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Amendments to the Rules for the Classification of Naval Ships

Amendments to Pt B, Ch 8, Sec 9: “Arrangement of Hull and Superstructure Openings”

(Reason: introduction of criteria for acceptance of glasses chemically reinforced and glasses with strength properties different from those of standard ones)

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SECTION 9 ARRANGEMENT OF HULL AND SUPERSTRUCTURE OPENINGS

1 General

1.1 Application

1.1.1 The requirements of this Section apply to the arrangement of hull and superstructure openings excluding hatchways, for which the requirements in Sec 7 apply.

1.2 Definitions

1.2.1 Standard height of superstructure

The standard height of superstructure is that defined in Tab 1.

1.2.2 Standard sheer

The standard sheer is that defined according to regulation 38 of the International Load Line Convention 1966, as amended.

1.2.3 Exposed zones

Exposed zones are the boundaries of superstructures or deckhouses set in from the ship's side at a distance less than or equal to 0,04 B.

1.2.4 Unexposed zones

Unexposed zones are the boundaries of deckhouses set in from the ship's side at a distance greater than 0,04 B.

2 External openings

2.1 General

2.1.1 All external openings leading to compartments assumed intact in the damage analysis, which are below the final damage waterline, are required to be watertight.

2.1.2 External openings required to be watertight in accordance with [2.1.1] are to be of sufficient strength and, except for cargo hatch covers, are to be fitted with indicators on the bridge.

2.1.3 Openings in the shell plating below the deck limiting the vertical extent of damage are to be kept permanently closed while at sea. Should any of these openings be accessible during the voyage, they are to be fitted with a device which prevents unauthorised opening.

2.1.4 Notwithstanding the requirements of [2.1.3], the Society may authorise that particular doors may be opened at the discretion of the Master, if necessary for the operation of the ship and provided that the safety of the ship is not impaired.

2.1.5 Other closing appliances which are kept permanently closed at sea to ensure the watertight integrity of external openings are to be provided with a notice affixed to each appliance to the effect that it is to be kept closed. Manholes fitted with closely bolted covers need not be so marked.

2.2 Closing devices subjected to weapon firing loads

2.2.1 In addition to the applicable requirements of this Section, the net scantlings of closing devices subjected to weapon firing loads are to be not less that those obtained from the applicable formulae in Chapter 7, where the pressures are to be calculated according to Ch 5, Sec 6, [8].

3 Sidescuttles, windows and skylights

3.1 General

3.1.1 Application

The requirements in [3.1]to [3.4] apply to sidescuttles and rectangular windows providing light and air, located in positions which are exposed to the action of sea and/or bad weather.

Table 1 : Standard height of superstructure *(1/1/2017)*

Lenght L_{LL}, in m	Standard height h_S, in m	
	Raised quarter deck	All other superstructures
$L_{LL} \leq 30$	0,90	1,80
$30 < L_{LL} < 75$	$0,9+0,00667(L_{LL}-30)$	1,80
$75 \leq L_{LL} < 125$	$1,2+0,012(L_{LL}-75)$	$1,8+0,01(L_{LL}-75)$
$L_{LL} \geq 125$	1,80	2,30

Table 2 : Types of sidescuttles

<table>
<tr><td>Zone</td><td colspan="2">Aft of 0,875 L from the aft end</td><td>Fwd of 0,875 L from the aft end</td></tr>
<tr><td>5</td><td colspan="2">Type C</td><td>Type B</td></tr>
<tr><td rowspan="2">4</td><td colspan="2">Protecting openings giving direct access to spaces below the main deck: Type B</td><td rowspan="2">Type B</td></tr>
<tr><td colspan="2">Not protecting openings giving direct access to spaces below the main deck: Type C</td></tr>
<tr><td rowspan="3">3</td><td colspan="2">Exposed zones: Type B</td><td rowspan="3">Type B</td></tr>
<tr><td rowspan="2">Unexposed zones</td><td>Protecting openings giving direct access to spaces below the main deck: Type B</td></tr>
<tr><td>Not protecting openings giving direct access to spaces below the main deck: Type C</td></tr>
<tr><td>2</td><td colspan="2">Type B</td><td>Type A</td></tr>
<tr><td>1</td><td colspan="2">Type A</td><td>Type A</td></tr>
</table>

3.1.2 Sidescuttle definition

Sidescuttles are round or oval openings with an area not exceeding 0,16 m^2. Round or oval openings having areas exceeding 0,16 m^2 are to be treated as windows.

