GUIDELINES FOR STATUTORY SURVEYS OF SEA-GOING SHIPS ENGAGED ON NON-INTERNATIONAL VOYAGES

PART FIVE
PREVENTION OF POLLUTION FROM SHIPS

Contents

Chapter 1 GENERAL ····· 5-1
1 General provisions ····· 5-1

Chapter 2 PROVISIONS FOR THE prevention OF POLLUTION BY OIL ····· 5-2
1 General provisions ····· 5-2
2 Requirements for machinery spaces of all ships ····· 5-4
3 Requirements for the cargo area of oil tankers ····· 5-16
4 Prevention of pollution during transfer of oil cargo between oil tankers at sea ···· 5-30

Chapter 3 PROVISIONS FOR THE CONTROL OF POLLUTION BY NOXIOUS LIQUID SUBSTANCES IN BULK ····· 5-31
1 General provisions ····· 5-31
2 Requirements for design, construction, arrangement and equipment ····· 5-32
3 Operational discharges of residues of noxious liquid substances ····· 5-34
4 Prevention of pollution arising from an incident involving noxious liquid substances ····· 5-36

Chapter 4 PROVISIONS FOR THE PREVENTION OF POLLUTION BY HARMFUL SUBSTANCES CARRIED BY SEA IN PACKAGED FORM ····· 5-37
1 General provisions ····· 5-37

Chapter 5 PROVISIONS FOR THE PREVENTION OF POLLUTION BY SEWAGE FROM SHIPS ····· 5-38
1 General provisions ····· 5-38

Chapter 6 PROVISIONS FOR THE PREVENTION OF POLLUTION BY GARBAGE FROM SHIPS ····· 5-40
1 General provisions ····· 5-40

Chapter 7 PROVISIONS FOR THE PREVENTION OF AIR POLLUTION FROM SHIPS ····· 5-41
1 General provisions ····· 5-41
2 Requirements for control of emissions from ships ····· 5-42

Chapter 8 PROVISIONS FOR CONTROL OF POLLUTION BY HARMFUL ANTI-FOULING SYSTEMS ON SHIPS ····· 5-45
1 General provisions ····· 5-45

Chapter 1 GENERAL

1 General provisions

1.1 Application

1.1.1 This Part is to give the requirements for controlling the following pollutions from all the sea-going ships engaged on the non-international voyages:

(1) pollution by oil;

(2) pollution by noxious liquid substances in bulk;

(3) pollution by harmful substances carried by sea in packaged form;

(4) pollution by sewage from ships;

(5) pollution by garbage from ships;

(6) air pollution from ships;

(7) pollution by harmful anti-fouling systems.

1.1.2 The ships, if navigating in the sea area with special requirements for pollution prevention, are to follow the decrees and the relevant provisions of the Government of the State whose flag the ship is entitled to fly.

1.2 Exceptions

1.2.1 The requirements for the discharge into the sea of oily mixture, noxious liquid substances, harmful substances in packaged form, sewage, garbage from ships into the sea, the provisions for the prevention of air pollution from ships and pollution by harmful anti-fouling systems specified in the chapters of this Part are not to apply to the following discharge when such a discharge:

(1) is necessary for the purpose of securing the safety of a ship or saving life at sea;

(2) results from accidental damage to a ship or its equipment provided that all reasonable precautions have been taken;

(3) is approved by the port Administration when being used for the special purpose.

Chapter 2 PROVISIONS FOR THE PREVENTION OF POLLUTION BY OIL

1 General provisions

1.1 Application

1.1.1 Unless expressly provided otherwise, the requirements of this chapter apply to all the sea-going ships which can produce slop and engaged on non-international voyages, including non-self-propelled ships.

1.1.2 In ships other than oil tankers fitted with cargo spaces which are constructed and utilized to carry oil in bulk of an aggregate capacity of 1000 m^3 or more, the requirements of paragraphs 1.3.1, 2.6.2, 3.6.2(2), 3.8, 3.9, 3.10, 3.11 and 3.12 of this chapter for oil tankers are also to apply to the construction and operation of those spaces, except that where such aggregate capacity is more than 200 m^3 but less than 1,000 m^3, the requirement of paragraph 3.12.3 of this chapter may apply in lieu of paragraphs 3.8, 3.9 and 3.10.

1.1.3 Where a cargo subject to the provisions of chapter 3 of this Part is carried in a cargo space of an oil tanker, the appropriate requirements of chapter 3 of this Part are also to apply.

1.1.4 Any new type ship (such as near-surface craft, submarine craft and etc.), whose constructional features are such as to render the application of any of the technical requirements of this chapter relating to construction and equipment unreasonable or impracticable may accept the equivalent protective measures, provided that the construction and equipment of that ship provides equivalent protection against pollution by oil, in accordance with the service for which it is intended. The signed certificate is to indicate.

1.1.5 The requirements of paragraphs 3.8, 3.9 and 3.10 of this chapter are not to apply to oil tankers carrying asphalt or other products, which through their physical properties inhibit effective product/water separation and monitoring. Such oil tankers are to retain the residues on board with discharge of all contaminated washings to reception facilities.

1.1.6 Unless the flag Administration determines otherwise, for the purpose of this chapter, oil recovery ships and slop reception ships are considered as ships other than oil tankers.

1.2 Definitions

1.2.1 For the purpose of this chapter:

(1) *Oil* means petroleum in any form including crude oil, fuel oil, sludge, oil refuse and refined products (other than those petrochemicals which are subject to the provisions of chapter 3 of this Part) and, without limiting the generality of the foregoing, includes the substances listed in appendix I to Annex I of MARPOL.

(2) *Oily mixture* means a mixture with any oil content.

(3) *Oil fuel* means any oil used as fuel in connection with the propulsion and auxiliary machinery of the ship in which such oil is carried.

(4) *Oil tanker* means a ship constructed or adapted primarily to carry oil in bulk in its cargo spaces and includes other ships, such as combination carriers, any "NLS tanker" as defined in Annex II of MARPOL and any liquefied gas carrier as defined in regulation 3.20 of chapter II-1 of 1974 SOLAS (as amended), when carrying a cargo or part cargo of oil in bulk.

(5) *Combination carrier* means a ship designed to carry either oil or solid cargoes in bulk.

(6) *Crude oil tanker* means an oil tanker engaged in the trade of carrying crude oil.

(7) *Product carrier* means an oil tanker engaged in the trade of carrying oil other than crude oil.

(8) *Nearest land* means from the baseline from which the territorial sea of the territory in question is established.

(9) *Instantaneous rate of discharge of oil content* means the rate of discharge of oil in litres per hour at any instant divided by the speed of the ship in knots at the same instant.

(10) *Slop tank* means a tank specifically designated for the collection of tank drainings, tank washings and other oily mixtures.

(11) *Clean ballast* means the ballast in a tank which, since oil was last carried therein, has been so cleaned that effluent therefrom if it were discharged from a ship which is stationary into clean calm water on a clear day would not produce visible traces of oil on the surface of the water or on adjoining shorelines or cause a sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines. If the ballast is discharged through an approved oil discharge monitoring and control system, evidence based on such a system to the effect that the oil content

of the effluent did not exceed 15 ppm is to be determinative that the ballast was clean, notwithstanding the presence of visible traces.
(12) *Segregated ballast* means the ballast water introduced into a tank which is completely separated from the cargo oil and oil fuel system and which is permanently allocated to the carriage of ballast or to the carriage of ballast or cargoes other than oil or noxious liquid substances as variously defined in the chapters of this Part.
(13) *Length (L)* means 96% of the total length on a waterline at 85% of the least moulded depth measured from the top of the keel, or the length from the foreside of the stem to the axis of the rudder stock on that waterline, if that be greater. In ships designed with a rake of keel the waterline on which this length is measured is to be parallel to the designed waterline. The length (*L*) is to be measured in metres.
(14) *Forward and after perpendiculars* is to be taken at the forward and after ends of the length (*L*). The forward perpendicular is to coincide with the foreside of the stem on the waterline on which the length is measured.
(15) *Amidships* is at the middle of the length (*L*).
(16) *Breadth (B)* means the maximum breadth of the ship, measured amidships to the moulded line of the frame in a ship with a metal shell and to the outer surface of the hull in a ship with a shell of any other material. The breadth (*B*) is to be measured in metres.
(17) *Deadweight (DW)* means the difference in tonnes between the displacement of a ship in water of a density of 1.025 at the load waterline corresponding to the assigned summer freeboard and the lightweight of the ship.
(18) *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.
(19) *Volumes and areas in a ship* is to be calculated in all cases to moulded lines.
(20) *Permeability of a space* means the ratio of the volume within that space which is assumed to be occupied by water to the total volume of that space.
(21) *Tank* means an enclosed space which is formed by the permanent structure of a ship and which is designed for the carriage of liquid in bulk.
(22) *Oil residue (sludge)* means the residual waste oil products generated during the normal operation of a ship such as those resulting from the purification of fuel or lubricating oil for main or auxiliary machinery, separated waste oil from oil filtering equipment, waste oil collected in drip trays, and waste hydraulic and lubricating oils.
(23) *Oil residue (sludge) tank* means a tank which holds oil residue (sludge) from which sludge may be disposed directly through the standard discharge connection or any other approved means of disposal.
(24) *Oily bilge water* means water which may be contaminated by oil resulting from things such as leakage or maintenance work in machinery spaces. Any liquid entering the bilge system including bilge wells, bilge piping, tank top or bilge holding tanks is considered oily bilge water.
(25) *Oily bilge water holding tank* means a tank collecting oily bilge water prior to its discharge, transfer or disposal.

1.3 Oil Record Book

1.3.1 Every oil tanker of 150 gross tonnage and above is to be provided with an Oil Record Book (Part II - Cargo/Ballast Operations) in the form specified in appendix III to Annex I of MARPOL and is to meet the relevant requirements of regulation 36 in Annex I of MARPOL.
1.3.2 Every oil tanker of 150 gross tonnage and above and every ship of 400 gross tonnage and above other than an oil tanker are to be provided with an Oil Record Book (Part I - Machinery space operations) in the form specified in appendix III to Annex I of MARPOL and are to meet the relevant requirements of regulation 17 in Annex I of MARPOL.

1.4 Shipboard oil pollution emergency plan

1.4.1 Every oil tanker of 150 gross tonnage and above and every ship other than an oil tanker of 400 gross tonnage and above are to carry on board an approved shipboard oil pollution emergency plan.

1.4.2 Such a plan is to be prepared based on the guidelines① developed by International Maritime Organization and written in the working languages of the master and other officers.
1.4.3 All oil tankers of 5,000 tonnes deadweight or more are to have prompt access to computerized shore-based damage stability and residual structural strength calculation programs.
1.4.4 In the case of ships to which paragraph 4.1 of chapter 3 of this Part also applies, such a plan may be combined with the shipboard marine pollution emergency plan for noxious liquid substances required under paragraph 4.1 of chapter 3. In this case, the title of the combined plan is to be "Shipboard marine pollution emergency plan".

2 Requirements for machinery spaces of all ships

2.1 Requirements for construction and equipment

2.1.1 Except as specially provided for in this paragraph, the machinery spaces of all ships (oil tankers and ships other than oil tankers) are to be provided with the corresponding equipment and measures for preventing oil pollution and are to comply with the following requirements:
(1) to be fitted with oil filtering equipment;
(2) to be provided with tanks for oil residues (sludge);
(3) to be fitted with standard discharge connection;
(4) oil fuel tank protection;

2.2 Tanks for oil residues (sludge)

2.2.1 Every ship of 400 gross tonnage and above is to be provided with a tank or tanks of adequate capacity, having regard to the type of machinery and length of voyage, to receive the oil residues (sludge) which cannot be dealt with otherwise in accordance with the requirements of this chapter.
2.2.2 Oil residue (sludge) may be disposed of directly from the oil residue (sludge) tank(s) through the standard discharge connection referred to in paragraph 2.3 of this chapter, or any other approved means of disposal. The oil residue (sludge) tank(s):
(1) is to be provided with a designated pump for disposal that is capable of taking suction from the oil residue (sludge) tank(s). A designated pump should be as any pump used for the disposal of oil residue (sludge) through the standard discharge connection referred to in paragraph 2.3 of this chapter, or any pump used to transfer oil residue (sludge) to any other approved means of disposal such as an incinerator, auxiliary boiler suitable for burning oil residues (sludge) or other acceptable means; and
(2) is to have no discharge connections to the bilge system, oily bilge water holding tank(s), tank top or oil filtering equipment except that the tank(s) may be fitted with drains, with manually operated self-closing valves and arrangements for visual monitoring of the settled water, that lead to an oily bilge water holding tank or bilge well, or an alternative arrangement, provided such arrangement does not connect directly to the bilge piping system. A common discharge piping may be accepted only to the standard discharge connection mentioned in paragraph 2.3 of this chapter between the sludge tank discharge piping and bilge-water piping.
2.2.3 Such tanks are to be designed and constructed so as to facilitate their cleaning and the discharge of residues to reception facilities.
2.2.4 Piping to and from oil residue (sludge) tanks is to have no direct connection overboard, other than the standard discharge connection referred to in paragraph 2.3 of this chapter.
2.2.5 Determination of capacity of oil residue (sludge) tanks:
(1) For ships which do not carry ballast water in oil fuel tanks, the minimum sludge tank capacity (V_1) should be calculated by the following formula:

$$V_1 = K_1CD \qquad m^3$$

where: K_1 = 0.015 for ships where heavy fuel oil is purified for main engine use, or K_1 = 0.005 for ships using diesel oil or heavy fuel oil which does not require purification before use;
C − daily fuel oil consumption (m^3):
① the fuel oil consumption of the main engine is to be taken at the maximum

① Refer to the Guidelines for the development of shipboard oil pollution emergency plans adopted by International Maritime Organization by resolution MEPC.54(32), as amended by resolution MEPC.86(44).

continuous rating of the main engine; half the fuel oil consumption of the auxiliary engine is to be taken at the maximum continuous rating of all the auxiliary engines;

② operational time is to be determined in accordance with the service: 8 h in sheltered water service or like service, 16 h in coastal service, 24 h in greater coastal service and unrestricted service.

D − maximum period of voyage between ports where sludge can be discharged ashore (days). In the absence of precise data a figure of 30 days should be used.

(2) When such ships are fitted with homogenizers, sludge incinerators or other recognized means on board for the control of sludge, the minimum sludge tank capacity (V_1) should, in lieu of the above, be:

V_1 = 1 m^3 for ships of 400 gross tonnage and above but less than 4,000 gross tonnage;

V_1 = 2 m^3 for ships of 4,000 gross tonnage and above.

(3) For ships which carry ballast water in fuel oil tanks, the minimum sludge tank capacity (V_2) should be calculated by the following formula:

$$V_2 = V_1 + K_2 B \quad (m^3)$$

where: V_1 − sludge tank capacity specified in (1) or (2) above, in m^3;

K_2 − a factor;

K_2 = 0.01 for heavy fuel oil bunker tanks;

K_2 = 0.005 for diesel oil bunker tanks;

B − capacity of water ballast tanks which can also be used to carry oil fuel (m^3).

2.3 Standard discharge connection of oil

2.3.1 To enable pipes of reception facilities to be connected with the ship's discharge pipeline for residues from machinery bilges and from oil residue (sludge) tanks, both lines are to be fitted with a standard discharge connection in accordance with the table 2.3.1:

Standard dimensions of flanges for discharge connections Table 2.3.1

Description	Dimension
Outside diameter	215 mm
Inner diameter	According to pipe outside diameter
Bolt circle diameter	183 mm
Slots in flange	6 holes, 22 mm in diameter, equidistantly placed on a bolt circle of the above diameter, slotted to the flange periphery. The slot width to be 22 mm
Flange thickness	20 mm
Bolts and nuts: quantity and diameter	6, each of 16 mm in diameter and of suitable length
Note: The flange is designed to accept pipes up to a maximum internal diameter of 125 mm and is to be of steel or other equivalent material having a flat face. This flange, together with a gasket of oil-proof material, is to be suitable for a service pressure of 600 kPa.	

2.4 Oil fuel tank protection

2.4.1 This paragraph is to apply to all ships with an aggregate oil fuel capacity of 600 m^3 and above.

2.4.2 The application of this paragraph in determining the location of tanks used to carry oil fuel is also to comply with the provisions of paragraph 3.4 of this chapter.

2.4.3 For the purpose of this paragraph, the following definitions are to apply:

(1) *Oil fuel* means any oil used as fuel oil in connection with the propulsion and auxiliary machinery of the ship in which such oil is carried.

(2) *Load line draught (d_S)* is the vertical distance, in metres, from the moulded baseline at mid-length to the waterline corresponding to the summer freeboard draught to be assigned to the ship.

(3) *Light ship draught* is the moulded draught amidships corresponding to the lightweight.

(4) *Partial load line draught (d_P)* is the light ship draught plus 60% of the difference between the light ship draught and the load line draught *(d_S)*. The partial load line draught *(d_P)* is to be measured in metres.

(5) *Waterline (d_B)* is the vertical distance, in metres, from the moulded baseline at mid-length to the waterline corresponding to 30% of the depth D_S.

