrical power required by Regulation 56 shall be capable of simultaneously supplying the following services, including any starting current, for a period of 36 hours or for such shorter period (being not less than 12 hours) as may be permitted in the case of any ship regularly engaged on voyages of short duration -



- (1) emergency lighting -
  - (a) at every muster and embarkation station on deck and over sides as required by the Merchant Shipping (Life-Saving Appliances) Regulations 1980<sup>(a)</sup> or the Merchant Shipping (Life-Saving Appliances) Regulations 1986<sup>(b)</sup> as applicable;
  - (b) in alleyways, stairways and exits giving access to the muster and embarkation stations;
  - (c) in all service and accommodation alleyways, stairways and exits and personnel lift cars;
  - (d) in the machinery spaces, main generating stations and emergency generating set position including their control positions;
  - (e) in all control stations, machinery control rooms and at each main and emergency switchboard;
  - (f) at all stowage positions for firemen's outfits;
  - (g) at the steering gear; and
  - (h) at the fire pumps, the sprinkler pump, the emergency bilge pump and at the starting position of their motors.
- (2)
  - (a) navigation lights and other lights required by the Merchant Shipping (Distress Signals and Prevention of Collisions) Regulations 1996<sup>(c)</sup>;
  - (b) on ships constructed on or after 1st February 1995, the VHF radio installation required by regulation 8(1)(a) and (b) of the Merchant Shipping (Radio Installations) Regulations 1992<sup>(d)</sup>; and if applicable -
    - (i) The MF radio installation required by regulations 10(1)(a), 10(1)(b) and 11(1)(Alternative A)(b), and 11(1)(Alternative A)(c) of the same Regulations;
    - (ii) the ship earth station required by regulation 11(1)(Alternative A)(a);
    - (iii) The MF/HF radio installations required by regulations 11(1)(Alternative B)(a), 11(1)(Alternative B)(b) and 12;
- (3) miscellaneous services -
  - (a) all internal communication equipment required in an emergency;

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(a) SI 1980/538 to which there are amendments not relevant to this notice.

(b) SI 1986/1066 to which there are amendments not relevant to this notice.

(c) SI 1996/75

(d) SI 1992/3

- (b) In ships constructed on or after 1st September 1984, the ship-borne navigational equipment required by the Merchant Shipping (Navigational Equipment) Regulations 1993<sup>(a)</sup>. Where such provision is unreasonable or impracticable the Secretary of State may waive this requirement for ships of less than 5,000 tons;
- (c) the fire detection and fire alarm system, and in the case of ships constructed after 1st September 1984 the fire door holding and release system; and
- (d) 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.

(4) pumps and associated equipment as follows -

- (a) the ship's emergency bilge pump, if it is electrically operated and in ships constructed on or after 1st September 1984, all equipment essential for the operation of electrically powered remote controlled bilge valves;
- (b) the automatic sprinkler pump; if any, and
- (c) in ships constructed on or after 1st September 1984, one of the fire pumps required by the Merchant Shipping (Fire Protection Large Ships) Regulations 1998<sup>(b)</sup>;

14. The emergency source of electrical power referred to in paragraph 13 shall be capable of supplying simultaneously the services required by paragraph 13 and the steering gear for the period of time required by paragraph 15 of Schedule 9.

15. In addition to fulfilling the requirements of subparagraph 13(1) the emergency source of electrical power shall be capable of supplying simultaneously for a period of 30 minutes -

- (1) the ship's watertight doors, if they are electrically or electro-hydraulically operated, together with their indicators which show if the doors are open or closed, and the warning signals, if they are electrically operated; and
- (2) in the case of a ship constructed on or after 1st September 1984 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.