3.1.3 Window definition

Windows are rectangular openings generally, having a radius at each corner relative to the window size in accordance with recognised national or international standards, and round or oval openings with an area exceeding 0,16 m^2.

3.1.4 Number of openings in the shell plating

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

3.1.5 Material and scantlings

Sidescuttles and windows together with their glasses, deadlights and storm covers, if fitted, are to be of approved design and substantial construction in accordance with, or equivalent to, recognised national or international standards.

Non-metallic frames are not acceptable. The use of ordinary cast iron is prohibited for sidescuttles below the main deck.

3.1.6 Means of closing and opening

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

3.1.7 Opening of sidescuttles

All sidescuttles, the sills of which are below the bulkhead deck, are to be of such construction as to prevent effectively any person opening them without the consent of the Master of the ship.

Sidescuttles and their deadlights which are not accessible during navigation are to be closed and secured before the ship leaves port.

The Society, at its discretion, may prescribe that the time of opening such sidescuttles in port and of closing and locking them before the ship leaves port is to be recorded in a log book.

3.2 Opening arrangement

3.2.1 General

Sidescuttles may not be fitted in such a position that their sills are below a line drawn parallel to the main deck at side and having its lowest point 0,025B or 0,5 m, whichever is the greater distance, above the waterline corresponding to the deepest draught.

3.2.2 Sidescuttles below 1,4+0,025B m above the water

Where in 'tweendecks the sills of any of the sidescuttles are below a line drawn parallel to the bulkhead deck at side and having its lowest point 1,4+0,025B m above the water when the ship departs from any port, all the sidescuttles in that 'tweendecks are to be closed watertight and locked before the ship leaves port, and they may not be opened before the ship arrives at the next port. In the application of this requirement, the appropriate allowance for fresh water may be made when applicable.

For any ship that has one or more sidescuttles so placed that the above requirements apply when it is floating at its deepest subdivision load line, the Society may indicate the limiting mean draught at which these sidescuttles are to have their sills above the line drawn parallel to the bulkhead deck at side, and having its lowest point 1,4+0,025B above the waterline corresponding to the limiting mean draught, and at which it is therefore permissible to depart from port without previously closing and locking them and to open them at sea under the responsibility of the Master during the voyage to the next port. In tropical zones as defined in the International Convention on Load Lines in force, this limiting draught may be increased by 0,3 m.

3.2.3 Cargo spaces

No sidescuttles may be fitted in any spaces which are appropriated exclusively for the carriage of cargo or coal.

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

If cargo is carried in such spaces, the sidescuttles and their deadlights are to be closed watertight and locked before the cargo is shipped. The Society, at its discretion, may prescribe that the time of closing and locking is to be recorded in a log book.

3.2.4 Non-opening type sidescuttles

Sidescuttles are to be of the non-opening type in the following cases:

- where they become immersed by any intermediate stage of flooding or the final equilibrium waterplane in any required damage case for ships subject to damage stability regulations
- where they are fitted outside the space considered flooded and are below the final waterline for those ships where the watertight is reduced on account of subdivision characteristics.

3.2.5 Manholes and flush scuttles

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

3.2.6 Ships with several decks

In ships having several decks above the bulkhead deck, such as passenger ships, the arrangement of sidescuttles and rectangular windows is considered by the Society on a case by case basis.

Particular consideration is to be given to the ship side up to the upper deck and the front bulkhead of the superstructure.