(6) *Breadth (B_S)* is the greatest moulded breadth of the ship, in metres, at or below the deepest

load line draught d_S.
(7) *Breadth (B_B)* is the greatest moulded breadth of the ship, in metres, at or below the waterline d_B.
(8) *Depth (D_S)* is the moulded depth, in metres, measured at mid-length to the upper deck at side. For the purpose of the application, "upper deck" means the highest deck to which the watertight transverse bulkheads except aft peak bulkheads extend.
(9) *Length (L)* means 96% of the total length on a waterline at 85% of the least moulded depth measured from the top of the keel, or the length from the foreside of the stem to the axis of the rudder stock on that waterline, if that be greater. In ships designed with a rake of keel the waterline on which this length is measured is to be parallel to the designed waterline. The length *(L)* is to be measured in metres.
(10) *Breadth (B)* means the maximum breadth of the ship, in metres, measured amidships to the moulded line of the frame in a ship with a metal shell and to the outer surface of the hull in a ship with a shell of any other material.
(11) *Oil fuel tank* means a tank in which oil fuel is carried, but excludes those tanks which would not contain oil fuel in normal operation, such as overflow tanks.
(12) *Small oil fuel tank* is an oil fuel tank with a maximum individual capacity not greater than 30 m^3.
(13) *C* is the ship's total volume of oil fuel, in cubic metres, at 98% tank filling.
(14) *Oil fuel capacity* means the volume of a tank, in cubic metres, at 98% filling.
2.4.4 The provisions of this paragraph apply to all oil fuel tanks except small oil fuel tanks, as defined in above 2.4.3 (12), provided that the aggregate capacity of such excluded tanks is not greater than 600 m^3.
2.4.5 Individual oil fuel tanks are not to have a capacity of over 2,500 m^3.
2.4.6 For ships having an aggregate oil fuel capacity of 600 m^3 and above, oil fuel tanks are to be located above the moulded line of the bottom shell plating nowhere less than the distance *h* as specified below:

h = *B*/20 (m), or
h = 2.0 m, whichever is the lesser.
The minimum value of *h* = 0.76 m.

In the turn of the bilge area and at locations without a clearly defined turn of the bilge, the oil fuel tank boundary line is to run parallel to the line of the midship flat bottom as shown in figure 2.4.6.

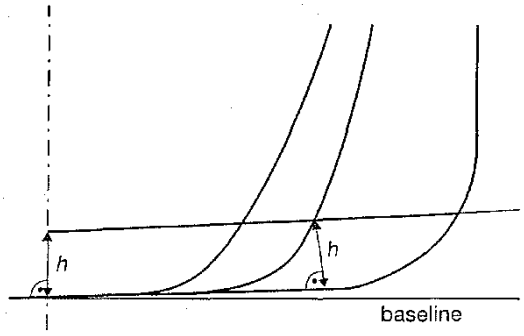


Figure 2.4.6 Oil fuel tank boundary lines for the purpose of 2.4.6

2.4.7 For ships having an aggregate oil fuel capacity of 600 m^3 or more but less than 5,000 m^3, oil fuel tanks are to be located inboard of the moulded line of the side shell plating, nowhere less than the distance *w* which, as shown in figure 2.4.7, is measured at any cross-section at right angles to the side shell, as specified below:

$$w = 0.4 + \frac{2.4C}{20{,}000}(\text{m})$$

The minimum value of *w* = 1.0 m; however, for individual tanks with an oil fuel capacity of less than 500 m^3 the minimum value is 0.76 m.
2.4.8 For ships having an aggregate oil fuel capacity of 5,000 m^3 and over, oil fuel tanks are to be located inboard of the moulded line of the side shell plating, nowhere less than the distance *w* which, as shown in figure 2.4.7, is measured at any cross-section at right angles to the side shell, as specified below:

$w = 0.5 + \frac{C}{20{,}000}$ (m) , or

w = 2.0 m, whichever is the lesser.

The minimum value of w = 1.0 m.

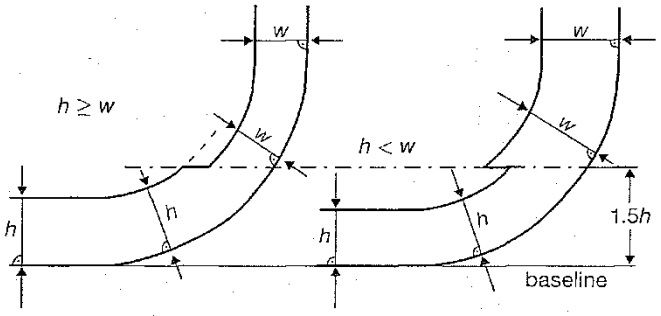


Figure 2.4.7 Oil fuel tank boundary lines for the purpose of 2.4.7 and 2.4.8

2.4.9 Lines of oil fuel piping located at a distance from the ship's bottom of less than *h*, as defined in 2.4.6, or from the ship's side less than *w*, as defined in 2.4.7 and 2.4.8, are to be fitted with valves or similar closing devices within or immediately adjacent to the oil fuel tank. These valves are to be capable of being brought into operation from a readily accessible enclosed space the location of which is accessible from the navigation bridge or propulsion machinery control position without traversing exposed freeboard or superstructure decks. The valves are to close in case of remote control system failure (fail in a closed position) and are to be kept closed at sea at any time when the tank contains oil fuel except that they may be opened during oil fuel transfer operations.

2.4.10 Suction wells in oil fuel tanks may protrude into the double bottom below the boundary line defined by the distance *h* provided that such wells are as small as practicable and the distance between the well bottom and the bottom shell plating is not less than 0.5 *h.*

2.4.11 Alternatively to 2.4.6 and either 2.4.7 or 2.4.8, ships are to comply with the accidental oil fuel outflow performance standard specified below:

(1) The level of protection against oil fuel pollution in the event of collision or grounding is to be assessed on the basis of the mean oil outflow parameter as follows:

$O_M \leq 0.0157 - 1.14E - 6C$ for 600 $m^3 \leq C <$ 5,000 m^3

$O_M \leq 0.010$ for $C \geq$ 5,000 m^3

where: O_M = mean oil outflow parameter;

C = total oil fuel volume.

(2) The following general assumption is to apply when calculating the mean oil outflow parameter:

① the ship is to be assumed loaded to the partial load line draught (d_p) without trim or heel;

② all oil fuel tanks are to be assumed loaded to 98% of their volumetric capacity;

③ the nominal density of the oil fuel (p_n) is to generally be taken as 1,000 kg/m^3. If the density of the oil fuel is specifically restricted to a lesser value, the lesser value may be applied; and

④ for the purpose of these outflow calculations, the permeability of each oil fuel tank is to be taken as 0.99, unless proven otherwise.

(3) The following assumptions are to be used when combining the oil outflow parameters:

① The mean oil outflow is to be calculated independently for side damage and for bottom damage and then combined into a non-dimensional oil outflow parameter O_M, as follows:

$$O_M = \frac{0.4O_{MS} + 0.6O_{MB}}{C}$$

where: O_{MS} − mean outflow for side damage, in m^3;

O_{MB} − mean outflow for bottom damage, in m^3;

C − total oil fuel volume.

② For bottom damage, independent calculations for mean outflow are to be done for 0 m and 2.5 m tide conditions, and then combined as follows:

$O_{MB} = 0.7O_{MB(0)} + 0.3O_{MB(2.5)}$

where: $O_{MB(0)}$ = mean outflow for 0 m tide condition, and

$O_{MB(2.5)}$ = mean outflow for minus 2.5 m tide condition, in m^3.

(4) The mean outflow for side damage O_{MS} is to be calculated as follows:

$$O_{MS} = \sum_{i}^{n} P_{S(i)} O_{S(i)} \qquad (m^3)$$

where: i − each oil fuel tank under consideration;

n − total number of oil fuel tanks;

$P_{S(i)}$ − the probability of penetrating oil fuel tank i from side damage, calculated in accordance with 2.4.11(6) of this paragraph;

$O_{S(i)}$ − the outflow, in m^3, from side damage to oil fuel tank i, which is assumed equal to the total volume in oil fuel tank i at 98% filling.

(5) The mean outflow for bottom damage is to be calculated for each tidal condition as follows:

$$O_{MB(0)} = \sum_{i}^{n} P_{B(i)} O_{B(i)} C_{DB(i)} \qquad (m^3)$$

where: i - each oil fuel tank under consideration;

n - total number of oil fuel tanks;

$P_{B(i)}$ − the probability of penetrating oil fuel tank i from bottom damage, calculated in accordance with 2.4.11(7) of this paragraph;

$O_{B(i)}$ − the outflow from oil fuel tank i, in m^3, calculated in accordance with 2.4.11(5)③ of this paragraph; and

$C_{DB(i)}$ − factor to account for oil capture as defined in 2.4.11(5)④.

② $$O_{MB(2.5)} = \sum_{i}^{n} P_{B(i)} O_{B(i)} C_{DB(i)} \qquad (m^3)$$

where: i, n, $P_{B(i)}$ and $C_{DB(i)}$ = as defined in ① above;

$O_{B(i)}$ − the outflow from oil fuel tank i, in m^3, after tidal change.

③ The oil outflow $O_{B(i)}$ for each oil fuel tank is to be calculated based on pressure balance principles, in accordance with the following assumptions:

(a) The ship is to be assumed stranded with zero trim and heel, with the stranded draught prior to tidal change equal to the partial load line draught d_p.

(b) The oil fuel level after damage is to be calculated as follows:

$$h_F = \frac{(d_p + t_c - Z_l)\rho_s}{\rho_n}$$

where: h_F − the height of the oil fuel surface above Z_l in metres;

t_c − the tidal change, in metres. Reductions in tide are to be expressed as negative values;

Z_l − the height of the lowest point in the oil fuel tank above the baseline, in metres;

p_s − density of seawater, to be taken as 1,025 kg/m^3; and

p_n − nominal density of the oil fuel, as defined in 2.4.11(2)③.

(c) The oil outflow $O_{B(i)}$ for any tank bounding the bottom shell plating is to be taken not less than the following formula:

$$O_{B(i)} = H_W \cdot A$$

where: H_w = 1.0 m, when $Y_B = 0$

$H_w = \frac{B_B}{50}$ but not greater than 0.4 m, when Y_B is greater than $\frac{B_B}{5}$ or 11.5 m, whichever is less.

For Y_B values outboard $\frac{B_B}{5}$ or 11.5 m, whichever is less, H_w is to be linearly interpolated.

Y_B = the minimum value of Y_B over the length of the oil fuel tank, where at any given location, Y_B is the transverse distance between the side shell at water-

line d_B and the tank at or below waterline d_B.

A = the maximum horizontal projected area of the oil fuel tank up to the level of H_w from the bottom of the tank.

(d) In the case of bottom damage, a portion from the outflow from an oil fuel tank may be captured by non-oil compartments. This effect is approximated by application of the factor $C_{DB(i)}$ for each tank, which is to be taken as follows:

$C_{DB\,(i)}$ = 0.6 for oil fuel tanks bounded from below by non-oil compartments;

$C_{DB(i)}$ = 1 for oil fuel tanks bounded from the bottom shell plating.

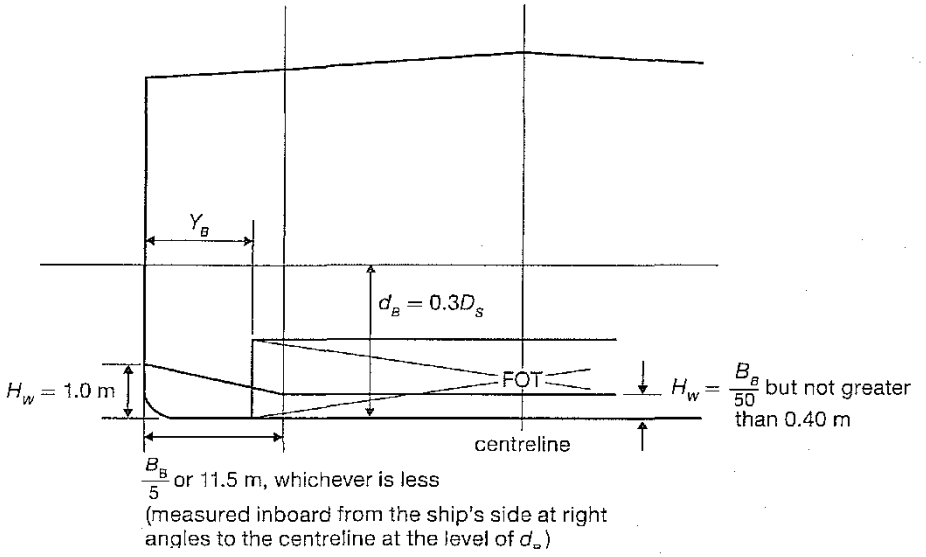


Figure 2.4.11 Dimensions for calculation of the minimum oil outflow for the purpose of 2.4.11(5)③(c)

(6) The probability *P*s of breaching a compartment from side damage is to be calculated as follows:

① $P_S = P_{SL} \cdot P_{SV} \cdot P_{ST}$

where:

P_{SL} = (1 - P_{Sf} - P_{Sa}) − probability the damage will extend into the longitudinal zone bounded by X_a and X_f;

P_{sv} = (1 - P_{su} - P_{Sl}) − probability the damage will extend into the vertical zone bounded by Z_l and Z_u;

P_{ST} = (1 - P_{Sy}) − probability the damage will extend transversely beyond the boundary defined by y.

② P_{Sa}, P_{Sf}, P_{Su} and P_{Sl} are to be determined by linear interpolation from the tables of probabilities for side damage provided in 2.4.11(6)③, and P_{Sy} is to be calculated from the formulas provided in 2.4.11(6)③, where:

P_{Sa} − the probability the damage will lie entirely aft of location $\frac{X_a}{L}$;

P_{Sf} − the probability the damage will lie entirely forward of location $\frac{X_f}{L}$;

P_{Sl} − probability the damage will lie entirely below the tank;

P_{Su} − probability the damage will lie entirely above the tank; and

P_{Sy} − probability the damage will lie entirely outboard the tank.

Compartment boundaries X_a, X_f, Z_l, Z_u and y are to be developed as follows:

X_a − the longitudinal distance from aft terminal of L to the aftmost point on the compartment being considered, in metres;

X_f − the longitudinal distance from aft terminal of L to the foremost point on the compartment being considered, in metres;

Z_l − the vertical distance from the moulded baseline to the lowest point on the compartment being considered, in metres. Where Z_l is greater than D_s, Z_l is to be taken as D_s;

Z_u − the vertical distance from the moulded baseline to the highest point on the compartment being considered, in metres. Where Z_u is greater than D_s, Z_u is to be taken as D_s; and

y − the minimum horizontal distance measured at right angles to the centreline between the compartment under consideration and the side shell, in metres[①].

③ Tables of probabilities for side damage

$\frac{X_a}{L}$	P_{sa}		$\frac{X_f}{L}$	P_{sf}		$\frac{Z_l}{D_s}$	P_{sl}		$\frac{Z_u}{D_s}$	P_{su}
0.00	0.000		0.00	0.967		0.00	0.000		0.00	0.968
0.05	0.023		0.05	0.917		0.05	0.000		0.05	0.952
0.10	0.068		0.10	0.867		0.10	0.001		0.10	0.931
0.15	0.117		0.15	0.817		0.15	0.003		0.15	0.905
0.20	0.167		0.20	0.767		0.20	0.007		0.20	0.873
0.25	0.217		0.25	0.717		0.25	0.013		0.25	0.836
0.30	0.267		0.30	0.667		0.30	0.021		0.30	0.789
0.35	0.317		0.35	0.617		0.35	0.034		0.35	0.733
0040	0.367		0040	0.567		0040	0.055		0040	0.670
0045	00417		0045	0.517		0045	0.085		0045	0.599
0.50	00467		0.50	00467		0.50	0.123		0.50	0.525
0.55	0.517		0.55	00417		0.55	0.172		0.55	00452
0.60	0.567		0.60	0.367		0.60	0.226		'0.60	0.383
0.65	0.617		0.65	0.317		0.65	0.285		0.65	0.317
0.70	0.667		0.70	0.267		0.70	0.347		0.70	0.255
0.75	0.717		0.75	0.217		0.75	00413		0.75	0.197
0.80	0.767		0.80	0.167		0.80	00482		0.80	0.143
0.85	0.817		0.85	0.117		0.85	0.553		0.85	0.092
0.90	0.867		0.90	0.068		0.90	0.626		0.90	0.046
0.95	0.917		0.95	0.023		0.95	0.700		0.95	0.013
1.00	0.967		1.00	0.000		1.00	0.775		1.00	0.000

P_{Sy} is to be calculated as follows:

$$P_{Sy} = \left(\frac{24.96 - 199.6y}{B_S}\right)\left(\frac{y}{B_S}\right) \quad \text{for } \frac{y}{B_S} \le 0.05$$

$$P_{Sy} = 0.749 + \left(5 - 44.4\left(\frac{y}{B_S} - 0.05\right)\left(\frac{y}{B_S}\right) - 0.05\right) \quad \text{for } 0.05 < \frac{y}{B_S} < 0.1$$

$$P_{Sy} = 0.888 + 0.56\left(\frac{y}{B_S} - 0.1\right) \quad \text{for } \frac{y}{B_S} \ge 0.1$$

P_{Sy} is not to be taken greater than 1.

(7) The probability P_B of breaching a compartment from bottom damage is to be calculated as follows:

① $P_B = P_{BL} \cdot P_{BT} \cdot P_{BV}$

where:

P_{BL} = (1-P_{Bf} -P_{Ba}) = probability the damage will extend into the longitudinal zone bounded by X_a and X_f;

P_{BT} = (1 - P_{Bp} - P_{Bs}) = probability the damage will extend into transverse zone bounded by Y_p and Y_s; and

P_{BV} = (1 - P_{Bz}) = probability the damage will extend vertically above the boundary defined by z;

② P_{Ba}, P_{Bf}, P_{Bp}, and P_{Bs} are to be determined by linear interpolation from the tables of probabilities for bottom damage provided in 2.4.11(7)③, and P_{Bz} is to be calculated from

① For symmetrical tank arrangements, damages are considered for one side of the ship only, in which case all "y" dimensions are to be measured from that same side. For asymmetrical arrangements, reference is made to the Explanatory Notes on matters related to the accidental oil outflow performance, adopted by IMO by resolution MEPC.122(52), as amended.

the formulas provided in 2.4.11(7)③, where:

P_{Ba} − the probability the damage will lie entirely aft of location $\frac{X_a}{L}$;

P_{Bf} − the probability the damage will lie entirely forward of location $\frac{X_f}{L}$;

P_{Bp} − probability the damage will lie entirely to port of the tank;

P_{Bs} − probability the damage will lie entirely to starboard of the tank; and

P_{Bz} − probability the damage will lie entirely below the tank.