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(a) SI 1993/69

(b) SI 1998/1012

## SCHEDULE 8

## STORAGE AND DISTRIBUTION OF OIL AND GASEOUS FUEL

1. In every ship in which oil or gaseous fuel is used in engines or boilers for the propulsion or safety of the ship, the arrangements for the storage, distribution and utilisation of the fuel shall be such that the effective use of the engines can be maintained under all conditions likely to be met by the ship in service;
2. In every ship in which oil or gaseous fuel is used, the arrangements for the storage, distribution and utilization of the fuel shall be such that, having regard to the hazard of fire and explosion which the use of such fuel may entail, the safety of the ship and of persons on board is preserved.
3. Every oil fuel installation which serves a boiler supplying steam for the propulsion of the ship shall include not less than two oil fuel units.

*Ships Constructed on or after 1st September 1984*

4. In addition to complying with paragraphs 1 to 3 every ship *constructed on or after 1st September 1984* shall comply also with paragraphs 5 and 6.
5. In every ship in which oil or gaseous fuel is used, the arrangements for storage, distribution and utilisation of fuel shall comply at least with the provisions of this paragraph.
  - (1) Oil fuel systems containing heated fuel oil at a pressure exceeding 1.8 bar shall be in illuminated locations so that defects and leakage can be readily observed. Where it is impracticable to meet the requirements of this subparagraph the Certifying Authority may permit other arrangements.
  - (2) Oil fuel tanks shall be part of the ship's structure and shall be located outside machinery spaces of Category A. When oil fuel tanks, except 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, if practicable, they shall have a boundary common with the double bottom tanks. The area of the tank boundary common with the machinery space shall be kept to a minimum. Any oil fuel tank located within the boundaries of machinery spaces of Category A shall not contain fuel having a flash point of less than 60 degrees C. Where it is impracticable to meet the requirements of this subparagraph, the Certifying Authority may permit other arrangements.
  - (3) Every oil fuel tank shall, where necessary, be provided with save-alls or gutters which will catch any oil which may leak from the tank.
  - (4) Oil fuel tanks shall not be situated directly above boilers or other heated surfaces.
  - (5) Oil fuel shall not be carried in forepeak tanks.
  - (6) Means shall be provided for the removal of water from fuel oil. Such means shall include the fitting of water drain valves to daily service tanks, settling tanks and where practicable, to other oil fuel tanks. Where the removal of water by drain valves is impracticable water separators shall be fitted in the supply lines to propulsion machinery.
  - (7) Save-alls or gutters and screens shall be provided to prevent oil fuel that may leak under pressure from any pump, filter or heater from coming into contact with boilers or other heated surfaces.

- (8) Every pipe connected to any oil fuel storage, settling, or daily service tank, not being a double bottom tank, which if damaged would otherwise permit discharge of the contents so as to cause a fire hazard shall be fitted with a valve or cock which shall be secured to the tank to which it is connected and be capable of being closed from a readily accessible position outside the space in which the tank is situated provided that in the case of any inlet pipe to such a tank, a non-return valve similarly secured to the tank may be substituted. In the case of an oil fuel deep tank traversed by any shaft or pipe tunnel, in addition to the valve or cock secured to the tank, a valve or valves may be fitted on the pipe line or lines outside the tunnel or tunnels to enable control to be exercised in the event of fire.
  - (9) Provision shall be made which will prevent overpressure in any oil fuel tank, oil fuel filling pipe or any part of the oil fuel system. Air and overflow pipes and relief valves shall discharge to a position where there will be no risk of fire or explosion from the emergence of oil or oil vapour.
  - (10) Every oil fuel pipe shall be made of steel or other suitable material except that flexible pipes may be permitted in positions where the Certifying Authority is satisfied that they are necessary; such flexible pipes and their attachments shall be constructed to the satisfaction of the Certifying Authority.
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 therefrom could arise. In particular, sounding pipes shall not terminate in passenger spaces or crew spaces. Other means of ascertaining the amount of oil fuel may be permitted provided that the failure of such means or overfilling of the tanks will not permit release of oil fuel.