3.2.7 Automatic ventilating scuttles

Automatic ventilating sidescuttles, fitted in the shell plating below the bulkhead deck are considered by the Society on a case by case basis.

3.2.8 Window arrangement

Windows may not be fitted below the watertight deck, in first tier end bulkheads or sides of enclosed superstructures and in first tier deckhouses considered as being buoyant in the stability calculations or protecting openings leading below.

In the front bulkhead of a superstructure situated on the upper deck, in the case of substantially increased watertight, rectangular windows with permanently fitted storm covers are acceptable.

3.2.9 Skylights

Fixed or opening skylights are to have glass thickness appropriate to their size and position as required for sidescuttles and windows. Skylight glasses in any position are to be protected from mechanical damage and, where fitted in positions 1 or 2, to be provided with permanently attached robust deadlights or storm covers.

3.2.10 Gangway, and cargo ports

Gangway and cargo ports fitted below the bulkhead deck are to be of sufficient strength. They are to be effectively closed and secured watertight before the ship leaves port, and to be kept closed during navigation.

Such ports are in no case to be so fitted as to have their lowest point below a line positioned 230 mm above the waterline corresponding to the deepest draught.

Unless otherwise granted by the Society, these opening are to open outwards.

The number of such openings is to be the minimum compatible with the design and proper working of the ship.

Where it is permitted to arrange cargo ports and other similar openings with their lower edge below the line specified above, additional features are to be fitted to maintain the watertight integrity.

The fitting of a second door of equivalent strength and watertightness is one acceptable arrangement. A leakage detection device is to be provided in the compartment between the two doors. Drainage of this compartment to the bilges, controlled by a readily accessible screw-down valve, is to be arranged. The outer door is to open outwards.

Arrangements for bow doors and their inner doors, side doors and stern doors and their securing are to be in compliance with the requirements specified in Sec 5 and in Sec 6, respectively.

3.3 Glasses

3.3.1 General *(1/1/2020)*

~~In general, toughened glasses with frames of special type are to be used in compliance with, or equivalent to, recognised national or international standards.~~

~~The use of clear plate glasses is considered by the Society on a case by case basis.~~

In general, the following materials may be used:

- toughened (thermally strengthened) monolithic or laminated glass,
- chemically strengthened laminated glass.

Other materials will be considered on a case-by-case basis.

When chemically strengthened safety glass is used, exposed surfaces are to be subject to regular inspections.

Frames of special type are to be used in compliance with, or equivalent to, recognised national or international standards.

3.3.2 Thickness of toughened glasses in sidescuttles

The thickness of toughened glasses in sidescuttles is to be not less than that obtained, in mm, from Tab 2.

Type A, B or C sidescuttles are to be adopted according to the requirements of Tab 3, where:

- Zone 1 is the zone comprised between a line, parallel to the sheer profile, with its lowest points at a distance above the waterline corresponding to the deepest draught equal to 0,025B m, or 0,5 m, whichever is the greater, and a line parallel to the previous one and located 1,4 m above it
- Zone 2 is the zone located above Zone A and bounded at the top by the main deck
- Zone 3 is the first tier of superstructures or deckhouses
- Zone 4 is the second tier of deckhouses

- Zone 5 is the third and higher tiers of deckhouses.

Table 3 : Thickness of toughened glasses in sidescuttles

Clear light diameter of sidescuttle, in mm	Thickness, in mm		
	Type A Heavy series	Type B Medium series	Type C Light series
200	10	8	6
250	12	8	6
300	15	10	8
350	15	12	8
400	19	12	10
450	Not applicable	15	10

3.3.3 Thickness of toughened glasses in ~~rectangular~~ windows *(1/1/2020)*

The thickness of toughened glasses in rectangular windows is to be not less than that obtained, in mm, from Tab 4.