Compartment boundaries X_a, X_f, Y_p, Y_s and z are to be developed as follows:

X_a and X_f as defined in 2.4.11(6)②;

Y_p − the transverse distance from the port-most point on the compartment located at or below the waterline d_B, to a vertical plane located $\frac{B_B}{2}$ to starboard of the ship's centreline;

Y_s − the transverse distance from the starboard-most point on the compartment located at or below the waterline d_B, to a vertical plane located $\frac{B_B}{2}$ to starboard of the ship's centreline; and

z − the minimum value of z over the length of the compartment, where, at any given longitudinal location, z is the vertical distance from the lower point of the bottom shell at that longitudinal location to the lower point of the compartment at that longitudinal location.

③ Tables of probabilities for bottom damage

$\frac{X_a}{L}$	P_{Ba}		$\frac{X_f}{L}$	P_{Bf}		$\frac{Y_P}{B_B}$	P_{Bp}		$\frac{Y_s}{B_B}$	P_{Bs}
0.00	0.000		0.00	0.969		0.00	0.844		0.00	0.000
0.05	0.002		0.05	0.953		0.05	0.794		0.05	0.009
0.10	0.008		0.10	0.936		0.10	0.744		0.10	0.032
0.15	0.017		0.15	0.916		0.15	0.694		0.15	0.063
0.20	0.029		0.20	0.894		0.20	0.644		0.20	0.097
0.25	0.042		0.25	0.870		0.25	0.594		0.25	0.133
0.30	0.058		0.30	0.842		0.30	0.544		0.30	0.171
0.35	0.076		0.35	0.810		0.35	0.494		0.35	0.211
0.40	0.096		0.40	0.775		0.40	0.444		0.40	0.253
0.45	0.119		0.45	0.734		0.45	0.394		0.45	0.297
0.50	0.143		0.50	0.687		0.50	0.344		0.50	0.344
0.55	0.171		0.55	0.630		0.55	0.297		0.55	0.394
0.60	0.203		0.60	0.563		0.60	0.253		0.60	0.444
0.65	0.242		0.65	0.489		0.65	0.211		0.65	0.494
0.70	0.289		0.70	0.413		0.70	0.171		0.70	0.544
0.75	0.344		0.75	0.333		0.75	0.133		0.75	0.594
0.80	0.409		0.80	0.252		0.80	0.097		0.80	0.644
0.85	0.482		0.85	0.170		0.85	0.063		0.85	0.694
0.90	0.565		0.90	0.089		0.90	0.032		0.90	0.744
0.95	0.658		0.95	0.026		0.95	0.009		0.95	0.794
1.00	0.761		1.00	0.000		1.00	0.000		1.00	0.844

P_{Bz} is to be calculated as follows:

$$P_{Bz} = \left(14.5 - \frac{67z}{D_S}\right)\left(\frac{z}{D_S}\right) \quad \text{for } \frac{z}{D_S} \le 0.1,$$

$$P_{Bz} = 0.78 + 1.1\left(\frac{z}{D_S} - 0.1\right) \quad \text{for } \frac{z}{D_S} > 0.1.$$

P_{Bz} is not to be taken greater than 1.

(8) Any oil fuel tanks that do not border the outer shell plating are to be located no closer to the

bottom shell plating than the minimum value of *h* in 2.4.6 and no closer to the side shell plating than the applicable minimum value of *w* in 2.4.7 or 2.4.8.

2.4.12 In approving the design and construction of ships to be built in accordance with this paragraph, attentions are to be paid to the general safety aspects, including the need for maintenance and inspection of wing and double bottom tanks or spaces .

2.5 Oil filtering equipment

2.5.1 Any ship of 400 gross tonnage and above but less than 10,000 gross tonnage is to be fitted with oil filtering equipment complying with 2.5.3. Any such ship which carries a large quantity of fuel oil is to comply with 2.5.2.

2.5.2 Except as specified in 2.5.6, any ship of 10,000 gross tonnage and above is to be fitted with oil filtering equipment and alarm arrangements to ensure that any discharge of oily mixtures is automatically stopped when the oil content of the effluent exceeds 15 ppm, which is to comply with 2.5.4.

2.5.3 Oil filtering equipment referred to in 2.5.1 is to be of a design approved and is to be such as will ensure that any oily mixture discharged into the sea after passing through the system has an oil content not exceeding 15 ppm①.

2.5.4 Oil filtering equipment referred to in 2.5.2 is to be of a design approved and is to be such as will ensure that any oily mixture discharged into the sea after passing through the system has an oil content not exceeding 15ppm. The oil filtering equipment is to be provided with alarm arrangements to indicate when this level cannot be maintained. The system is to also be provided with arrangements to ensure that any discharge of oily mixtures is automatically stopped when the oil content of the effluent exceeds 15 ppm①.

2.5.5 Ships, such as hotel ships, storage vessels, etc., and fixed-point-operation non-propulsion floating docks which are stationary except for non-cargo-carrying relocation voyages need not be provided with oil filtering equipment. Such ships are to be provided with a holding tank having a volume adequate for the total retention on board of the oily bilge water. All oily bilge water is to be retained on board for subsequent discharge to reception facilities. The volume of a holding tank is to comply with the result of the formula below:

$$V = Tq \qquad m^3$$

where: V – Volume of the holding tank with the oily bilge water, in m^3;

T – Duration of the retention on board of the oil bilge water, in *h*; to be determined in accordance with the actual condition of the ship;

q – Assumed volume of the oily bilge water produced per hour, m^3/h;

$q = 1.8 \times 10^{-5} GT$;

GT – Gross tonnage of the ship.

2.5.6 For the high speed crafts engaged on a scheduled service with a turn-around time not exceeding 24 *h* and covering also non-passenger/cargo-carrying relocation voyages for these ships, the following measures may be taken in lieu of the requirements of 2.5.1 and 2.5.2.

(1) the ship is fitted with a holding tank, the sufficient volume of which is to comply with the result of the formula below:

$$V = 15Tq \qquad m^3$$

where: $q = 1.8 \times 10^{-5} GT$, m^3/h; V, T, q, GT are defined as in 2.5.5; however, V is not to be less than 1 m^3.

(2) all oily bilge water is retained on board for subsequent discharge to reception facilities;

(3) adequate reception facilities are available to receive such oily bilge water in a sufficient number of ports or terminals the ship calls at;

(4) the International Oil Pollution Prevention Certificate is endorsed to the effect that the service of a high-speed craft is identified; and

(5) the quantity, time, and port of the discharge are recorded in the Oil Record Book (Machinery space operations) specified in 1.3.2 of this chapter.

2.5.7 Any ship of less than 400 gross tonnage is not required to provide with the oil filtering equipment, however, it is to comply with the following conditions:

(1) the volume of the holding tank having all oily bilge water on board the ship is to comply with

---

① Refer to the Guidelines and specifications for pollution prevention equipment for machinery space of ships adopted by IMO by resolution MEPC.107(49).

the result of the formula below:

$$V = 15Tq \quad m^3$$

where: V – Volume of the holding tank with the oily bilge water, in m^3, and the actual taken value of V is not to be less than 48 q; for ships designed for operation in ports, the value is to be taken in accordance with the actual condition, or may be relaxed appropriately after agreement, but is not to be less than 0.1 m^3;

T – Duration of the retention on board of the oil bilge water, in h; to be determined in accordance with the actual condition of the ship;

q – Assumed volume of the oily bilge water produced per hour, m^3/h; when calculating:

$q = 3.5 \times 10^{-5}\ GT$, applicable to oil stern tube bearing;

$q = 2.1 \times 10^{-5}\ GT$, applicable to water stern tube bearing;

$q = 1.8 \times 10^{-5}\ GT$, applicable to ships designed for operation in ports;

GT – Gross tonnage of the ship.

(2) adequate reception facilities are available to receive oily mixtures in ships' call ports or terminals.

2.5.8 Notwithstanding the requirements of 2.5.1, 2.5.2 and 2.5.7, non-propulsion ships are not required to provide oil filtering equipment, but are to comply with all the following conditions:

(1) the volume of the holding tank having all oily bilge water on board the ship is to comply with the result of the formula below:

$$V = Tq \quad m^3$$

where: $q = 1.8 \times 10^{-5}\ GT$, m^3/h; V, T, q, GT are defined as in 2.5.5; however, for the non-propulsion ships of 10000 gross tonnage and above, V is not to be less than 1 m^3.

(2) adequate reception facilities are available to receive oily mixtures in ships' call ports or terminals.

2.6 Requirements for control of operational discharge of oil

2.6.1 Control of discharge of oil

(1) Discharge of oily bilge water from machinery space of the ships of 400 gross tonnage and above:

① the ship is proceeding *en route;*

② the oily mixture is processed through an oil filtering equipment meeting the requirements of 2.5 of this chapter;

③ the oil content of the effluent without dilution does not exceed 15 ppm;

④ the oily mixture does not originate from cargo pump-room bilges on oil tankers; and

⑤ the oily mixture, in case of oil tankers, is not mixed with oil cargo residues.

(2) In the case of a ship of less than 400 gross tonnage, oily bilge water from machinery space is, in accordance with 2.5.7 of this chapter, either to be retained on board for subsequent discharge to reception facilities or to be discharged into the sea when in accordance with the following provisions:

① the ship is proceeding *en route;*

② the ship has in operation equipment in compliance with figure 2.6.1(1) and figure 2.6.1(2) that ensures that the oil content of the effluent without dilution does not exceed 15 ppm;

③ the oily mixture does not originate from cargo pump-room bilges on oil tankers; and

④ the oily mixture, in case of oil tankers, is not mixed with oil cargo residues.

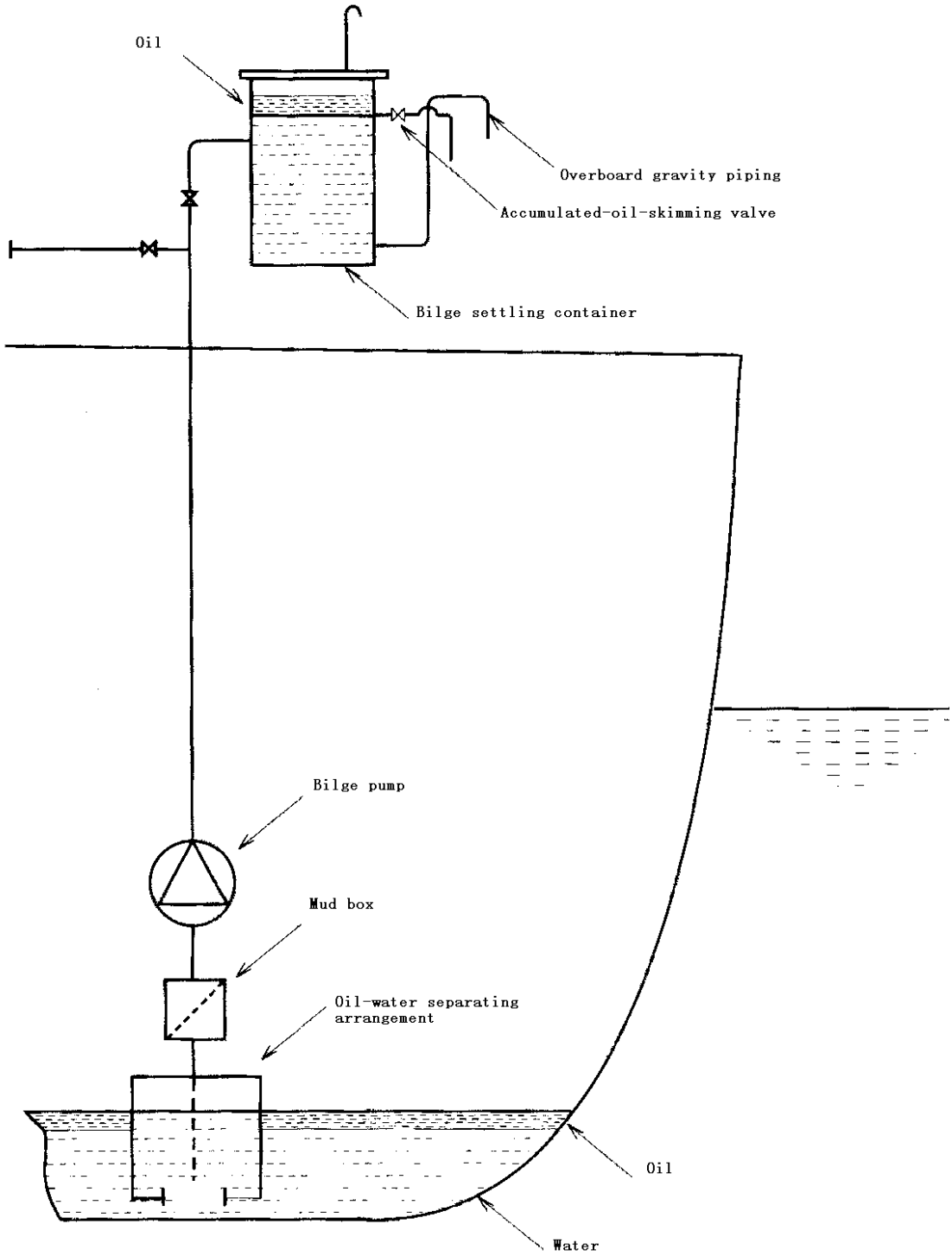
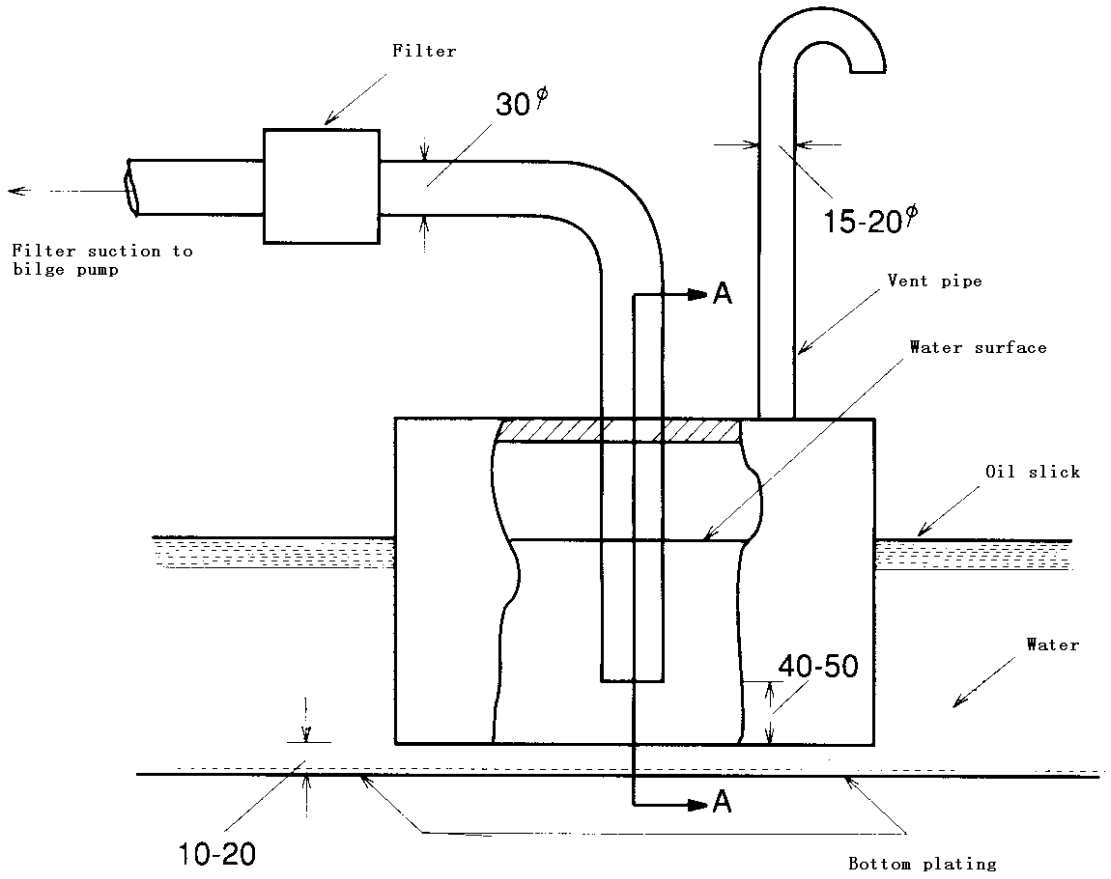
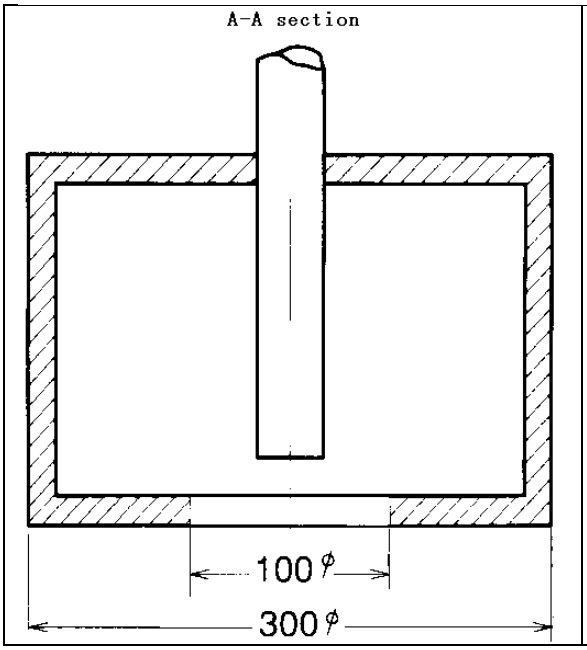


Figure 2.6.1(1) Combined oil-water separating arrangement and bilge settling container

Notes:

1. The efficient volume of the bilge settling container (between the inlet and the outlet) is to be equivalent to the capacity of the bilge produced for 24 h. For the volume of the oily bilge water, refer to the value of q in 2.5.7 of this chapter.
2. Bilge pump may be, of either power type or manual type, operated continually and continuously.
3. For the construction of the oil-water separating arrangement, see the figure 2.6.1(2).
4. The facilities necessary for removing the residues from the surface of the bilge and retaining them on board are available.