**Ships Constructed On or After 1st February 1992**

7. In the case of ships constructed on or after 1st February 1992, sounding pipes shall not terminate in machinery spaces. However where the Certifying Authority considers that impracticable it may permit the termination of sounding pipes in machinery spaces on condition that -
- (1) an oil level gauge is provided meeting the requirements of subparagraph (4);
  - (2) the sounding pipes terminate in locations remote from ignition hazards unless precautions are taken, such as the fitting of effective screens to prevent the oil fuel in the case of spillage through the terminations of the sounding pipes from coming into contact with a source of ignition;
  - (3) the terminations of sounding pipes are fitted with self-closing blanking devices and with a small-diameter self-closing control cock located below the blanking device for the purpose of ascertaining before the blanking device is opened that oil fuel is not present. Provision shall be made so as to ensure that any spillage of oil through the control cock involves no ignition hazard;
  - (4) other oil level gauges may be used in place of sounding pipes. Such means, like the means provided in subparagraph 7(1), shall not require penetration below the top of the tank and their failure or over-filling of the tanks shall not permit release of fuel.

**8. Lubricating and other Oil Systems**

**Ships Constructed On or After 1st September 1984**

- (1) Subparagraphs (2) and (3) apply to ships constructed on or after 1st September 1984.
- (2) The arrangements for the storage, distribution and utilisation of lubricating oil in machinery spaces of Category A shall comply with the requirements of subparagraphs 5(1), 5(4), 5(7), 5(8), 5(9), 5(10), 6 and 7 as applicable as they apply to oil fuel installations except that tank

gauges of the flat glass type, provided with self-closing valves at each tank connection and sight flow glasses having an acceptable degree of fire resistance may be permitted. Alternative arrangements may be permitted in machinery spaces other than machinery spaces of Category A where the Certifying Authority is satisfied that the safety of the ship is not impaired.

- (3) The arrangements for the storage, distribution and utilisation of flammable oils, other than fuel and lubricating oil, used in power transmission control and activating systems and heating systems shall be such as to ensure the safety of the ship and persons on board. In enclosed spaces containing a source of ignition the arrangements shall comply with subparagraphs 5(4), 5(7), 5(9), 5(10), 6 and 7 as they apply to oil fuel installations except that tank gauges of the flat glass type provided with self-closing valves at each tank connection may be permitted.

#### **9. Arrangements for oil fuel, lubricating oil and other flammable oils**

- (1) Ships *constructed before 1st July 1998* shall comply with the requirements of subparagraphs (2), (3) and (4) not later than *1st July 2003*, except that a suitable enclosure on engines having an output of 375 kW or less having fuel injection pumps serving more than one injector may be used as an alternative to the jacketed piping system in subparagraph (2).
- (2) All external high pressure fuel delivery lines between the high pressure fuel pumps and fuel injectors shall be protected with a jacketed piping system capable of containing fuel from a high pressure line failure. A jacketed pipe incorporates an outer pipe into which the high pressure fuel pipe is placed forming a permanent assembly. The jacketed piping system shall include a means for collection of leakages and arrangements shall be provided for an alarm to be given of a fuel line failure.
- (3) All surfaces with temperatures above 220 degrees C which may be impinged as a result of a fuel system failure shall be properly insulated.
- (4) Oil fuel lines shall be screened or otherwise suitably protected to avoid as far as practicable oil spray or oil leakages onto hot surfaces, into machinery air intakes, or other sources of ignition. The number of joints in such piping systems shall be kept to a minimum.

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### **SCHEDULE 9**

#### **STEERING GEARS**

##### **1. The main steering gear and rudder stock shall -**

- (1) be of adequate strength and sufficient to steer the ship at maximum ahead service speed;
- (2) be capable of putting the rudder over from 35 degrees on one side to 35 degrees on the other side with the ship running ahead at maximum service speed and, under the same conditions, from 35 degrees on either side to 30 degrees on the other side in not more than 28 seconds;
- (3) be designed so that they will not be damaged at maximum astern speed; and
- (4) in the case of a ship *constructed on or after 1st September 1984* be operated by power if necessary to meet the requirements of subparagraph (2) and in any case in which the diameter of the rudder stock in way of the tiller is required to be greater than 120 millimetres excluding additional strengthening for navigation in ice.