~~Dimensions of rectangular windows other than those in Tab 4 are considered by the Society on a case by case basis.~~

Table 4 : Thickness of toughened glasses in rectangular windows

Nominal size (clear light) of rectangular window, in mm²	Thickness, in mm		Total minimum of closing appliances of openingtype rectangular windows (1)
	Unexposed zone of first tier, exposed zone of second tier	Unexposed zone of second tier, exposed zone of third tier and above	
300 x 425	10	8	4
355 x 500	10	8	4
400 x 560	12	8	4
450 x 630	12	8	4
500 x 710	15	10	6
560 x 800	15	10	6
900 x 630	19	12	6
1000 x 710	19	12	8
1100 x 800	Not applicable	15	8

(1) Swing bolts and circular hole hinges of glass holders of opening type rectangular windows are considered as closing appliances.

The minimum required thickness, t_o, of glasses for windows with dimensions and materials other than those indicated in Tab 4 are to be calculated according the following formulas:

Rectangular windows:

$$t_o = b \cdot \sqrt{\frac{\beta \cdot p}{1000 \cdot \sigma_A}}$$

Circular windows:

$$t_o = 0,5 \cdot d \sqrt{\frac{1,21 \cdot p}{1000 \cdot \sigma_A}}$$

where:

b is the shorter side of the rectangular windows, (mm).

d is the diameter of the circular windows (mm).

β is the coefficient given below:

- β for circular windows is to be taken as 0,284
- β for rectangular windows

  $\beta = 0,54*(a/b)-0,078(a/b)^2 - 0,17$ per $(a/b) \leq 3$

  $\beta = 0,75$ per $(a/b) > 3$

a is the longest side of the glazing.

p is the lateral pressure, defined in Sec 4, [2.2.2].

σ_a is the flexural strength of the material, in (N/mm²)

$$\sigma_A = \frac{\sigma_C}{\gamma}$$

γ is the safety factor to be taken equal to 4.

σ_C is the characteristic failure strength.

For thermally strengthened glasses the characteristic failure strength σ_C in general is equal to 160 N/mm².

Different values of σ_C can be calculated according [3.3.4].

For chemically strengthened glasses the characteristic failure strength σ_C in general is to be calculated in accordance to [3.3.4].

Different procedures for the evaluation of the characteristic failure strength may be considered by the Society on a case-by-case basis.

3.3.4 ~~Thickness of glasses forming screen bulkheads or internal boundaries of deckhouses~~

~~The thickness of glasses forming screen bulkheads on the side of enclosed promenade spaces and that for rectangular windows in the internal boundaries of deckhouses which are protected by such screen bulkheads are considered by the Society on a case by case basis.~~

~~The Society may require both limitations on the size of rectangular windows and the use of glasses of increased thickness in way of front bulkheads which are particularly exposed to heavy sea.~~

3.3.5 ~~Thickness of glasses subjected to weapon firing loads~~

~~The thickness of glasses subjected to weapon firing dynamic loads is to be not less than the value obtained, in mm, from the following formulae:~~

$$t = 17,5d \sqrt{\frac{p_W}{\sigma_{ALL}}} \text{ for sidescuttles}$$

$$t = 31,6s\sqrt{\beta\frac{p_W}{\sigma_{ALL}}} \text{ for windows}$$

where

p_w : pressure, in kN/m², induced by weapon firing dynamic loads, to be calculated according to the requirements specified in Ch 5, Sec 6, [8], as the case may be

d : clear light diameter, in m, of the sidescuttle

s : clear light diameter, in m, of the sidescuttle

β : coefficient to be obtained in Fig 1

σ_{ALL} : allowable stress, in N/mm². For toughened glasses, in general, it is to be taken equal to:

σ_{ALL} = 40 N/mm²

Other values may be accepted if adequate documentation is provided to the Society.

For glasses built in two or more layers, t is the equivalent thickness of the single layer glass having the same strength of the multiple layer glass under consideration.

3.3.6 *(1/1/2017)*

For windows and sidescuttles with dimensions different from those indicated in Tab 2 and Tab 4the thickness calculation of the glasses is to be obtained according to Standard ISO 21005, considering the pressure indicated in Sec 4, [2.2.2].