Notes:

1. Oil-water separating arrangement is to be located in the machinery space of the ship and is to be :
   - .1 fitted at the opening end of the suction pipe of the bilge;
   - .2 at the aft. part between 2 frames in way of the ship's center line;
   - .3 at the flat position, 10-20 mm away from the bottom plating, the suction pipe of the bilge water 50-70 mm away from the bottom plating.
2. The boundaries are enclosed by dampers in the clear area between the frames.
3. Symbol Ø means diameter, in mm.

Figure 2.6.1(2) Oil-water separating arrangement– only for the small ship of less than 400 gross tonnage

(3) No discharge into the sea is to contain chemicals or other substances in quantities or concentrations which are hazardous to the marine environment or chemicals or other substances introduced for the purpose of circumventing the conditions of discharge specified in this paragraph.

(4) The oil residues which cannot be discharged into the sea in compliance with this paragraph are to be retained on board for subsequent discharge to reception facilities.

2.6.2 Segregation of oil and water ballast and carriage of oil in forepeak tanks

(1) Except as provided in (2) below, in ships of 4,000 gross tonnage and above other than oil tankers, and in oil tankers of 150 gross tonnage and above, no ballast water is to be carried in any oil fuel tank.
(2) Where there is an abnormal condition or the need to carry large quantities of oil fuel render it necessary to carry ballast water which is not a clean ballast in any oil fuel tank, such ballast water is to be discharged to reception facilities or into the sea in compliance with 2.6.1 of this chapter using the equipment specified in 2.5.2 of this chapter, and an entry is to be made in the Oil Record Book to this effect.
(3) In a ship of 400 gross tonnage and above, oil is not to be carried in a forepeak tank or a tank forward of the collision bulkhead.

3 Requirements for the cargo area of oil tankers

3.1 Requirements for construction and equipment

3.1.1 Requirements for pollution-prevention construction and equipment in the cargo area of oil tankers are to include the following:
(1) Segregated ballast tanks;
(2) Crude oil washing requirements;
(3) Double hull and double bottom requirements for oil tankers;
(4) Pump-room bottom protection;
(5) Accidental oil outflow performance;
(6) Subdivision and damage stability;
(7) Slop tanks;
(8) Oil discharge monitoring and control system and oil/water interface detector;
(9) Pumping, piping and discharge arrangement;

3.2 Segregated ballast tanks and crude oil washing

3.2.1 Every crude oil tanker of 20,000 tonnes deadweight and above and every product carrier of 30,000 tonnes deadweight and above are to be provided with segregated ballast tanks and are to comply with 3.2.2, 3.2.3 and 3.2.4, or 3.2.5 below as appropriate, of this section.
3.2.2 The capacity of the segregated ballast tanks is to be so determined that the ship may operate safely on ballast voyages without recourse to the use of cargo tanks for water ballast except as provided for in 3.2.3 or 3.2.4. In all cases, however, the capacity of segregated ballast tanks is to be at least such that, in any ballast condition at any part of the voyage, including the conditions consisting of lightweight plus segregated ballast only, the ship's draughts and trim can meet the following requirements:
(1) the moulded draught amidships *(d_m)* (without taking into account any ship's deformation) is not to be less than:

$$d_m = 2.0 + 0.02L \quad \text{m}$$

(2) the draughts at the forward and after perpendiculars are to correspond to those determined by the draught amidships *(d_m)* as specified in (1) above, in association with the trim by the stern of not greater than $0.015L$; and
(3) in any case the draught at the after perpendicular is not to be less than that which is necessary to obtain full immersion of the propeller(s).
3.2.3 In no case is ballast water to be carried in cargo tanks, except:
(1) on those rare voyages when weather conditions are so severe that, in the opinion of the master, it is necessary to carry additional ballast water in cargo tanks for the safety of the ship; and
(2) in exceptional cases where the particular character of the operation of an oil tanker renders it necessary to carry ballast water in excess of the quantity required under 3.2.2, provided that such operation of the oil tanker falls under the category of required exceptional cases.
Such additional ballast water is to be processed and discharged in compliance with 3.12 and an entry is to be made in the Oil Record Book referred to in 1.3.1 of this chapter.
3.2.4 In the case of crude oil tankers, the additional ballast permitted in 3.2.3 is to be carried in cargo tanks only if such tanks have been crude oil washed in accordance with 3.3 of this chapter before departure from an oil unloading port or terminal.
3.2.5 Notwithstanding the provisions of paragraph 3.2.2, the segregated ballast conditions for oil tankers less than 150 m in length are to be to the satisfaction.

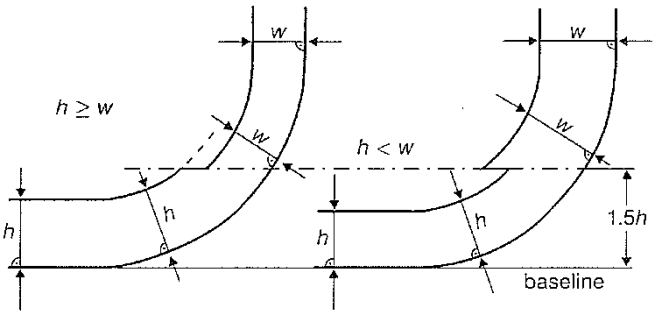
3.2.6 Every crude oil tanker of 20,000 tonnes deadweight and above is to be fitted with a cargo tank cleaning system using crude oil washing. The system is to fully comply with the requirements of 3.3 of this chapter within one year after the tanker was first engaged in the trade of carrying crude oil or by the end of the third voyage carrying crude oil suitable for crude oil washing, whichever occurs later. Except that the carried crude oil is not suitable as crude oil washing, such the oil tanker is to use the tank cleaning system in accordance with the requirement of this section.
3.2.7 Any oil tanker which is not required to be provided with segregated ballast tanks in accordance with 3.1.2 of this chapter may, however, be qualified as a segregated ballast tanker, provided that it complies with the requirements of 3.2.2 and 3.2.3 or 3.2.5, as appropriate, of this chapter.

3.3 Crude oil washing requirements

3.3.1 Every crude oil washing system required to be provided in accordance with 3.2.6 of this chapter is to comply with the requirements of this section.
3.3.2 Crude oil washing installation and associated equipment and arrangements are to comply with the relevant requirements①.
3.3.3 Every cargo tank and slop tank are to be fitted with an inert gas system.
3.3.4 With respect to the ballasting of cargo tanks. sufficient cargo tanks are to be crude oil washed prior to each ballast voyage in order that, taking into account the tanker's trading pattern and expected weather conditions, ballast water is put only into cargo tanks which have been crude oil washed.
3.3.5 Every oil tanker operating with crude oil washing systems is to be provided with an Operations and Equipment Manual② detailing the system and equipment and specifying operational procedures. Such a Manual is to contain all the information set out in the specifications referred to in 3.3.2. If an alteration affecting the crude oil washing system is made, the Operations and Equipment Manual is to be revised accordingly.

3.4 Double hull and double bottom requirements for oil tankers

3.4.1 This requirement of this paragraph is to apply to oil tankers of 600 tonnes deadweight and above.
3.4.2 Every oil tanker of 5,000 tonnes deadweight and above is to:
(1) comply with the requirements of 3.4.3 of this chapter; and
(2) comply, if applicable, with the requirements of 3.7.6 of this chapter.
3.4.3 The entire cargo tank length is to be protected by ballast tanks or spaces other than tanks that carry oil as follows:
(1) Wing tanks or spaces
Wing tanks or spaces are to extend either for the full depth of the ship's side or from the top of the double bottom to the uppermost deck, disregarding a rounded gunwale where fitted. They are to be arranged such that the cargo tanks are located inboard of the moulded line of the side shell plating nowhere less than the distance *w*, which, as shown in figure 3.4.3, is measured at any cross-section at right angles to the side shell, as specified below:



① Refer to the revised Specifications for the design, operation and control of crude oil washing systems adopted by IMO by resolution A.446(XI), as amended by resolution A.497(XII) and as further amended by resolution A.897(21).
② Refer to the Standard Format of the Crude Oil Washing Operation and Equipment Manual adopted by the Marine Environment Protection Committee of IMO by resolution MEPC.3(XII), as amended by resolution MEPC.8l(43).

Figure 3.4.3 Cargo tank boundary lines

$$w = 0.5 + \frac{DW}{20{,}000}\ (\text{m}) \text{ or}$$

w = 2.0 m, whichever is the lesser.

The minimum value of w = 1.0 m .

(2) Double bottom tanks or spaces

At any cross-section, the depth of each double bottom tank or space is to be such that the distance h between the bottom of the cargo tanks and the moulded line of the bottom shell plating measured at right angles to the bottom shell plating as shown in figure 3.4.3 is not less than specified below:

$$h = \frac{B}{15}\ (\text{m}) \text{ or}$$

h = 2.0 m, whichever is the lesser.

The minimum value of h = 1.0 m.

(3) Turn of the bilge area or at locations without a clearly defined turn of the bilge

When the distances h and w are different, the distance w is to have preference at levels exceeding 1.5 h above the baseline as shown in figure 3.4.3.

(4) The aggregate capacity of ballast tanks

On crude oil tankers of 20,000 tonnes deadweight and above and product carriers of 30,000 tonnes deadweight and above, the aggregate capacity of wing tanks, double bottom tanks, forepeak tanks and after peak tanks are not to be less than the capacity of segregated ballast tanks necessary to meet the requirements of 3.2.2 of this chapter. Wing tanks or spaces and double bottom tanks used to meet the requirements of 3.2.2 of this chapter are to be located as uniformly as practicable along the cargo tank length. Additional segregated ballast capacity provided for reducing longitudinal hull girder bending stress, trim, etc. may be located anywhere within the ship.

(5) Suction wells in cargo tanks

Suction wells in cargo tanks may protrude into the double bottom below the boundary line defined by the distance h provided that such wells are as small as practicable and the distance between the well bottom and bottom shell plating is not less than 0.5 h.

(6) Ballast and cargo piping

Ballast piping and other piping such as sounding and vent piping to ballast tanks are not to pass through cargo tanks. Cargo piping and similar piping to cargo tanks are not to pass through ballast tanks. No requirement for the above may be granted for short lengths of piping, provided that they are completely welded or equivalent.

3.4.4 Other methods of design and construction of oil tankers may also be accepted as alternatives to the requirements prescribed in 3.4.3 of this chapter, provided that such methods ensure at least the same level of protection against oil pollution in the event of collision or stranding and are approved in principle by the Marine Environment Protection Committee based on guidelines① developed by IMO.

3.4.5 Every oil tanker of less than 5,000 tonnes deadweight is to comply with 3.4.3 of this chapter, or is to:

(1) at least be fitted with double bottom tanks or spaces having such a depth that the distance h specified in 3.4.3(2) of this chapter complies with the following:

$$h = \frac{B}{15}\ (\text{m})\ ;$$

with a minimum value of h = 0.76 m;

in the turn of the bilge area and at locations without a clearly defined turn of the bilge, the cargo tank boundary line is to run parallel to the line of the midship flat bottom as shown in figure 3.4.4; and

① Refer to the Revised Interim Guidelines for the approval of alternative methods of design and construction of oil tankers adopted by the Marine Environment Protection Committee of IMO by resolution MEPC.110(49).

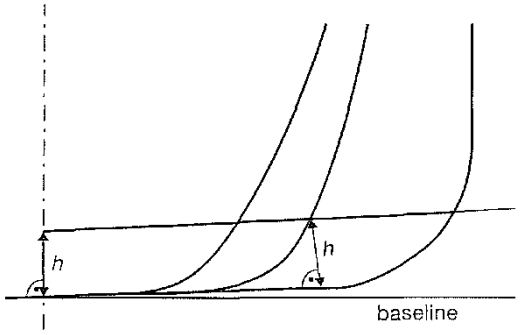


Figure 3.4.4 Cargo tank boundary lines

(2) be provided with cargo tanks so arranged that the capacity of each cargo tank does not exceed 700 m^3 unless wing tanks or spaces are arranged in accordance with 3.4.3(1) of this chapter, complying with the following:

$$w = 0.4 + \frac{2.4DW}{20{,}000}\ (\text{m})$$

,

with a minimum value of w = 0.76 m.

3.4.6 Oil is not to be carried in any space extending forward of a collision bulkhead. An oil tanker that is not required to have a collision bulkhead in accordance with this paragraph is not to carry oil in any space extending forward of the transverse plane perpendicular to the centreline that is located as if it were a collision bulkhead located in accordance with this paragraph.

3.4.7 In approving the design and construction of oil tankers to be built in accordance with the provisions of this paragraph, attentions is to be paid to the general safety aspects, including the need for the maintenance and inspections of wing and double bottom tanks or spaces.

3.5 Pump-room bottom protection

3.5.1 This paragraph applies to oil tankers of 5,000 tonnes deadweight and above.

3.5.2 The pump-room is to be provided with a double bottom such that at any cross-section the depth of each double bottom tank or space is to be such that the distance h between the bottom of the pump-room and the ship's baseline measured at right angles to the ship's baseline is not less than specified below:

$$h = \frac{B}{15}\ (\text{m})$$

h = 2 m, whichever is the lesser.

The minimum value of h = 1 m.

3.5.3 In case of pump-rooms whose bottom plate is located above the baseline by at least the minimum height required in 3.5.2 above (e.g., gondola stern designs), there will be no need for a double bottom construction in way of the pump-room.

3.5.4 Ballast pumps are to be provided with suitable arrangements to ensure efficient suction from double bottom tanks.

3.5.5 Notwithstanding the provisions of 3.5.2 and 3.5.3 above, where the flooding of the pump-room would not render the ballast or cargo pumping system inoperative, a double bottom need not be fitted.

3.6 Accidental oil outflow performance

3.6.1 For the purpose of this paragraph, the following definitions are to apply:

(1) *Load line draught (d_s)* is the vertical distance, in metres, from the moulded baseline at mid-length to the waterline corresponding to the summer freeboard to be assigned to the ship. Calculations pertaining to this paragraph should be based on draught d_s, notwithstanding assigned draughts that may exceed d_s, such as the tropical load line.

(2) *Waterline (d_B)* is the vertical distance, in metres, from the moulded baseline at mid-length to the waterline corresponding to 30% of the depth D_s.

(3) *Breadth* (B_s) is the greatest moulded breadth of the ship, in metres, at or below the deepest load line draught d_s .

(4) *Breadth* (B_B) is the greatest moulded breadth of the ship, in metres, at or below the waterline d_B.

(5) *Depth* (D_s) is the moulded depth, in metres, measured at mid-length to the upper deck at side.
(6) *Length (L)* means 96% of the total length on a waterline at 85% of the least moulded depth measured from the top of the keel, or the length from the foreside of the stem to the axis of the rudder stock on that waterline, if that be greater. In ships designed with a rake of keel the waterline on which this length is measured is to be parallel to the designed waterline. The length *(L)* is to be measured in metres.
(7) *Deadweight (DW)* means the difference in tonnes between the displacement of a ship in water of a relative density of 1.025 at the load waterline corresponding to the assigned summer freeboard and the lightweight of the ship.
3.6.2 To provide adequate protection against oil pollution in the event of collision or stranding, the following is to be complied with:
(1) for oil tankers of 5,000 tonnes deadweight (DWT) and above, the mean oil outflow parameter is to be as follows:

$$O_M \leq 0.015 \text{ for } C \leq 200{,}000 \text{ m}^3$$

$$O_M \leq 0.012 + \frac{0.003}{200{,}000}(400{,}000 - C)$$

$$\text{for } 200{,}000 \text{ m}^3 < C < 400{,}000 \text{ m}^3$$

$$O_M \leq 0.012 \text{ for } C \geq 400{,}000 \text{ m}^3$$

for combination carriers between 5,000 tonnes deadweight (DWT) and 200,000 m^3 capacity, the mean oil outflow parameter maybe applied, provided calculations are submitted to the satisfaction of CCS, demonstrating that, after accounting for its increased structural strength, the combination carrier has at least equivalent oil outflow performance to a standard double hull tanker of the same size having a $O_M \leq 0.015$.

$$O_M \leq 0.021 \text{ for } C \leq 100{,}000 \text{ m}^3$$

$$O_M \leq 0.015 + \left(\frac{0.006}{100{,}000}\right)(200{,}000 - C)$$

$$\text{for } 100{,}000 \text{ m}^3 < C \leq 200{,}000 \text{ m}^3$$

where: O_M = mean oil outflow parameter;
C = total volume of cargo oil, in m^3, at 98% tank filling.
(2) for oil tankers of less than 5,000 tonnes deadweight (DWT):
the length of each cargo tank is not to exceed 10 m or one of the following values, whichever is the greater:

① where no longitudinal bulkhead is provided inside the cargo tanks:

$\left(0.5\frac{b_i}{B} + 0.1\right)L$ but not to exceed *0.2L*

② where a centreline longitudinal bulkhead is provided inside the cargo tanks:

$\left(0.25\frac{b_i}{B} + 0.15\right)L$

③ where two or more longitudinal bulkheads are provided inside the cargo tanks:
(a) for wing cargo tanks: 0.2 *L*
(b) for centre cargo tanks:

ⓐ if $\frac{b_i}{B} \geq 0.2L$: $0.2L$

ⓑ if $\frac{b_i}{B} < 0.2L$:

-- where no centreline longitudinal bulkhead is provided:

$\left(0.5\frac{b_i}{B} + 0.1\right)L$

-- where a centreline longitudinal bulkhead is provided:

$\left(0.25\frac{b_i}{B} + 0.15\right)L$

④ b_i is the minimum distance from the ship's side to the outer longitudinal bulkhead of the tank in question measured inboard at right angles to the centreline at the level

corresponding to the assigned summer freeboard.