2. The auxiliary steering gear shall -
  - (1) be of adequate strength and capable of being brought speedily into action in an emergency;
  - (2) have sufficient power to enable the ship to be steered at navigable speed and in the case of a ship constructed on or after 1st September 1984 be capable of putting the rudder over from 15 degrees on one side to 15 degrees 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 greater; and
  - (3) be operated by power if necessary to meet the requirements of subparagraph (2) and in any case in which the diameter of the rudder stock in way of the tiller is required to be greater than 230 millimetres diameter excluding additional strengthening for ice.
3. The angular position of the rudder shall be indicated in the steering gear compartment and, if the main steering gear is power operated, at the steering position on the navigating bridge. In the case of a ship constructed on or after 1st September 1984 the rudder angle indicator system shall be independent of any steering gear control system.
4.
  - (1) In every ship constructed before 1st September 1984 in which a rudder stock of over 230 millimetres is required to comply with paragraph 1, there shall be provided a suitably located alternative steering station. In every other ship means shall be provided by which the ship can be steered from a position aft.
  - (2) In every such ship the remote steering control systems from the principal and alternative steering stations shall be so arranged that failure of either system will not result in inability to steer the ship by means of the other system. Means of communications shall be provided to enable orders to be transmitted from the bridge to the alternative steering station.
5. An auxiliary steering gear need not be fitted if -
  - (1) two or more identical gear power units are fitted and which in the event of failure of any one of these units the remaining units are capable of operating the rudder in accordance with the requirements of subparagraph 1(2); and
  - (2) the main steering gear is so arranged that after a single failure in its piping system or in one of the power units the defect can be isolated so that steering capability can be maintained or speedily regained. A steering gear with a proven record of reliability that does not comply with this subparagraph may be accepted by the Secretary of State on any ship constructed before 1st September 1986 or on a cargo ship which is converted to a passenger ship before that date.

Additional requirements for ships constructed on or after 1st September 1984

6.
  - (1) The steering gear components, the rudder stock, the rudder and associated fittings shall be of sound and reliable construction. In particular, single essential components such as tillers and hunting gear shall be designed and constructed to withstand, with an adequate factor of safety, the maximum working stresses to which they may be subjected. Any bearings for such essential components shall be of a suitable type which shall be permanently lubricated or provided with lubrication fittings.
  - (2) The design pressure for steering gear components and piping subject to internal hydraulic pressure shall be at least 1.25 times the maximum working pressure anticipated when the steering gear is operating taking into account any pressure which may exist in the low pressure side of the system. Fatigue criteria, taking into account pulsating pressure due to dynamic loads, shall be taken into account in the design of piping and components if this is appropriate.

- (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 a power unit or from external forces. The pressure at which relief valves operate shall not exceed the design pressure. The valves shall be of adequate size so as to avoid an undue rise in pressure above the design pressure.
7. Steering gears other than of the hydraulic type shall achieve equivalent standards to those required by this Schedule.
8. Main and auxiliary steering gear power units shall -
  - (1) be arranged to re-start automatically when power is restored after a power failure;
  - (2) be capable of being brought into operation from a position on the navigating bridge; and
  - (3) be provided with an audible and visual alarm on the navigating bridge that will operate in the event of a power failure to any steering gear power unit.
9.
  - (1) Main steering gear control shall be provided on the navigating bridge and in the steering gear compartment. Two independent control systems operable from the navigating bridge shall be provided for a steering gear arranged in accordance with paragraph 5 except that when the control system consists of a hydraulic telemotor, a second independent system need not be fitted. The steering wheel or steering lever need not be duplicated.
  - (2) Auxiliary steering gear control shall be provided in the steering gear compartment and, if the auxiliary steering gear is power operated, from the navigating bridge. Any auxiliary steering gear system provided on the navigating bridge shall be independent of the control system for the main steering gear.
10. Every main and auxiliary steering gear control system shall -
  - (1) if electric, 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 the 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) be provided in the steering gear compartment with means for disconnecting the control system from the steering gear it serves;
  - (3) be capable of being brought into operation from a position on the navigating bridge;
  - (4) be provided with an audible and visual alarm on the navigating bridge that will operate in the event of a failure of the electric power supply to the control system; and
  - (5) be provided only with short circuit protection for the electric supply circuits.
11. The electric power circuits and the steering gear control system with the associated components, cables and pipes required by this Schedule, including those required by subparagraphs 18(1) and 18(2), shall be separated as far as is practicable throughout their length.
12. Hydraulic power operated steering gear shall be provided with -
  - (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 arranged to give audible and visual alarms on the navigating bridge and in the machinery space in the event of leakage of the hydraulic fluid;