3.3.7 3.3.4 Calculation of the characteristic failure strength *(1/1/2020)*

The characteristic flexural strength of glass materials may be determined by flexural four point bending test according to ISO 1288-3.

A Declaration of conformity from the Manufacturer to the test according to ISO 1288-3 is to be provided for every glazing fitted on board. All the characteristics of the glass have to be declared to be at least equal or higher than those reported in the test report.

The test is valid for:

- the same thickness of monolithic glass or the same laminated cross section
- the same composition of glass and interlayer material
- the same treatment.

Different procedures for the evaluation of the characteristic failure strength may be considered by the Society on a case-by-case basis.

The breaking position is to occur inside the loading rolls. The specimens where the breaking occurs outside the loading rolls is to be disregarded. There shall be at least 10 specimens where the breaking occurred inside the loading rolls.

The characteristic failure strength, σ_C, determined by mechanical tests is:

$\sigma_C = \sigma_{av} (1 - Kn\ C_v)$

Where:

- σ_{av} average value:

$$\sigma_{av} = \frac{1}{N} \cdot \sum_{i=1}^{N} \sigma_i$$

where:

N = number of test specimens (at least 10).

σ_i breaking stress (MPa) for each test specimen tested in accordance with ISO 1288-3.

- Kn statistic coefficient corresponding to 90% confidence limit. This value depends on the number of test specimens, N, according to the t-Student statistical distribution, see Tab 5.

Table 5 *(1/1/2020)*

Number of test specimens N	Kn
10	1,833
11	1,812
12	1,796
13	1,782
14	1,771
15	1,761
20	1,729
25	1,711
30	1,699
40	1,685
60	1,671
100	1,660
∞	1,645

- C_v coefficient of variation:

$$C_v = \frac{S_x}{\sigma_{av}}$$

where:

S_x standard deviation:

$$s_x = \sqrt{\frac{\sum_{i=1}^{N} (\sigma_i - \sigma_{av})^2}{N-1}}$$

When a laminated glass is made of two or more plies of different thickness, the smaller characteristic strength among the ones tested in accordance with ISO 1288-3 of different thickness is to be used in the calculation of t_e. The equivalent thickness t_{eq} of the laminated glass is to be calculated in

accordance to [3.3.5] and the laminate construction is acceptable when $t_{eq} \geq t_o$.

The characteristic flexural strength of a laminated glass can be used for the calculation of the thickness required t_o defined in [3.3.3]. In this case, the physical thickness of the laminate t_{Lam} is acceptable when $t_{Lam} \geq t_o$.

3.3.8 3.3.5 Calculation of equivalent thickness of a laminated glass *(1/1/2020)*

Once the required monolithic thickness t_o is calculated, the following procedure is to be followed to check if the laminated glass proposed has an equivalent monolithic thickness higher than the required one and is therefore acceptable. This procedure takes into consideration the possibility of having independent plies or collaborating plies:

a) Independent plies:

When the mechanical properties of the interlayer material (the laminating adhesive material) are not known, the plies of the laminated glazing have to be considered as mechanically independent.

The equivalent thickness of laminates made of n independent plies of thicknesses: t_{p1}, t_{p2}, ..., t_{pn}, shall be calculated and compared with the basic thickness, t_O, calculated as explained above.

The equivalent thickness of n independent plies shall be calculated as follows. The thickness of one ply of the laminate is indicated generically as, t_j, where the index j is ranging from 1 to n.