3.6.3 The following general assumptions are to apply when calculating the mean oil outflow parameter:

(1) The cargo block length extends between the forward and aft extremities of all tanks arranged for the carriage of cargo oil, including slop tanks.

(2) Where this paragraph refers to cargo tanks, it is to be understood to include all cargo tanks, slop tanks and fuel tanks located within the cargo block length.

(3) The ship is to be assumed loaded to the load line draught d_s without trim or heel.

(4) All cargo oil tanks are to be assumed loaded to 98% of their volumetric capacity. The nominal density of the cargo oil (ρ_n) is to be calculated as follows:

$$\rho_n = \frac{1{,}000(DWT)}{C} \text{ (kg/m}^3\text{)}$$

(5) For the purposes of these outflow calculations, the permeability of each space within the cargo block, including cargo tanks, ballast tanks and other non-oil spaces, is to be taken as 0.99, unless proven otherwise.

(6) Suction wells may be neglected in the determination of tank location provided that such wells are as small as practicable and the distance between the well bottom and bottom shell plating is not less than 0.5 h, where h is the height as defined in 3.4.3(2).

3.6.4 The following assumptions are to be used when combining the oil outflow parameters:

(1) The mean oil outflow is to be calculated independently for side damage and for bottom damage and then combined into the non-dimensional oil outflow parameter O_M, as follows:

$$O_M = \frac{0.4O_{MS} + 0.6O_{MB}}{C}$$

where: O_{MS} = mean outflow for side damage, in m^3; and
O_{MB} = mean outflow for bottom damage, in m^3.

(2) For bottom damage, independent calculations for mean outflow are to be done for 0 m and minus 2.5 m tide conditions, and then combined as follows:

$O_{MB} = 0.7\ O_{MB(0)} + 0.3\ O_{MB(2.5)}$

where: $O_{MB(0)}$ = mean outflow for 0 m tide condition; and
$O_{MB(2.5)}$ = mean outflow for minus 2.5 m tide condition, in m^3.

3.6.5 The mean outflow for side damage O_{MS} is to be calculated as follows:

$$O_{MS} = C_3 \sum_i^n P_{S(i)} O_{S(i)} \quad (\text{m}^3)$$

where: i represents each cargo tank under consideration;
n = total number of cargo tanks;
$P_{S(i)}$ = the probability of penetrating cargo tank i from side damage, calculated in accordance with 3.6.7(1);
$O_{S(i)}$ = the outflow, in m^3, from side damage to cargo tank i, which is assumed equal to the total volume in cargo tank i at 98% filling, unless it is proven through the application of the Guidelines referred to in 3.4.5 of this chapter that any significant cargo volume will be retained; and
C_3 = 0.77 for ships having two longitudinal bulkheads inside the cargo tanks, provided these bulkheads are continuous over the cargo block and $P_{S(i)}$ is developed in accordance with this section. C_3 equals 1.0 for all other ships or when $P_{S(i)}$ is developed in accordance with this section.

3.6.6 The mean outflow for bottom damage is to be calculated for each tidal condition as follows:

(1) $$O_{MB(0)} = \sum_i^n P_{B(i)} O_{B(i)} C_{DB(i)} \quad (\text{m}^3)$$

where: i represents each cargo tank under consideration;
n = the total number of cargo tanks;
$P_{B(i)}$ = the probability of penetrating cargo tank i from bottom damage, calculated in accordance with 3.6.8(1) of this paragraph;
$O_{B(i)}$ = the outflow from cargo tank i, in m^3, calculated in accordance with 3.6.6(3) of this paragraph; and
$C_{DB(i)}$ = factor to account for oil capture as defined in 3.6.6(4) this paragraph.

(2) $O_{MB(2.5)} = \sum_{i}^{n} P_{B(i)} O_{B(i)} C_{DB(i)} \quad (m^3)$

where: i, n, $P_{B(i)}$ and $C_{DB(i)}$ = as defined in (1) above;

$O_{B(i)}$ = the outflow from cargo tank i, in m^3, after tidal change.

(3) The oil outflow $O_{B(i)}$ for each cargo oil tank is to be calculated based on pressure-balance principles, in accordance with the following assumptions:

① The ship is to be assumed stranded with zero trim and heel, with the stranded draught prior to tidal change equal to the load line draught d_s.

② The cargo level after damage is to be calculated as follows:

$$h_c = \frac{(d_S + t_c - Z_l)(\rho_s) - \frac{1{,}000p}{g}}{\rho_n}$$

where: h_c - the height of the cargo oil above Z_l, in metres;

t_c - the tidal change, in metres. Reductions in tide are to be expressed as negative values;

Z_l - the height of the lowest point in the cargo tank above baseline, in metres;

ρ_s - density of seawater, to be taken as 1,025 kg/m^3;

p - if an inert gas system is fitted, the normal overpressure, in kilopascals, to be taken as not less than 5 kPa; if an inert gas system is not fitted, the overpressure may be taken as 0;

g - the acceleration of gravity, to be taken as 9.81 m/s^2; and

ρ_n - nominal density of cargo oil, calculated in accordance with 3.6.3(4) of this section.

③ For cargo tanks bounded by the bottom shell, unless proven otherwise, oil outflow $O_{B(i)}$ is to be taken not less than 1% of the total volume of cargo oil loaded in cargo tank i, to account for initial exchange losses and dynamic effects due to current and waves.

(4) In the case of bottom damage, a portion from the outflow from a cargo tank may be captured by non-oil compartments. This effect is approximated by application of the factor $C_{DB(i)}$ for each tank, which is to be taken as follows:

$C_{DB(i)}$ = 0.6 for cargo tanks bounded from below by non-oil compartments;

$C_{DB(i)}$ = 1.0 for cargo tanks bounded by the bottom shell.

3.6.7 The probability P_s of breaching a compartment from side damage is to be calculated as follows:

(1) $P_s = P_{SL} \cdot P_{SV} \cdot P_{ST}$

where: $P_{SL} = 1 - P_{Sf} - P_{Sa}$ = probability the damage will extend into the longitudinal zone bounded by X_a and X_f;

$P_{SV} = 1 - P_{su} - P_{Sl}$ = probability the damage will extend into the vertical zone bounded by Z_l and Z_u; and

$P_{ST} = 1 - P_{Sy}$ = probability the damage will extend transversely beyond the boundary defined by y.

(2) P_{Sa}, P_{Sf}, P_{Sl}, P_{Su}, and P_{Sy} are to be determined by linear interpolation from the tables of probabilities for side damage provided in 3.6.7(3) of this paragraph,

where: P_{Sa} = the probability the damage will lie entirely aft of location $\frac{X_a}{L}$;

P_{Sf} = the probability the damage will lie entirely forward of location $\frac{X_f}{L}$;

P_{Sl} = the probability the damage will lie entirely below the tank;

P_{Su} = the probability the damage will lie entirely above the tank; and

P_{Sy} = the probability the damage will lie entirely outboard of the tank.

Compartment boundaries X_a, X_f, Z_l, Z_u and y are to be developed as follows:

X_a = the longitudinal distance from the aft terminal of L to the aftmost point on the compartment being considered, in metres;

X_f = the longitudinal distance from the aft terminal of L to the foremost point on the compartment being considered, in metres;

Z_l = the vertical distance from the moulded baseline to the lowest point on the compartment being considered, in metres;

Z_u = the vertical distance from the moulded baseline to the highest point on the compartment being considered, in metres. Z_u is not to be taken greater than D_s; and

y = the minimum horizontal distance measured at right angles to the centreline between the compartment under consideration and the side shell, in metres.①

(3) Tables of probabilities for side damage

$\frac{X_a}{L}$	P_{sa}		$\frac{X_f}{L}$	P_{Sf}		$\frac{Z_l}{D_s}$	P_{Sl}		$\frac{Z_u}{D_s}$	P_{Su}
0.00	0.000		0.00	0.967		0.00	0.000		0.00	0.968
0.05	0.023		0.05	0.917		0.05	0.000		0.05	0.952
0.10	0.068		0.10	0.867		0.10	0.001		0.10	0.931
0.15	0.117		0.15	0.817		0.15	0.003		0.15	0.905
0.20	0.167		0.20	0.767		0.20	0.007		0.20	0.873
0.25	0.217		0.25	0.717		0.25	0.013		0.25	0.836
0.30	0.267		0.30	0.667		0.30	0.021		0.30	0.789
0.35	0.317		0.35	0.617		0.35	0.034		0.35	0.733
0.40	0.367		0.40	0.567		0.40	0.055		0.40	0.670
0.45	0.417		0.45	0.517		0.45	0.085		0.45	0.599
0.50	0.467		0.50	0.467		0.50	0.123		0.50	0.525
0.55	0.517		0.55	0.417		0.55	0.172		0.55	0.452
0.60	0.567		0.60	0.367		0.60	0.226		0.60	0.383
0.65	0.617		0.65	0.317		0.65	0.285		0.65	0.317
0.70	0.667		0.70	0.267		0.70	0.347		0.70	0.255
0.75	0.717		0.75	0.217		0.75	0.413		0.75	0.197
0.80	0.767		0.80	0.167		0.80	0.482		0.80	0.143
0.85	0.817		0.85	0.11		0.85	0.553		0.85	0.092
0.90	0.867		0.90	0.068		0.90	0.626		0.90	0.046
0.95	0.917		0.95	0.023		0.95	0.700		0.95	0.013
1.00	0.967		1.00	0.000		1.00	0.775		1.00	0.000

P_{Sy} is to be calculated as follows:

$$p_{Sy} = \left(24.96 - \frac{199.6y}{B_S}\right)\left(\frac{y}{B_S}\right) \quad \text{for } \frac{y}{B_S} \le 0.05$$

$$p_{Sy} = 0.749 + \left(5 - 44.4\left(\frac{y}{B_S} - 0.05\right)\right)\left(\frac{y}{B_S} - 0.05\right) \quad \text{for } 0.05 < \frac{y}{B_S} < 0.1$$

$$p_{Sy} = 0.888 + 0.56\left(\frac{y}{B_S} - 0.1\right) \quad \text{for } \frac{y}{B_S} \ge 0.1$$

P_{Sy} is not to be taken greater than 1.

3.6.8 The probability P_B of breaching a compartment from bottom damage is to be calculated as follows:

(1) $P_B = P_{BL}\, P_{BT}\, P_{BV}$

where: $P_{BL} = 1 - P_{Bf} - P_{Ba}$ = probability the damage will extend into the longitudinal zone bounded by X_a and X_f;

$P_{BT} = 1 - P_{Bp} - P_{Bs}$ = probability the damage will extend into the transverse zone bounded by Y_p and Y_s; and

$P_{BV} = 1 - P_{Bz}$ = probability the damage will extend vertically above the boundary defined by z.

(2) P_{Ba}, P_{Bf}, P_{BP}, P_{BS}, and P_{Bz} are to be determined by linear interpolation from the tables of probabilities for bottom damage provided in 3.6.8(3) of this section,

① For symmetrical tank arrangements, damages are considered for one side of the ship only, in which case all "y" dimensions are to be measured from that same side. For asymmetrical arrangements, reference is made to the Explanatory Notes on matters related to the accidental oil outflow performance, adopted by IMO by resolution MEPC.122(52), as amended by resolution MEPC.146(54).

where: P_{Ba} = the probability the damage will lie entirely aft of location $\frac{X_a}{L}$;

P_{Bf} = the probability the damage will lie entirely forward of location $\frac{X_f}{L}$;

P_{Bp} = the probability the damage will lie entirely to port of the tank;

P_{Bs} = the probability the damage will lie entirely to starboard of the tank; and

P_{Bz} = the probability the damage will lie entirely below the tank.

Compartment boundaries X_a, X_f, Y_p, Y_s, and z are to be developed as follows:

Y_p = the transverse distance from the port-most point on the compartment located at or below the waterline d_B, to a vertical plane located $B_B/2$ to starboard of the ship's centreline, in metres;

Y_s = the transverse. distance from the starboard-most point on the compartment located at or below the waterline d_B, to a vertical plane located $B_B/2$ to starboard of the ship's centreline, in metres; and

z = the minimum value of z over the length of the compartment, where, at any given longitudinal location, z is the vertical distance from the lower point of the bottom shell at that longitudinal location to the lower point of the compartment at that longitudinal location, in metres .

(3) Tables of probabilities for bottom damage

$\frac{X_a}{L}$	P_{Ba}		$\frac{X_f}{L}$	P_{Bf}		$\frac{Y_p}{B_B}$	P_{Bp}		$\frac{Y_s}{B_B}$	P_{Bs}
0.00	0.000		0.00	0.969		0.00	0.844		0.00	0.000
0.05	0.002		0.05	0.953		0.05	0.794		0.05	0.009
0.10	0.008		0.10	0.936		0.10	0.744		0.10	0.032
0.15	0.017		0.15	0.916		0.15	0.694		0.15	0.063
0.20	0.029		0.20	0.894		0.20	0.644		0.20	0.097
0.25	0.042		0.25	0.870		0.25	0.594		0.25	0.133
0.30	0.058		0.30	0.842		0.30	0.544		0.30	0.171
0.35	0.076		0.35	0.810		0.35	0.494		0.35	0.211
0.40	0.096		0.40	0.775		0.40	0.444		0.40	0.253
0.45	0.119		0.45	0.734		0.45	0.394		0.45	0.297
0.50	0.143		0.50	0.687		0.50	0.344		0.50	0.344
0.55	0.171		0.55	0.630		0.55	0.297		0.55	0.394
0.60	0.203		0.60	0.563		0.60	0.253		0.60	0.444
0.65	0.242		0.65	0.489		0.65	0.211		0.65	0.494
0.70	0.289		0.70	0.413		0.70	0.171		0.70	0.544
0.75	0.344		0.75	0.333		0.75	0.133		0.75	0.594
0.80	0.409		0.80	0.252		0.80	0.097		0.80	0.644
0.85	0.482		0.85	0.170		0.85	0.063		0.85	0.694
0.90	0.565		0.90	0.089		0.90	0.032		0.90	0.744
0.95	0.658		0.95	0.026		0.95	0.009		0.95	0.794
1.00	0.761		1.00	0.000		1.00	0.000		1.00	0.844

P_{Bz} is to be calculated as follows:

$$p_{Bz} = \left(14.5 - \frac{67z}{D_S}\right)\left(\frac{z}{D_S}\right) \qquad \text{for} \frac{z}{D_S} \le 0.1,$$

$$p_{Bz} = 0.78 + 1.1\left(\frac{z}{D_S} - 0.1\right) \qquad \text{for} \frac{z}{D_S} > 0.1.$$

P_{Bz} is not to be taken greater than 1.

3.6.9 This paragraph uses a simplified probabilistic approach where a summation is carried out over the contributions to the mean outflow from each cargo tank. For certain designs, such as those characterized by the occurrence of steps/recesses in bulkheads/decks and for sloping bulkheads and/or a pronounced hull curvature, more rigorous calculations may be appropriate. In such cases one of the following calculation procedures may be applied:

(1) The probabilities referred to in 3.6.7 and 3.6.8 above may be calculated with more precision

through application of hypothetical sub-compartments①.
(2) The probabilities referred to in 3.6.7 and 3.6.8 above may be calculated through direct application of the probability density functions contained in the Guidelines referred to in 3.4.5 of this chapter.
(3) The oil outflow performance may be evaluated in accordance with the method described in the Guidelines referred to in 3.4.5 of this chapter.
3.6.10 The provisions regarding piping arrangements are to apply:
(1) Lines of piping that run through cargo tanks in a position less than $0.30B_s$ from the ship's side or less than $0.30D_s$ from the ship's bottom are to be fitted with valves or similar closing devices at the point at which they open into any cargo tank. These valves are to be kept closed at sea at any time when the tanks contain cargo oil, except that they may be opened only for cargo transfer needed for essential cargo operations.