- (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 provided with a contents gauge and 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.
13. The steering gear compartment shall be readily accessible and, as far as is practicable, separated from the machinery spaces. Handrails and gratings or other non-slip surfaces shall be provided to ensure suitable working conditions at the steering gear machinery and controls in the event of hydraulic fluid leakage.
14. Simple operating instructions with a block diagram showing the change-over procedures for remote steering gear control systems and steering gear power units shall, where applicable, be permanently displayed on the navigating bridge and in the steering gear compartment.
15. An alternative power supply shall be provided in every ship where the rudder stock is required to be 230 millimetres diameter or over excluding any strengthening for navigation in ice. The alternative power supply shall be provided automatically within 45 seconds either from the emergency source of electric power or from an independent source of power located in the steering gear compartment. The independent source of power shall be used for this purpose only. The alternative power supply shall be at least sufficient to provide power for the steering gear to comply with the performance requirements of subparagraph 2(2) and its associated control system and rudder angle indicator. The alternative power supply shall have a capacity sufficient for at least 30 minutes of continuous operation in every ship of 10,000 tons or over and at least 10 minutes of continuous operation in any other ship.
16. The main steering gear in every ship of 70,000 tons or over shall have two or more identical power units complying with the requirements of subparagraphs 5(1) and 5(2).
17. A means of communication shall be provided between the navigating bridge and the steering gear compartment.

#### **18. Electric and electro-hydraulic steering gear**

- (1) Every ship which is fitted with electric or electro-hydraulic steering gear shall be provided with indicators which will show when the power units of such steering gear are running. These indicators shall be situated in the machinery control room or in such other position or positions as may be approved, and on the navigating bridge.
- (2) Every such steering gear shall -
  - (a) be served by at least two exclusive circuits fed from the main switchboard one of which may pass through the emergency switchboard where provided. Each circuit shall have adequate capacity for supplying all the motors which are normally connected to it and which operate simultaneously, and if transfer arrangements are provided in the steering gear compartment to permit either circuit to supply any motor or combination of motors. The capacity of each circuit shall be adequate for the most severe load condition. The circuits shall be separated as widely as is practicable throughout their length. An auxiliary electric or electro-hydraulic steering gear may be connected to one of the circuits supplying the main steering gear; and
  - (b) be provided with short-circuit protection and an overload alarm for the protection of the circuits and motors. Any protection provided against excess current shall be capable of conducting at least twice the full load current of the motor or motors taking into consideration the motor starting currents. Where a three phase supply is used an alarm shall be provided that will indicate the failure of any one of the supply phases. The alarms required by this subparagraph shall be both audible and visual and located in a conspicuous position in the main machinery space or in the control room from which the main machinery is normally controlled.