For each ply of the laminate a partial equivalent thickness, $t_{eq,j}$, is calculated as:

$$t_{eq,j} = \sqrt{\frac{\sum_{i=1}^{N} t_i^3}{t_j}}$$

and the equivalent thickness of the laminate t_{eq} shall be the minimum of the n $t_{eq,j}$ values:

$$t_{eq} = \min[t_{eq,j}]; \qquad j = 1, n$$

The laminate construction is accepted when $t_{eq} \geq t_o$

b) Collaborating plies:

When the mechanical properties of the interlayer are known in terms of shear modulus, G (N/mm^2), at 25 °C for 60 s duration load, the equivalent thickness shall be calculated as follows:

$$t_{eq} = \min[t_{1ef;\sigma}, t_{2ef;\sigma}]$$

where:

$$t_{1ef;\sigma} = \sqrt{\frac{t_{eq;w}^3}{t_1 + 2 \cdot \Gamma \cdot t_{s;2}}} \qquad t_{2ef;\sigma} = \sqrt{\frac{t_{eq;w}^3}{t_2 + 2 \cdot \Gamma \cdot t_{s;1}}}$$

where:

- t_1 ply thickness (mm);
- t_2 ply thickness (mm);
- Γ Shear transfer coefficient evaluation:

$$\Gamma = \frac{1}{1 + 9,6 \cdot \frac{E}{G} \cdot \frac{Is}{hs^2} \cdot \frac{t_i}{b^2}}$$

t_i interlayer thickness (mm);

b shortest clear opening dimension of the glazing laminate (mm);

E Young's modulus of the glass ply (N/mm^2);

G shear modulus of the interlayer at 25 °C (N/mm^2).

Acceptable value for polyvinylbutyral (PVB) is: G = 1,6 N/mm^2. For other interlayer materials the shear modulus value at 25 °C for short time duration load (60 s) shall be declared by the interlayer material Manufacturer in form of a Statement where evidence of the test carried out to calculate G is given.

In case this value is not known the plies shall be considered independent.

If for the interlayer a value is available only for Young's modulus, E (MPa), a shear modulus may be assumed as G = E/3.

$$Is = t_1 \cdot t_{s;2}^2 + t_2 \cdot t_{s;1}^2$$

where:

$$t_{s;2} = \frac{hs \cdot t_2}{t_1 + t_2}; \qquad t_{s;1} = \frac{hs \cdot t_1}{t_1 + t_2}$$

$$hs = 0,5 \cdot (t_1 + t_2) + t_1$$

- $t_{eq,w}$ Equivalent thickness evaluation:

$$t_{eq;w} = \sqrt[3]{t_1^3 + t_2^3 + 12 \cdot \Gamma \cdot Is}$$

In case of 3 or more plies the calculation is to be iterated.

The laminate construction is accepted when $t_{eq} \geq t_o$

Laminate made of plies of different materials will be specially considered.

3.4 Deadlight arrangement

3.4.1 General

Sidescuttles to the following spaces are to be fitted with efficient, hinged inside deadlights:

- spaces below the main deck
- spaces within the first tier of enclosed superstructures
- first tier deckhouses on the main deck protecting openings leading below or considered buoyant in stability calculations.

3.4.2 Watertight deadlights

Efficient, hinged inside deadlights so arranged that they can be easily and effectively closed and secured watertight, are to be fitted to all sidescuttles except that abaft one eighth of

the ship's length from the forward perpendicular and above a line drawn parallel to the bulkhead deck at side and having its lowest point at a height of 3,7+0,025B m above the waterline corresponding to the deepest draught.

3.4.3 Openings at the side shell in the second tier

Sidescuttles and windows at the side shell in the second tier, protecting direct access below or considered buoyant in the stability calculations, are to be provided with efficient, hinged inside deadlights capable of being effectively closed and secured weathertight.