3.7 Subdivision and stability

3.7.1 Every oil tanker of 150 gross tonnage and above, is to comply with the subdivision and damage stability criteria as specified in 3.7.2, after the assumed side or bottom damage as specified in 3.7.3, for any operating draught reflecting actual partial or full load conditions consistent with trim and strength of the ship as well as relative densities of the cargo. Such damage is to be applied to all conceivable locations along the length of the ship as follows:
(1) in tankers of more than 225 m in length, anywhere in the ship's length;
(2) in tankers of more than 150 m, but not exceeding 225 m in length, anywhere in the ship's length except involving either after or forward bulkhead bounding the machinery space located aft. The machinery space is to be treated as a single floodable compartment; and
(3) in tankers not exceeding 150 m in length, anywhere in the ship's length between adjacent transverse bulkheads with the exception of the machinery space. For tankers of 100 m or less in length where all requirements of 3.7.3 cannot be fulfilled without materially impairing the operational qualities of the ship, relaxations may be allowed from these requirements.
Ballast conditions where the tanker is not carrying oil in cargo tanks, excluding any oil residues, are not to be considered.
3.7.2 The following provisions regarding the extent and the character of the assumed damage are to apply:
(1) Side damage:

① Longitudinal extent: $\frac{1}{3}L^{\frac{2}{3}}$, or 14.5 m, whichever is less

② Transverse extent: $\frac{B}{5}$, or 11.5 m, whichever is less

(inboard from the ship's side at right angles to the centreline at the level of the summer load line)

③ Vertical extent: From the moulded line of the bottom shell plating at centreline, upwards without limit.

(2) Bottom damage:

	For $0.3L$ from the forward perpendicular of the ship	Any other part of the ship
① Longitudinal extent:	$\frac{1}{3}\left(L^{\frac{2}{3}}\right)$ or 14.5 m, whichever is less	$\frac{1}{3}\left(L^{\frac{2}{3}}\right)$ or 5 m, whichever is less
② Transverse extent:	$\frac{B}{6}$ or 10 m, whichever is less	$\frac{B}{6}$ or 5 m, whichever is less
③ Vertical extent:	$\frac{B}{15}$ or 6 m, whichever is less, measured from the moulded line of the bottom shell plating at centreline	$\frac{B}{15}$ or 6 m, whichever is less, measured from the moulded line of the bottom shell plating at centreline

① Reference is made to the Explanatory Notes on matters related to the accidental oil outflow performance, adopted by IMO by resolution MEPC.122(52) and amended by resolution MEPC.146(54).

(3) If any damage of a lesser. extent than the maximum extent of damage specified in (1) and (2) above would result in a more severe condition, such damage is to be considered .
(4) where the damage involving transverse bulkheads is envisaged as specified in 3.7.1(1) and 3.7.1(2), transverse watertight bulkheads are to be spaced at least at a distance equal to the longitudinal extent of assumed damage specified in 3.7.2(1) in order to be considered effective. Where transverse bulkheads are spaced at a lesser distance, one or more of these bulkheads within such extent of damage is to be assumed as non-existent for the purpose of determining flooded compartments.
(5) Where the damage between adjacent transverse watertight bulkheads is envisaged as specified in 3.7.1(3), no main transverse bulkhead or a transverse bulkhead bounding side tanks or double bottom tanks is to be assumed damaged, unless:

① the spacing of the adjacent bulkheads is less than the longitudinal extent of assumed damage specified in 3.7.2(1); or

② there is a step or recess in a transverse bulkhead of more than 3.05 m in length, located within the extent of penetration of assumed damage. The step formed by the after peak bulkhead and after peak top are not to be regarded as a step for the purpose of this paragraph.

(6) If pipes, ducts or tunnels are situated within the assumed extent of damage, arrangements are to be made so that progressive flooding cannot thereby extend to compartments other than those assumed to be floodable for each case of damage.
3.7.3 Oil tankers are to be regarded as complying with the damage criteria if the following requirements are met:
(1) The final waterline, taking into account sinkage, heel and trim, is to be below the lower edge of any opening through which progressive flooding may take place. Such openings are to include air-pipes and those which are closed by means of weathertight doors or hatch covers and may exclude those openings closed by means of watertight manhole covers and flush scuttles, small watertight cargo tank hatch covers which maintain the high integrity of the deck, remotely operated watertight sliding doors, and sidescuttles of the non-opening type.
(2) In the final stage of flooding, the angle of heel due to unsymmetrical flooding are not to exceed 25 °, provided that this angle may be increased up to 30 °if no deck edge immersion occurs.
(3) The stability in the final stage of flooding is to be investigated and may be regarded as sufficient if the righting lever curve has at least a range of 20 °beyond the position of equilibrium in association with a maximum residual righting lever of at least 0.1 m within the 20 °range; the area under the curve within this range is not to be less than 0.0175 m rad. Unprotected openings are not to be immersed within this range unless the space concerned is assumed to be flooded. Within this range, the immersion of any of the openings listed in 3.7.3(1) above and other openings capable of being closed weathertight may be permitted.
(4) It is to be satisfied that the stability is sufficient during intermediate stages of flooding.
(5) Equalization arrangements requiring mechanical aids such as valves or cross-levelling pipes, if fitted, are not to be considered for the purpose of reducing an angle of heel or attaining the minimum range of residual stability to meet the requirements of 3.7.3(1), (2) and (3) and sufficient residual stability are to be maintained during all stages where equalization is used. Spaces which are linked by ducts of a large cross-sectional area may be considered to be common.
3.7.4 The requirements of 3.7.1 above are to be confirmed by calculations which take into consideration the design characteristics of the ship, the arrangements, configuration and contents of the damaged compartments; and the distribution, relative densities and the free surface effect of liquids. The calculations are to be based on the following:
(1) Account is to be taken of any empty or partially filled tank, the relative density of cargoes carried, as well as any outflow of liquids from damaged compartments.
(2) The permeabilities assumed for spaces flooded as a result of damage are to be as figure 3.7.4:

Permeabilities assumed for spaces Figure 3.7.4

Spaces	Permeabilities
Appropriated to stores	0.60
Occupied by accommodation	0.95
Occupied by machinery	0.85
Voids	0.95

Intended for consumable liquids	0 to 0.95①
Intended for other liquids	0 to 0.95①

(3) The buoyancy of any superstructure directly above the side damage is to be disregarded. The unflooded parts of superstructures beyond the extent of damage, however, may be taken into consideration provided that they are separated from the damaged space by watertight bulkheads and the requirements of 3.7.3(1) above in respect of these intact spaces are complied with. Hinged watertight doors may be acceptable in watertight bulkheads in the superstructure.
(4) The free surface effect is to be calculated at an angle of heel of 5° for each individual compartment. The free surface corrections to be calculated at an angle of heel greater than 5° for partially filled tanks may be required or allowed.
(5) In calculating the effect of free surfaces of consumable liquids it is to be assumed that, for each type of liquid, at least one transverse pair or a single centreline tank has a free surface and the tank or combination of tanks to be taken into account is to be those where the effect of free surface is the greatest.
3.7.5 The master of every oil tanker to which this chapter applies and the person in charge of a non-self-propelled oil tanker to which this chapter applies are to be supplied in an approved form with:
(1) information relative to loading and distribution of cargo necessary to ensure compliance with the provisions of this paragraph; and
(2) data on the ability of the ship to comply with damage stability criteria as determined by this paragraph, including the effect of relaxations that may have been allowed under 3.7.1(3) above.
3.7.6 For oil tankers of 20,000 tonnes deadweight and above, the damage assumptions prescribed in 3.7.2(2) above are to be supplemented by the following assumed bottom raking damage:
(1) longitudinal extent:
① ships of 75,000 tonnes deadweight and above:
0.6*L* measured from the forward perpendicular;
② ships of less than 75,000 tonnes deadweight:
0.4*L* measured from the forward perpendicular;
(2) transverse extent: $\frac{B}{3}$ anywhere in the bottom;
(3) vertical extent: breach of the outer hull.

3.8 Slop tanks

3.8.1 Subject to the provisions of 3.12.4 of this chapter, oil tankers of 150 gross tonnage and above are to be provided with slop tank arrangements in accordance with the requirements of 3.8.2 to 3.8.4 below.
3.8.2 Adequate means are to be provided for cleaning the cargo tanks and transferring the dirty ballast residue and tank washings from the cargo tanks into an approved slop tank.
3.8.3 In this system arrangements are to be provided to transfer the oily waste into a slop tank or combination of slop tanks in such a way that any effluent discharged into the sea will be such as to comply with the provisions of 3.12 of this chapter.
3.8.4 The arrangements of the slop tank or combination of slop tanks are to have a capacity necessary to retain the slop generated by tank washings, oil residues and dirty ballast residues. The total capacity of the slop tank or tanks is not to be less than 3% of the oil-carrying capacity of the ship, except that the total capacity of which may be reduced in the following condition:
(1) 2% for such oil tankers where the tank washing arrangements are such that once the slop tank or tanks are charged with washing water, this water is sufficient for tank washing and, where applicable, for providing the driving fluid for eductors, without the introduction of additional water into the system;
(2) 2% where segregated ballast tanks or dedicated clean ballast tanks are provided in accordance with 3.2 of this chapter, or where a cargo tank cleaning system using crude oil washing is fitted in accordance with 3.3 of this chapter. This capacity may be further reduced to 1.5% for such oil

① The permeability of partially filled compartments is to be consistent with the amount of liquid carried in the compartment. Whenever damage penetrates a tank containing liquids, it is to be assumed that the contents are completely lost from that compartment and replaced by salt water up to the level of the final plane of equilibrium.

tankers where the tank washing arrangements are such that once the slop tank or tanks are charged with washing water, this water is sufficient for tank washing and, where applicable, for providing the driving fluid for eductors, without the introduction of additional water into the system; and
(3) 1% for oil/bulk combination carriers where oil cargo is only carried in tanks with smooth walls. This capacity may be further reduced to 0.8% where the tank washing arrangements are such that once the slop tank or tanks are charged with washing water, this water is sufficient for tank washing and, where applicable, for providing the driving fluid for eductors, without the introduction of additional water into the system.

3.8.5 Slop tanks are to be so designed, particularly in respect of the position of inlets, outlets, baffles or weirs where fitted, so as to avoid excessive turbulence and entrainment of oil or emulsion with the water.

3.8.6 Oil tankers of 70,000 tonnes deadweight and above are to be provided with at least two slop tanks.

3.9 Oil discharge monitoring and control system

3.9.1 Subject to the provisions of 3.12.4 of this chapter, oil tankers of 150 gross tonnage and above are to be equipped with an approved oil discharge monitoring and control system.

3.9.2 In considering the design of the oil content meter to be incorporated in the system, attentions are to be paid to the specification recommended by IMO①. The system is to be fitted with a recording device to provide a continuous record of the discharge in litres per nautical mile and total quantity discharged, or the oil content and rate of discharge. This record is to be identifiable as to time and date and is to be kept for at least three years. The oil discharge monitoring and control system is to come into operation when there is any discharge of effluent into the sea and is to be such as will ensure that any discharge of oily mixture is automatically stopped when the instantaneous rate of discharge of oil exceeds that permitted by 3.12.1(4) of this chapter. Any failure of this monitoring and control system is to stop the discharge. In the event of failure of the oil discharge monitoring and control system a manually operated alternative method may be used, but the defective unit is to be made operable as soon as possible. A tanker with a defective oil discharge monitoring and control system may be allowed to undertake one ballast voyage before proceeding to a repair port.

3.9.3 The oil discharge monitoring and control system is to be designed and installed in compliance with the relevant requirements②.

3.9.4 Instructions as to the operation of the system are to be in accordance with an approved operational manual . They are to cover manual as well as automatic operations and are to be intended to ensure that at no time is oil to be discharged except in compliance with the conditions specified in 3.12 of this chapter.

3.10 Oil/water interface detector③

3.10.1 Subject to the provisions of 3.12.4 of this chapter, oil tankers of 150 gross tonnage and above are to be provided with approved effective oil/water interface detectors for a rapid and accurate determination of the oil/water interface in slop tanks and are to be available for use in other tanks where the separation of oil and water is effected and from which it is intended to discharge effluent direct to the sea.

3.11 Pumping, piping and discharge arrangement of oil tanker

3.11.1 In every oil tanker, a discharge manifold for connection to reception facilities for the discharge of dirty ballast water or oil-contaminated water is to be located on the open deck on both sides of the ship.

3.11.2 In every oil tanker of 150 gross tonnage and above, pipelines for the discharge to the sea of ballast water or oil-contaminated water from cargo tank areas which may be permitted under 3.12 of this chapter are to be led to the open deck or to the ship's side above the waterline in the

---

① Refer to the Revised Guidelines and specifications for oil discharge monitoring and control systems for oil tankers adopted by IMO by resolution MEPC.108(49).

② Refer to the Revised Guidelines and specifications for oil discharge monitoring and control systems for oil tankers adopted by IMO by resolution.MEPC.108(49) and amended by IMO by resolution MEPC.240(65).

③ Refer to the Specifications for oil/water interface detectors adopted by MEPC of IMO by resolution MEPC.5(XIII).

deepest ballast condition. Different piping arrangements to permit operation in the manner permitted in 3.11.5 may be accepted.

3.11.3 In oil tankers of 150 gross tonnage and above, means are to be provided for stopping the discharge into the sea of ballast water or oil-contaminated water from cargo tank areas, other than those discharges below the waterline permitted under 3.11.5, from a position on the upper deck or above located so that the manifold in use referred to in 3.11.1 and the discharge to the sea from the pipelines referred to in 3.11.2 may be visually observed. Means for stopping the discharge need not be provided at the observation position if a positive communication system such as a telephone or radio system is provided between the observation position and the discharge control position.

3.11.4 Every oil tanker required to be provided with segregated ballast tanks or fitted with a crude oil washing system, is to comply with the following requirements:

(1) it is to be equipped with oil piping so designed and installed that oil retention in the minimized; and

(2) means are to be provided to drain all cargo pumps and all oil lines at the completion of cargo discharge, where necessary by connection to a stripping device. The line and pump draining are to be capable of being discharged both ashore and to a cargo tank or a slop tank. For discharge ashore a special small diameter line is to be provided and is to be connected outboard of the ship's manifold valves.

3.11.5 On every oil tanker the discharge of ballast water or oil-contaminated water from cargo tank areas is to take place above the waterline, except as follows:

(1) Segregated ballast and clean ballast may be discharged below the waterline:

① in ports or at offshore terminals; or

② at sea by gravity; or

③ at sea by pumps if the ballast water exchange is performed under the provisions of regulation D-1.1 of the International Convention for the Control and Management of Ships' Ballast Water and Sediments;

provided that the surface of the ballast water has been examined immediately before the discharge to ensure that no contamination with oil has taken place.

(2) On every oil tanker at sea, dirty ballast water or oil-contaminated water from tanks in the cargo area, other than slop tanks, may be discharged by gravity below the waterline, provided that sufficient time has elapsed in order to allow oil/water separation to have taken place and the ballast water has been examined immediately before the discharge with an oil/water interface detector referred to in 3.10 of this chapter, in order to ensure that the height of the interface is such that the discharge does not involve any increased risk of harm to the marine environment

3.11.6 Every oil tanker of 150 gross tonnage and above which has installed a sea chest that is permanently connected to the cargo pipeline system, is to be equipped with both a sea chest valve and an inboard isolation valve. In addition to these valves, the sea chest is to be capable of isolation from the cargo piping system whilst the tanker is loading, transporting, or discharging cargo by use of an appropriate positive means. Such an appropriate positive means is a facility (blanks, spectacle blanks, pipeline blinds, evacuation or vacuum systems, or air or water pressure systems and etc.) that is installed in the pipeline system in order to prevent, under all circumstances, the section of pipeline between the sea chest valve and the inboard valve being filled with cargo. In the event that the vaccum systems, or air or water pressure systems are used, then these systems are to be equipped with both a pressure gauge and alarm system to enable the continuous monitoring of the status of the pipeline section, and thereby the valve integrity, between the sea chest and inboard valves.

3.12 Requirements for control of operational discharges of oil

3.12.1 Subject to the provisions of 1.1.2 and 1.2.1 of chapter 1 of this Part and 3.12.2 below, any discharge into the sea of oil or oily mixtures from the cargo area of an oil tanker to which the chapter applies is to be prohibited except when all the following conditions are satisfied:

(1) the tanker is not within a zero-discharge area;

(2) the tanker is more than 50 nautical miles from the nearest land;

(3) the tanker is proceeding *en route;*

(4) the instantaneous rate of discharge of oil content does not exceed 30 litres per nautical mile;

(5) the total quantity of oil discharged into the sea does not exceed for tankers, $\frac{1}{30{,}000}$ of the total

quantity of the particular cargo of which the residue formed a part; and
(6) the tanker has in operation an oil discharge monitoring and control system and a slop tank arrangement as required by 3.8 and 3.9 of this chapter.
3.12.2 The provisions of 3.12.1 above are not to apply to the discharge of clean or segregated ballast.
3.12.3 The requirements of 3.8, 3.9 and 3.10 of this chapter are not to apply to oil tankers of less than 150 gross tonnage, for which the control of discharge of oil is to be effected by the retention of oil on board with subsequent discharge of all contaminated washings to reception facilities. The total quantity of oil and water used for washing and returned to a storage tank is to be discharged to reception facilities unless adequate arrangements are made to ensure that any effluent which is allowed to be discharged into the sea is effectively monitored to ensure that the provisions of 3.12.1 are complied with.
3.12.4 For oil tankers of 150 gross tonnage and above, when meeting all following conditions, the requirements of 3.8, 3.9 and 3.10 of this chapter may be replaced:
(1) the oil tanker is engaged exclusively in the voyages within 50 nautical miles from the nearest land and in the restricted service of 72 h or less in duration;
(2) all oily mixtures are retained on board for subsequent discharge to reception facilities;
(3) adequate reception facilities are available to receive oily mixtures in those oil loading ports or terminals the tanker calls at;
(4) the International Oil Pollution Prevention Certificate is endorsed to the effect that the ship is exclusively engaged in restricted service;
(5) the quantity, time and port of discharge are recorded in the Oil Record Book.