## SCHEDULE 10

## OPENINGS IN THE SHELL PLATING BELOW THE BULKHEAD DECK

## 1. Sidescuttles

- (1) Sidescuttles below the bulkhead deck shall be of a non-opening type and constructed to a recognised standard except that in ships *constructed before 1st September 1984* opening type sidescuttles may be fitted, provided they have satisfactory locking arrangements.
- (2) (a) In every ship which is marked with a summer load line no sidescuttle shall be fitted in a between-decks such that its sill will be below a line drawn parallel to the freeboard deck at its side which has its lowest point either;
- (i) at a distance equal to 2.5 per cent of the breadth of the ship measured vertically above the summer load waterline; or
- (ii) 500 millimetres above the summer load waterline;
- whichever is the greater.
- (b) In every ship which is not marked with a summer load line no sidescuttle shall be fitted in a between-decks such that its sill will be below a line drawn parallel to the bulkhead deck at its side which has its lowest point at a distance equal to 2.5 per cent of the breadth of the ship measured vertically above the deepest load waterline. In ships *constructed before 1st September 1984*, if in a between-decks of such a ship all the sills of the sidescuttles are above the aforesaid line, every sidescuttle in that between-decks shall be either of a non-opening type or of an opening type fitted with approved locking arrangements. No sidescuttle shall be so fitted that its sill is below the deepest subdivision load water line.
- (3) Each sidescuttle fitted below the margin line shall be fitted with an efficiently hinged deadlight permanently attached so that it can be readily and effectively closed and secured watertight. Efficiently 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 the ship's side and having its lowest point at a height of 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 1966 to be permanently attached in their proper positions. Such portable deadlights shall be stowed adjacent to the sidescuttles they serve.
- (4) Sidescuttles shall not be fitted below the margin line to any space appropriated solely for the carriage of cargo. If sidescuttles are fitted below the margin line to spaces appropriated either to carry cargo or passengers, their deadlights shall be fitted with approved locking arrangements.

## 2. Inlets and discharges

- (1) Each inlet and discharge led through the shell below the bulkhead deck shall be fitted with efficient and readily accessible means for preventing the accidental admission of water into the ship.
- (2) Each discharge led through the shell from any space below the bulkhead deck, not being a discharge in connection with machinery, shall be provided with -

- (a) one automatic non-return valve fitted at the shell of the ship and having positive means of closure from a position or positions above the bulkhead deck. Such positions shall be readily accessible at all times under service conditions. The means of closure shall be provided with an indicator showing whether the valve is open or closed; or
  - (b) two automatic non-return valves having no positive means of closure. The inboard valve shall, where practicable, be fitted above the deepest load waterline; where that is not practicable a locally controlled sluice valve interposed between the two automatic non-return valves shall be fitted; the inboard valve shall in every case be in such a position that it will at all times under service conditions be readily accessible for examination.
- (3) The requirements of the International Convention on Load Lines 1966 shall apply to discharges led through the shell plating from spaces above the bulkhead deck.
  - (4) All valves attached to inlets or discharges, other than inlets or discharges connected with machinery, the failure of which may give rise to the danger of flooding, shall be made of steel, bronze or other equivalent material.
  - (5) Inlets and discharges connected with main or auxiliary machinery shall be fitted with cocks or valves between the pipes and the shell of the ship or between the pipes and a box attached to the shell. The controls to such cocks and valves or of any bilge injection system shall be readily accessible at all times under service conditions and fitted with indicators to show whether the cock or valve is open or closed. All valves attached to such inlets or discharges and all fittings outboard thereof shall be made of steel, bronze or other equivalent material. If made of steel, such valves shall be protected against corrosion.

## **6. Gangway and loading openings**

- (1) Each gangway port and cargo port fitted in the shell below the bulkhead deck shall be provided with a door or doors so fitted and designed as to ensure watertightness and structural integrity commensurate with the surrounding shell. They shall be effectively closed and secured watertight before the ship leaves port and shall be kept closed during navigation.
- (2) In every ship which is marked with a summer load line no such gangway port or cargo port below the freeboard deck shall, unless otherwise permitted, be so situated that the lower edge of the port or opening will be below a line drawn parallel to the freeboard deck at side and having as its lowest point the waterline corresponding with the upper edge of the uppermost load line. In any ship which is not marked with a summer load line the lower edge of the port or opening shall in no case be below the deepest subdivision load waterline.

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