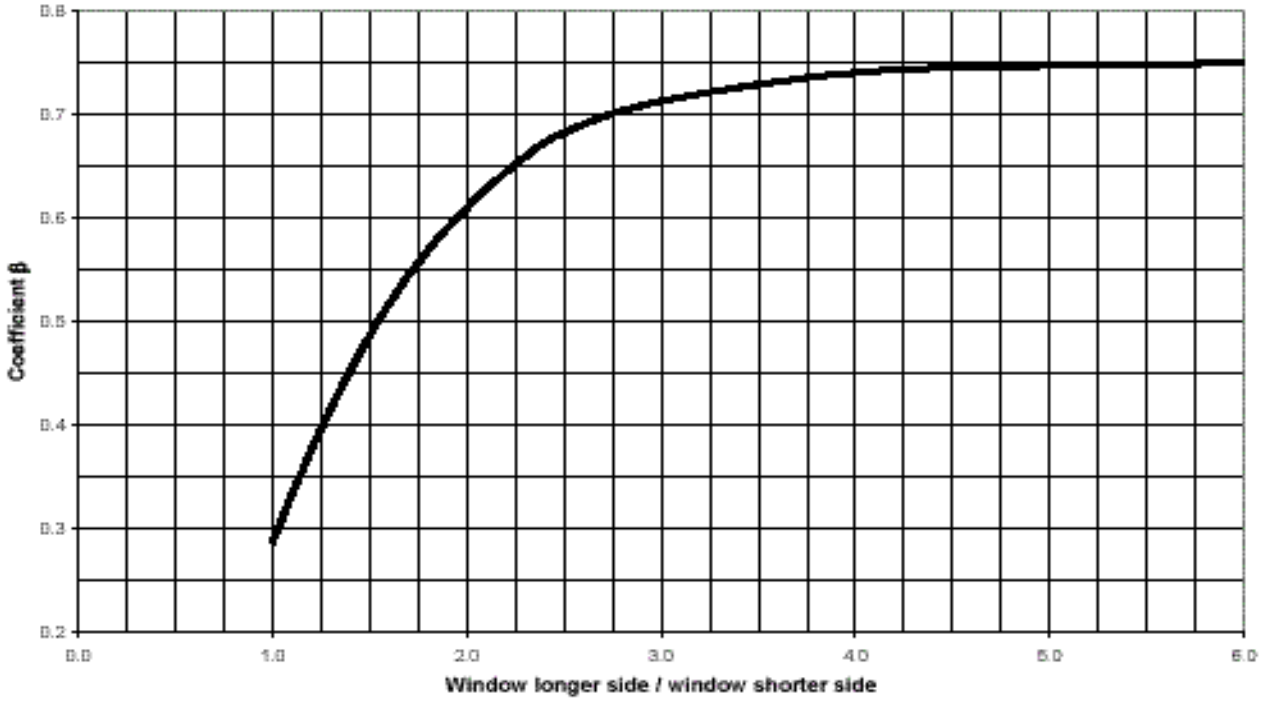
3.4.4 Openings set inboard in the second tier

Sidescuttles and windows set inboard from the side shell in the second tier, protecting direct access below to spaces listed in [3.4.1] are to be provided with either efficient, hinged inside deadlights or, where they are accessible, permanently attached external storm covers of approved design and substantial construction capable of being effectively closed and secured weathertight.

Cabin bulkheads and doors in the second tier separating sidescuttles and windows from a direct access leading below may be accepted in place of fitted deadlights or storm covers.

Note 1: Deadlights in accordance with recognised standards are fitted to the inside of windows and sidescuttles, while storm covers of comparable specifications to deadlights are fitted to the outside of windows, where accessible, and may be hinged or portable.

Figure 1 : ~~Coefficent~~ β-



3.4.5 Deckhouses on superstructures of less than standard height

Deckhouses situated on a raised quarterdeck or on a superstructure of less than standard height may be treated as being on the second tier as far as the provision of deadlights is concerned, provided the height of the raised quarterdeck or superstructure is not less than the standard quarterdeck height.

3.4.6 Openings protected by a deckhouse

Where an opening in a superstructure deck or in the top of a deckhouse on the main deck which gives access to a space below the main deck or to a space within an enclosed superstructure is protected by a deckhouse, then it is considered that only those sidescuttles fitted in spaces which give direct access to an open stairway need to be fitted with deadlights.

4 Discharges

4.1 Arrangement of discharges

4.1.1 Inlets and discharges

All inlets and discharges in the shell plating are to be fitted with efficient and accessible arrangements for preventing the accidental admission of water into the ship.