4 Prevention of pollution during transfer of oil cargo between oil tankers at sea

4.1 Scope of application

4.1.1 The section applies to oil tankers of 150 gross tonnage and above engaged in the transfer of oil cargo between oil tankers at sea (STS operations) and their STS operations.
4.1.2 The section is not to apply to oil transfer operations associated with fixed or floating platforms including drilling rigs; floating production, storage and of floating facilities (FPSOs) used for the offshore production and storage of oil; and floating storage units (FSUs) used for the offshore storage of produced oil.
4.1.3 The section is not to apply to bunkering operations.

4.2 General rules

4.2.1 Any oil tanker involved in STS operations is to carry on board a Plan prescribing how to conduct STS operations (STS operations Plan). Each oil tanker's STS operations Plan is to be approved.
4.2.2 The STS operations Plan is to be developed taking into account the information contained in the best practice guidelines for STS operations identified by the Administration①.
4.2.3 Any oil tanker subject to this section and engaged in STS operations is to comply with its STS operations Plan.
4.2.4 Requirements for recording bunkering and oil cargo transfer operations in the Oil Record Book (Cargo/ballast operations) and any records required by the STS operations Plan are to be retained on board for three years and be readily available for inspection by a port State.

① IMO's "Manual on Oil Pollution, Section I, Prevention" as amended, and the ICS and OCIMF "ship to ship Transfer Guide, Petroleum", fourth edition, 2005.

Chapter 3 PROVISIONS FOR THE CONTROL OF POLLUTION BY NOXIOUS LIQUID SUBSTANCES IN BULK

1 General provisions

1.1 Application

1.1.1 Unless expressly provided otherwise, the provisions of this chapter apply to all sea-going ships engaged on non-international voyages and carrying noxious liquid substances in bulk.

1.1.2 Where a cargo subject to the provisions of chapter 2 of this Part is carried in a cargo space of an NLS tanker, the appropriate requirements of chapter 2 of this Part are also to apply.

1.1.3 It may be allowed that any fitting, material, appliance or apparatus to be fitted in a ship as an alternative to control pollution by noxious liquid substances in bulk that required by this chapter if such fitting, material, appliance or apparatus is at least as effective after inspection and test. It is not allowed that the substitution of operational methods to effect the control of discharge of noxious liquid substances as equivalent to those design and construction features which are prescribed by provisions in this chapter.

1.2 Definitions

1.2.1 For the purpose of this chapter:

(1) *Associated piping* means the pipeline from the suction point in a cargo tank to the shore connection used for unloading the cargo and includes all ship's piping, pumps and filters which are in open connection with the cargo unloading line.

(2) *Clean ballast* means ballast water carried in a tank which, since it was last used to carry a cargo containing a substance in category X, Y or Z, has been thoroughly cleaned and the residues resulting therefrom have been discharged and the tank emptied in accordance with the appropriate requirements of this chapter.

(3) *Segregated ballast* means ballast water introduced into a tank permanently allocated to the carriage of ballast or cargoes other than oil or noxious liquid substances as variously defined in the chapters of this Part, and which is completely separated from the cargo and oil fuel system.

(4) *International Bulk Chemical Code* means the International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk adopted by the Marine Environment Protection Committee of IMO by resolution MEPC.19(22), as amended by IMO.

(5) *Depth of water* means the charted depth.

(6) *En route* means that the ship is under way at sea on a course or courses, including deviation from the shortest direct route, which as far as practicable for navigational purposes, will cause any discharge to be spread over as great an area of the sea as is reasonable and practicable.

(7) *Liquid substances* are those having a vapour pressure not exceeding 0.28 MPa absolute at a temperature of 37.8℃.

(8) *Manual* means Procedures and Arrangements Manual in accordance with the model given in appendix IV of Annex II of MARPOL.

(9) *Nearest land* means from the baseline from which the territorial sea in question is drawn by Chinese government.

(10) *Noxious liquid substance* means any substance indicated in the Pollution Category column of chapter 17 or 18 of the International Bulk Chemical Code or provisionally assessed under the provisions of regulation 6.3 of MARPOL Annex II, as falling into category X, Y or Z.

(11) *ppm* means ml/m^3.

(12) *Residue* means any noxious liquid substance which remains for disposal.

(13) *Residue/water mixture* means residue to which water has been added for any purpose (e.g., tank cleaning, ballasting, bilge slops).

(14) *Solidifying substance* means a noxious liquid substance which:

① in the case of a substance with a melting point of less than 15℃, is at a temperature of less than 5℃ above its melting point at the time of unloading; or

② in the case of a substance with a melting point of equal to or greater than 15℃, is at a temperature of less than 10℃ above its melting point at the time of unloading.

(15) *Non-solidifying substance* means a noxious liquid substance, which is not a solidifying substance.

(16) *High-viscosity substance* means a noxious liquid substance in category X or Y with a

viscosity equal to or greater than 50 mPa s at the unloading temperature.
(17) *Low-viscosity substance* means a noxious liquid substance which is not a high-viscosity substance.
(18) *Chemical tanker* means a ship constructed or adapted for the carriage in bulk of any liquid product listed in chapter 17 of the International Bulk Chemical Code.
(19) *NLS tanker* means a ship constructed or adapted to carry a cargo of noxious liquid substances in bulk and includes an "oil tanker" as defined in chapter 2 of this Part when certified to carry a cargo or part cargo of noxious liquid substances in bulk.

1.3 Categorization and listing of noxious liquid substances and other substances

1.3.1 For the purpose of the chapter, noxious liquid substances are to be divided into four categories as follows:
(1) Category X: Noxious liquid substances which, if discharged into the sea from tank cleaning or deballasting operations, are deemed to present a major hazard to either marine resources or human health and, therefore, justify the prohibition of the discharge into the marine environment;
(2) Category Y: Noxious liquid substances which, if discharged into the sea from tank cleaning or deballasting operations, are deemed to present a hazard to either marine resources or human health or cause harm to amenities or other legitimate uses of the sea and therefore justify a limitation on the quality and quantity of the discharge into the marine environment;
(3) Category Z: Noxious liquid substances which, if discharged into the sea from tank cleaning or deballasting operations, are deemed to present a minor hazard to either marine resources or human health and therefore justify less stringent restrictions on the quality and quantity of the discharge into the marine environment;
(4) Other substances: Substances indicated as OS (Other Substances) in the pollution category column of chapter 18 of the International Bulk Chemical Code which have been evaluated and found to fall outside category X, Y or Z as defined in 13.1(1), (2) or (3) of this chapter because they are, at present considered to present no harm to marine resources, human health, amenities or other legitimate uses of the sea when discharged into the sea from tank cleaning or deballasting operations. The discharge of bilge or ballast water or other residues or mixtures containing only substances referred to as "Other Substances" is not to be subject to any requirements of this chapter.
1.3.2 Where it is proposed to carry a liquid substance in bulk which has not been categorized under 1.3.1 of this chapter, application to assess the pollution category of the substance is to be submitted to the flag Administration. The substance is not to be carried before the provisional assessment is not given in accordance with the relevant categorization standards.

2 Requirements for design, construction, arrangement and equipment

2.1 Design, construction, equipment and operations

2.1.1 The design, construction, equipment and operation of ships certified to carry noxious liquid substances of category X, Y or Z in bulk identified in chapter 17 of the International Bulk Chemical Code, are to be in compliance with the provisions of the International Bulk Chemical Code to minimize the uncontrolled discharge into the sea of such substances:
2.1.2 The design, construction, equipment and operation of ships other than chemical tankers or liquefied gas carriers certified to carry noxious liquid substances of category X, Y or Z in bulk identified in chapter 17 of the International Bulk Chemical Code (such as off-shore support vessels), are to be in compliance with the relevant Guidelines developed by IMO①.
2.1.3 For ships certified to carry individually identified vegetable oils identified by the relevant footnote in chapter 17 of the IBC Code, the carriage requirements of 2.1.1 or 2.1.2 of this chapter may be replaced, provided the ship complies with the following conditions:
(1) the NLS tanker is to meet all requirements for ship type 3 as identified in the IBC Code except for cargo tank location;
(2) cargo tanks are to be located at the following distances inboard. The entire cargo tank length is to be protected by ballast tanks or spaces other than tanks that carry oil as follows:
① wing tanks or spaces are to be arranged such that cargo tanks are located inboard of the

① Reference is made to resolutions A.673(16), as amended by resolution MEPC.158(55) by IMO.

moulded line of the side shell plating nowhere less than 760 mm;

② double bottom tanks or spaces are to be arranged such that the distance between the bottom of the cargo tanks and the moulded line of the bottom shell plating measured at right angles to the bottom shell plating is not less than *B*/15 (m) or 2.0 m at the centreline, whichever is the lesser. The minimum distance is to be 1.0 m;

(3) the relevant certificate is to indicate the alternative measures.

2.2 Pumping piping, unloading arrangements and slop tanks

2.2.1 Every ship is to be provided with a pumping and piping arrangement to ensure that each tank certified for the carriage of substances in category X, Y or Z does not retain a quantity of residue in excess of 75 *l* in the tank and its associated piping. A performance test is to be carried out in accordance with appendix V to Annex II of MARPOL.

2.2.2 Pumping performance tests referred to in 2.2.1 is to be approved. Pumping performance tests are to use water as the test medium.

2.2.3 Ships designated to carry substances of category X, Y or Z are to have an underwater discharge outlet (or outlets).

2.2.4 The underwater discharge outlet(or outlets) is(are) to be located within the cargo area in the vicinity of the turn of the bilge and is(are) to be so arranged as to avoid the re-intake of residue/water mixtures by the ship's seawater intakes.

2.2.5 The underwater discharge outlet arrangement is to be such that the residue/water mixture discharged into the sea will not pass through the ship's boundary layer. To this end, when the discharge is made normal to the ship's shell plating, the minimum diameter of the discharge outlet is governed by the following equation:

$$d = \frac{Q_d}{5L_d}$$

where: d = minimum diameter of the discharge outlet (m);

L_d = distance from the forward perpendicular to the discharge outlet (m);

Q_d = the maximum rate selected at which the ship may discharge a residue/water mixture through the outlet (m^3/h).

2.2.6 When the discharge is directed at an angle to the ship's shell plating, the above relationship is to be modified by substituting for Q_d the component of Q_d which is normal to the ship's shell plating.

2.2.7 Although this chapter does not require the fitting of dedicated slop tanks, slop tanks may be needed for certain washing procedures. Cargo tanks may be used as slop tanks.

2.2.8 For a ship whose ballasting of cargo tanks is not required and cargo tank washing is only required for repair or dry-docking, the above requirements of 2.2.1- 2.2.7 may be replaced, provided that all of the following conditions are complied with:

(1) the design, construction and equipment of the ship are approved, having regard to the service for which it is intended;

(2) any effluent from tank washings before a repair or dry-docking is discharged to an reception facility;

(3) the certificate of Fitness for the Carriage of Chemicals or NLS certificate indicates:

① that each cargo tank is granted for the carriage of a restricted number of substances which are comparable and can be carried alternately in the same tank without intermediate cleaning; and

② the particulars of the alternatives;

(4) the ship carries a Manual approved by CCS.

2.3 Requirements for equivalents

2.3.1 The construction and equipment of liquefied gas carriers granted to carry noxious liquid substances listed in the applicable Gas Carrier Code, are to be deemed to be equivalent to the construction and equipment requirements contained in 2.1 and 2.2 of this chapter, provided that the gas carrier meets all following conditions:

(1) hold a Certificate of Fitness in accordance with the appropriate Gas Carrier Code for ships granted to carry liquefied gases in bulk;

(2) hold an International Pollution Prevention Certificate for the Carriage of Noxious Liquid

Substances in Bulk, in which it is indicated that the gas carrier may carry only those noxious liquid substances identified and listed in the appropriate Gas Carrier Code;
(3) be provided with segregated ballast arrangements;
(4) be provided with pumping and piping arrangements which ensure that the quantity of cargo residue remaining in the tank and its associated piping after unloading does not exceed the applicable quantity of residue as required by 2.2.1 of this chapter; and
(5) be provided with a Manual approved by CCS, ensuring that no operational mixing of cargo residues and water will occur and that no cargo residues will remain in the tank after applying the ventilation procedures prescribed in the Manual.

3 Operational discharges of residues of noxious liquid substances

3.1 Control of discharges of residues of noxious liquid substances

3.1.1 Discharge provisions

(1) The discharge into the sea of residues of substances assigned to category X, Y or Z or of those provisionally assessed as such or ballast water, tank washings or other mixtures containing such substances are to be prohibited unless such discharges are made in full compliance with the applicable operational requirements contained in this chapter.
(2) Before any prewash or discharge procedure is carried out in accordance with this paragraph, the relevant tank is to be emptied to the maximum extent in accordance with the procedures prescribed in the Manual.
(3) The carriage of substances which have not been categorized, provisionally assessed or evaluated as referred to in 1.3 of this chapter or of ballast water, tank washings or other mixtures containing such residues is to be prohibited along with any consequential discharge of such substances into the sea.

3.1.2 Discharge standards

(1) Unless the Administration has special provisions, where the provisions in this paragraph allow the discharge into the sea of residues of substances in category X, Y or Z or of those provisionally assessed as such or ballast water, tank washings or other mixtures containing such substances, the following discharge standards are to apply:

① the ship is proceeding *en route* at a speed of at least 7 knots in the case of self-propelled ships or at least 4 knots in the case of ships which are not self-propelled;
② the discharge is made below the waterline through the underwater discharge outlet(s) not exceeding the maximum rate for which the underwater discharge outlet(s) is (are) designed; and
③ the discharge is made at a distance of not less than 12 nautical miles from the nearest land in a depth of water of not less than 25 m.

3.1.3 Ventilation of cargo residues

(1) If ventilation procedures are used to remove cargo residues from a tank, such procedures are to be approved by CCS. Any water subsequently introduced into the tank is to be regarded as clean and is not to be subject to the discharge requirements in this chapter.

3.1.4 The use of cleaning agents or additives

(1) When a washing medium other than water, such as mineral oil or chlorinated solvent, is used instead of water to wash a tank, its discharge is to be governed by the provisions of either chapter 2 or this chapter which would apply to the medium had it been carried as cargo. Tank washing procedures involving the use of such a medium are to be set out in the Manual and are to be approved.
(2) When small amounts of cleaning additives (detergent products) are added to water in order to facilitate tank washing①, no additives containing pollution category X components are to be used except those components that are readily biodegradable and present in a total concentration of less than 10% of the cleaning additive.

3.1.5 Discharge of residues of category X

(1) A tank from which a substance in category X has been unloaded is to be prewashed before the ship leaves the port of unloading. The resulting residues are to be discharged to a reception facility until the concentration of the substance in the effluent to such facility, as indicated by analyses of

① Refer to Revised tank cleaning additives guidance note and reporting form by Circular MEPC.1/Circ.590.

samples of the effluent taken by the surveyor, is at or below 0.1% by weight. When the required concentration level has been achieved, remaining tank washings are to continue to be discharged to the reception facility until the tank is empty. Appropriate entries of these operations are to be made in the Cargo Record Book and endorsed by the surveyor.
(2) Any water subsequently introduced into the tank may be discharged into the sea in accordance with the discharge standards in 3.1.2.
(3) The ship is not required to measure the concentration required by 3.1.5(1) above if in compliance with all the following requirements:

① the tank is prewashed in accordance with a procedure approved in accordance with appendix VI to Annex II of MARPOL; and

② appropriate entries are to be made in the Cargo Record Book and endorsed by the surveyor stated by regulation 16 of Annex II of MARPOL.

3.1.6 Discharge of residues of category Y and Z
(1) With respect to the residue discharge procedures for substances in category Y or Z, the discharge standards in 3.1.2 are to apply.
(2) If the unloading of a substance of category Y or Z is not carried out in accordance with the Manual, a prewash is to be carried out before the ship leaves the port of unloading. The resulting tank washings of the prewash are to be discharged to a reception facility.
(3) For high-viscosity or solidifying substances in category Y, the following is to apply:

① a prewash procedure as specified in appendix VI to Annex II of MARPOL is to be applied;

② the residue/water mixture generated during the prewash is to be discharged to a reception facility until the tank is empty; and

③ any water subsequently introduced into the tank may be discharged into the sea in accordance with the discharge standards in 3.1.2.

(4) Operational requirements for ballasting and deballasting

① After unloading, and, if required, after a prewash, a cargo tank may be ballasted. Procedures for the discharge of such ballast are set out in 3.1.2.

② Ballast introduced into a cargo tank which has been washed to such an extent that the ballast contains less than 1 ppm of the substance previously carried may be discharged into the sea without regard to the discharge rate, ship's speed and discharge outlet location, provided that the ship is not less than 12 nautical miles from the nearest land and in water that is not less than 25 m deep.

③ The discharge into the sea of clean or segregated ballast is not to be subject to the requirements of this chapter.

3.1.7 Notwithstanding the above requirements for prewash in paragraphs 3.1.5 and 3.1.6, a prewash is notrequired where it is satisfied that:
(1) the unloaded tank is to be reloaded with the same substance or another substance compatible with the previous one and that the tank will not be washed or ballasted prior to loading; or
(2) the unloaded tank is neither washed nor ballasted at sea. The prewash in accordance with the applicable paragraph is to be carried out at another port provided that it has been confirmed in writing that a reception facility at that port is available and is adequate for such a purpose; or
(3) the cargo residues will be removed by an approved ventilation procedure.

3.2 Procedures and Arrangements Manual

3.2.1 Every ship granted to carry substances of category X, Y or Z is to have on board a Manual which has been approved by CCS and is in compliance with Regulation 14 of Annex II of MARPOL.
3.2.2 The main purpose of the Manual is to identify for the ship's officers the physical arrangements and all the operational procedures with respect to cargo handling, tank cleaning, slops handling and cargo tank ballasting and deballasting which must be followed in order to comply with the requirements of this chapter.

3.3 Cargo Record Book

3.3.1 Every ship to which this chapter applies is to be provided with a Cargo Record Book in compliance with regulation 15 of Annex II of MARPOL.

4 Prevention of pollution arising from an incident involving noxious liquid substances

4.1 Shipboard marine pollution emergency plan for noxious liquid substances

4.1.1 Every ship of 150 gross tonnage and above to which this chapter applies is to carry on board an approved shipboard marine pollution emergency plan for noxious liquid substances. Such a plan is to be based on the Guidelines① developed by IMO and written in a working language or languages understood by the master and officers.

4.1.2 In the case of ships to which 1.4 of chapter 2 of this Part also applies, such a plan may be combined with "shipboard oil pollution emergency plan". In this case, the title of such a plan is to be "Shipboard marine pollution emergency plan".

① Refer to Guidelines for the development of shipboard marine pollution emergency plans for oil and/or noxious liquid substances, adopted by IMO by resolution MEPC.85(44), as amended by resolution MEPC.l37(53).

Chapter 4 PROVISIONS FOR THE PREVENTION OF POLLUTION BY HARMFUL SUBSTANCES CARRIED BY SEA IN PACKAGED FORM

1 General provisions

1.1 Unless the Administration has special provisions, the ships are to meet the relevant requirements in Annex III of MARPOL (Resolution MEPC.193(61)).

Chapter 5 PROVISIONS FOR THE PREVENTION OF POLLUTION BY SEWAGE FROM SHIPS

1 General provisions

1.1 Application

1.1.1 The provisions of this chapter apply to the following sea-going ships engaged on non-international voyages:

(1) ships of 400 gross tonnage and above; and

(2) ships of less than 400 gross tonnage which are certified to carry more than 15 persons.

1.2 Definitions

1.2.1 For the purpose of this chapter:

(1) *Sewage* means:

① drainage and other wastes from any form of toilets and urinals;

② drainage from medical premises (dispensary, sick bay, etc.) via wash basins, wash tubs and scuppers located in such premises;

③ drainage from spaces containing living animals; or

④ other waste waters when mixed with the drainages defined above.

(2) *Holding tank* means a tank used for the collection and storage of sewage.

(3) *Nearest land* means from the baseline from which the territorial sea of the territory in question is established.

1.3 Discharge of sewage

1.3.1 The discharge of sewage into the sea is prohibited, except when:

(1) the ship is discharging comminuted and disinfected sewage using an approved system in accordance with 1.4.1(2) of this chapter at a distance of more than 3 nautical miles from the nearest land, or sewage which is not comminuted or disinfected, at a distance of more than 12 nautical miles from the nearest land, provided that, in any case, the sewage that has been stored in holding tanks, or sewage originating from spaces containing living animals, is not to be discharged instantaneously but at a moderate rate when the ship is *en route* and proceeding at not less than 4 knots; the rate of discharge is to be approved by CCS based upon the relevant standards①; or

(2) the ship has in operation a sewage treatment plant approved in accordance with 1.4.1(1) of this chapter, additionally, the effluent is not to produce visible floating solids nor cause discoloration of the surrounding water. The test results of the plant are laid down in the ship's International Sewage Pollution Prevention Certificate.

1.3.2 When the sewage is mixed with wastes or waste water covered by other chapters of this Part, the requirements of those corresponding chapters are to be complied with in addition to the requirements of this chapter.

1.4 Requirements for equipment

1.4.1 In order to comply with the requirements for discharging of sewage in 1.3 of this chapter, the ship is at least to be fitted with one of the following equipment:

(1) an approved sewage treatment plant when discharging sewage at a distance of less than 3 nautical miles from the nearest land②;

(2) an approved sewage comminuting and disinfecting system when the ship is discharging sewage only at a distance of more than 3 nautical miles from the nearest land;

(3) a holding tank of the capacity for the retention of all sewage, having regard to the operation of the ship, the number of persons on board and other relevant factors when the ship is discharging

---

① Refer to the Recommendation on standards for the rate of discharge of untreated sewage from ships adopted by the Marine Environment Protection Committee of IMO by resolution MEPC.157(55).

② Refer to the Revised guidelines on implementation of effluent standards and performance tests for sewage treatment plants adopted by the Marine Environment Protection Committee of IMO by resolution MEPC.159(55). For the ships fitted with the sewage treatment plants installed on or after 1 January 2016, refer to 2012 Guidelines on implementation of effluent standards and performance tests for sewage treatment plants adopted by resolution MEPC.227(64).

sewage only at a distance of more than 12 nautical miles from the nearest land①. The holding tank is to have a means to indicate visually the amount of its contents.

1.4.2 The ships to which the chapter applies are to be fitted with the pipeline discharging sewage to the reception facilities, additionally, the pipeline is to be fitted with a standard sewage-discharge connection in compliance with the following figure 1.4.2.

Standard dimensions of flanges for discharge connections Figure 1.4.2

Description	Dimension
Outside diameter	210 mm
Inner diameter	According to pipe outside diameter
Bolt circle diameter	170 mm
Slots in flange	4 holes, 18 mm in diameter, equidistantly placed on a bolt circle of the above diameter, slotted to the flange periphery. The slot width to be 18 mm
Flange thickness	16 mm
Bolts and nuts: quantity and diameter	4, each of 16 mm in diameter and of suitable length
The flange is designed to accept pipes up to a maximum internal diameter of 100 mm and is to be of steel or other equivalent material having a flat face. This flange, together with a suitable gasket, is to be suitable for a service pressure of 600 kPa. For ships having a moulded depth of 5 m and less, the inner diameter of the discharge connection may be 38 mm.	

1.4.3 For ships in dedicated trades, i.e. passenger ferries, alternatively the ship's discharge pipeline may be fitted with an equivalent discharge connection of other types, such as quick-connection couplings.

① When the other clear documents are not supplied, the following calculating methods are to be referred: 1) when the voyage time of the ship from the departing port to the discharge area required by the port Administration exceeds 24 h, 70 L for per person for one day and night is to be taken; 2) when the voyage time is between 8 h to 24 h, 35 L for per person for one day and night is to be taken; 3) when the voyage time is between 4 h to 8 h, 18 L for per person for one day and night is to be taken; 4) when the voyage time is between 1 h to 4 h, 9 L for per person for one day and night is to be taken; 5) when the voyage time is less than 1 h, 6 L for per person for one day and night is to be taken. If the ship is fitted with the toilets of the vacuum type, the above values of the different voyage times may be be reduced by half.

Chapter 6 PROVISIONS FOR THE PREVENTION OF POLLUTION BY GARBAGE FROM SHIPS

1 General provisions

1.1 Unless the Administration has special provisions, the ships are to meet the relevant requirements in Annex V of MARPOL.

Chapter 7 PROVISIONS FOR THE PREVENTION OF AIR POLLUTION FROM SHIPS

1 General provisions

1.1 Application

1.1.1 The provisions of this chapter apply to all the sea-going ships engaged on non-international voyages, except where expressly provided otherwise in this chapter.

1.2 Definitions

1.2.1 For the purpose of this chapter:

(1) *A similar stage of construction* means the stage at which:

① construction identifiable with a specific ship begins; and

② assembly of that ship has commenced comprising at least 50 tonnes or one per cent of the estimated mass of all structural material, whichever is less.

(2) *Continuous feeding* is defined as the process whereby waste is fed into a combustion chamber without human assistance while the incinerator is in normal operating conditions with the combustion chamber operative temperature between 850℃ and 1,200℃.

(3) *Emission* means any release of substances, subject to control by this chapter, from ships into the atmosphere or sea.

(4) *Fuel oil* means any fuel delivered to and intended for combustion purposes for propulsion or operation on board a ship, including gas fuels, distillate and residual fuels.

(5) *Installations* in relation to 2.2 of this chapter means the installation of systems, equipment, including portable fire-extinguishing units, insulation, or other material on a ship, but excludes the repair or recharge of previously installed systems, equipment, insulation or other material, or the recharge of portable fire-extinguishing units.

(6) *Installed* means a marine diesel engine that is or is intended to be fitted on a ship, including a portable auxiliary marine diesel engine, only if its fuelling, cooling or exhaust system is an integral part of the ship. A fuelling system is considered integral to the ship only if it is permanently affixed to the ship. This definition includes a marine diesel engine that is used to supplement or augment the installed power capacity of the ship and is intended to be an integral part of the ship.

(7) *Marine diesel engine* means any reciprocating internal combustion engine operating on liquid or dual fuel, to which 2.3 of this chapter applies, including booster/compound systems if applied.

(8) *NO_x Technical Code* means the Technical Code on Control of Emission of Nitrogen Oxides from Marine Diesel Engines developed by IMO and adopted in 1997, as may be amended .

(9) *Ozone-depleting substances* means controlled substances defined in paragraph (4) of article 1 of the Montreal Protocol on Substances that Deplete the Ozone Layer, 1987, listed in Annexes A, B, C or E to the said Protocol in force at the time of application or interpretation of this chapter. Ozone-depleting substances that may be found on board ship include, but are not limited to:

Halon 1211	Bromochlorodifluoromethane
Halon 1301	Bromotrifluoromethane
Halon 2402	1, 2-Dibromo-l,l,2,2-tetraflouroethane (also known as Halon 114B2)
CFC-11	Trichlorofluoromethane
CFC-12	Dichlorodifluoromethane
CFC-113	1, 1 , 2-Trichloro-l , 2, 2-trifluoroethane
CFC-114	1, 2-Dichloro-l, 1 , 2, 2-tetrafluoroethane
CFC-115	Chloropentafluoroethane

(10) *Sludge oil* means sludge from the fuel oil or lubricating oil separators, waste lubricating oil from main or auxiliary machinery, or waste oil from bilge water separators, oil filtering equipment or drip trays.

(11) *Shipboard incineration* means the incineration of wastes or other matter on board a ship, if such wastes or other matter were generated during the normal operation of that ship.

(12) *Shipboard incinerator* means a shipboard facility designed for the primary purpose of incineration.

(13) *Ships constructed* means ships the keels of which are laid or that are at a similar stage of construction.

2 Requirements for control of emissions from ships

2.1 General provisions

2.1.1 Subject to the provisions of 1.2.1 of Chapter 1 of this PART, all the ships to which the applications of this chapter apply are to meet the following requirements.

2.2 Ozone-depleting substances

2.2.1 Installations that contain ozone-depleting substances, other than hydrochlorofluorocarbons, are to be prohibited.

2.2.2 Installations that contain hydrochlorofluorocarbons are to be prohibited:

(1) on ships constructed on or after 1 January 2020; or

(2) in the case of ships constructed before 1 January 2020, which have a contractual delivery date of the equipment to the ship on or after 1 January 2020 or, in the absence of a contractual delivery date, the actual delivery of the equipment to the ship on or after 1 January 2020.

2.3 Nitrogen oxides (NO_x)

2.3.1 This paragraph is to apply to:

(1) each marine diesel engine with a power output of more than 130 kW installed on a ship; and

(2) each marine diesel engine with a power output of more than 130 kW that undergoes a major conversion.

2.3.2 This paragraph does not apply to an emergency engine or a marine diesel engine installed on any device or equipment intended to be used solely for emergencies in lifeboats.

2.3.3 For the purpose of this paragraph, *major conversion* means a modification of a marine diesel engine where:

(1) the engine is replaced by a non-identical marine diesel engine or the installation of an additional marine diesel engine, or

(2) any substantial modification, as defined in the revised NO_x Technical Code 2008, is made to the engine, or

(3) the maximum continuous rating of the engine is increased by more than 10% compared to the maximum continuous rating of the original certification of the engine.

2.3.4 The emission of nitrogen oxides (calculated as the total weighted emission of NO_2) from a marine diesel engine applicable to this paragraph is to be within the following limits,:

(1) 14.4 g/kWh when n is less than 130 rpm;

(2) 44.0 x $n^{(-0.23)}$ g/kWh when n is 130 or more but less than 2,000 rpm;

(3) 7.7 g/kWh when n is 2,000 rpm or more.

where n = rated engine speed (crankshaft revolutions per minute).

The test procedure and calculation method are to meet the requirements of NO_x Technical Code 2008 and the test cycles and weighting factors listed in appendix II to Annex VI of MARPOL.

2.4 Sulphur oxides (SO_x) and particulate matter(PM)

2.4.1 The sulphur content of any fuel oil used on board ships is not to exceed the following limits:

(1) 3.50% m/m prior to 1 January 2020;

(2) 0.50% m/m on and after 1 January 2020.

2.4.2 The sulphur content of fuel oil referred to in 2.4.1 above is to be documented by its supplier as required by paragraph 2.6 of this chapter.

2.4.3 For the requirements of 2.4.1 above, an approved exhaust gas cleaning system① may be used to achieve the emission level of SO_X equivalent to the sulphur content of the fuel oil specified in 2.4.1.

2.5 Shipboard incineration

2.5.1 Except as provided in 2.5.4, shipboard incineration is to be allowed only in a shipboard

① Refer to 2009 Guidelines for exhaust gas cleaning system adopted by IMO by MEPC.184(59) , as may be amended.

incinerator.

2.5.2 Each incinerator installed on board a ship is to meet the requirements contained in appendix IV to Annex VI of MARPOL, and to be approved in accordance with the requirements[①].

2.5.3 Shipboard incineration of the following substances is to be prohibited:

(1) residues of cargoes subject to Annex I, II and III of MARPOL or related contaminated packing materials;

(2) polychlorinated biphenyls (PCBs);

(3) garbage, as defined by Annex V of MARPOL, containing more than traces of heavy metals;

(4) refined petroleum products containing halogen compounds;

(5) sewage sludge and sludge oil either of which is not generated on board the ship; and

(6) exhaust gas cleaning system residues.

2.5.4 Shipboard incineration of sewage sludge and sludge oil generated during normal operation of a ship may also take place in the main or auxiliary power plant or boilers, but in those cases, is not to take place inside ports, harbours and estuaries.

2.5.5 Shipboard incineration of polyvinyl chlorides (PVCs) is to be prohibited, except in shipboard incinerators specified in 2.5.2 of this chapter.

2.5.6 Incinerators installed in accordance with the requirements of 2.5.2 are to be provided with a manufacturer's operating manual, which is to specify how to operate the incinerator within the limits described in item 2 in appendix IV to Annex VI of MARPOL.

2.5.7 Personnel responsible for the operation of an incinerator are to be trained to implement the guidance provided in the manufacturer's operating manual.

2.5.8 The combustion chamber gas outlet temperature is to be monitored at all times the unit is in operation. Where that incinerator is of the continuous-feed type, waste is not to be fed into the unit when the combustion chamber gas outlet temperature is below 850 ℃. Where that incinerator is of the batch-loaded type, the unit is to be designed so that the combustion chamber gas outlet temperature is to reach 600 ℃ within five minutes after start-up.

2.6 Fuel oil quality

2.6.1 Fuel oil for combustion purposes delivered to and used on board ships is to meet the following requirements:

(1) except as provided in (2) below:

① the fuel oil is to be blends of hydrocarbons derived from petroleum refining. This is not to preclude the incorporation of small amounts of additives intended to improve some aspects of performance;

② the fuel oil is to be free from inorganic acid; and

③ the fuel oil is not to include any added substance or chemical waste that:

(a) jeopardizes the safety of ships or adversely affects the performance of the machinery, or

(b) is harmful to personnel, or

(c) contributes overall to additional air pollution.

(2) fuel oil for combustion purposes derived by methods other than petroleum refining is not to:

① exceed the applicable sulphur content set forth in 2.4.1 of this chapter;

② cause an engine to exceed the applicable NO_x emission limit set forth in 2.3.4 of this chapter;

③ contain inorganic acid; or

④ result in the situations described in 2.6.1(1)③(a), (b) or (c) above.

2.6.2 For each ship subject to the application of this chapter, details of fuel oil for combustion purposes delivered to and used on board are to be recorded by means of a bunker delivery note that is to contain at least the information specified in appendix V to Annex VI of MARPOL.

2.6.3 The bunker delivery note is to be kept on board the ship in such a place as to be readily available for inspection at all reasonable times. It is to be retained for a period of three years after the fuel oil has been delivered on board.

2.6.4 The bunker delivery note is to be accompanied by a representative sample of the supplied

① Refer to Standard specification for shipboard incinerators by MEPC.76(40), as amended by resolution MEPC.93(45), or 2014 Standard specification for shipboard incinerators adopted by resolution MEPC.244(66).

fuel oil. The sample is to be sealed and signed by the supplier's representative①, and the master or officer in charge of the bunker operation on completion of bunkering operations and retained under the ship's control until the fuel oil is substantially consumed, but in any case for a period of not less than 12 months from the time of delivery.

2.6.5 The requirements in 2.6.2, 2.6.3 and 2.6.4 above do not apply to gas fuels such as liquefied natural gas, compressed natural gas or liquefied petroleum gas. The sulphur content of gas fuels delivered to a ship specifically for combustion purposes on board that ship is to be documented by the supplier.

① Refer to Guidelines for the sampling of fuel oil for determination of compliance with the revised Annex VI of MARPOL adopted by resolution MEPC.182(59).

Chapter 8 PROVISIONS FOR CONTROL OF POLLUTION BY HARMFUL ANTI-FOULING SYSTEMS ON SHIPS

1 General provisions

1.1 Unless the flag Administration has special provisions, the ships are to meet the relevant requirements in IMO International Convention on the Control of Harmful Anti-fouling Systems on ships, 2001 (“AFS Convention” in short form).