4.1.2 Inboard opening of ash-shoot, rubbish-shoot, etc.

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

If the inboard opening is situated below the bulkhead deck, the cover is to be watertight, and in addition an automatic non-return valve is to be fitted in the shoot in an easily

accessible position above the waterline corresponding to the deepest draught. When the shoot is not in use, both the cover and the valve are to be kept closed and secured.

4.2 Arrangement of garbage chutes

4.2.1 Inboard end above the waterline

The inboard end is to be located above the waterline formed by an 8,5° heel, to port or starboard, at the deepest draught but not less than 1000 mm above the waterline corresponding to the deepest draught.

Where the inboard end of the garbage chute exceeds 0,01L above the waterline corresponding to the deepest draught, valve control from the main deck is not required, provided the inboard gate valve is always accessible under service conditions.

4.2.2 Inboard end below the waterline

Where the inboard end of a garbage chute is below the margin line then:

- the inboard end hinged cover/valve is to be watertight
- the valve is to be a screw-down non-return valve fitted in an easily accessible position above the waterline corresponding to the deepest draught
- the screw-down non-return valve is to be controlled from a position above the bulkhead deck and provided with open/shut indicators. The valve control is to be clearly marked: "Keep closed when not in use".

4.2.3 Gate valves

For garbage chutes, two gate valves controlled from the working deck of the chute may be accepted instead of a non-return valve with a positive means of closing it from a position above the main deck. In addition, the lower gate valve is to be controlled from a position above the main deck. An interlock system between the two valves is to be arranged.

The distance between the two gate valves is to be adequate to allow the smooth operation of the interlock system.

4.2.4 Hinged cover and discharge flap

The upper gate valve, as required in [4.2.3], may be replaced by a hinged weathertight cover at the inboard end of the chute together with a discharge flap which replaces the lower gate valve.

The cover and discharge flap are to be arranged with an interlock so that the flap cannot be operated until the hopper cover is closed.

4.2.5 Marking of valve and hinged cover

The gate valve controls and/or hinged cover are to be clearly marked: "Keep closed when not in use".

4.3 Scantlings of garbage chutes

4.3.1 Material

The chute is to be constructed of steel. Other equivalent materials are considered by the Society on a case by case basis.

4.3.2 Wall thickness

The wall thickness of the chute up to and including the cover is to be not less than that obtained, in mm, from Tab 5.

Table 6 : Wall thickness of garbage chutes

External diameter d, in mm	Thickness, in mm
$d \le 80$	7,0
$80 < d < 180$	7,0 + 0,03 (d - 80)
$180 \le d \le 220$	10,0 + 0,063 (d - 180)

5 Freeing ports

5.1 General provisions

5.1.1 General

Where bulwarks on the weather portions of main or superstructure decks form wells, ample provision is to be made for rapidly freeing the decks of water and for draining them.

A well is any area on the deck exposed to the weather, where water may be entrapped. Wells are considered to be deck areas bounded on four sides by deck structures; however, depending on their configuration, deck areas bounded on three or even two sides by deck structures may be deemed wells.

5.1.2 Freeing port areas

The minimum required freeing port areas in bulwarks on the main deck are specified in Tab 6.

Table 7 : Freeing port area in bulwark located on main deck

Ship types or ship particulars	Area A of freeing ports, in m^2	Applicable requirement
Ships fitted with a trunk included in freeboard calculation and/or breadth ≥ 0,6B	$0,33\ \ell_B\ h_B$	[5.3.1]
Ships fitted with continuous or substantially continuous trunk and/or hatch coamings	A_2	[5.3.1]
Ships fitted with non-continuous trunk and/or hatch coamings	A_3	[5.3.2]
Ships fitted with open superstructure	A_S for superstructures A_W for wells	[5.4.2] [5.4.3]
Other ships	A_1	[5.2.1]

Note 1:

ℓ_B : Length, in m, of bulwark in a well at one side of the ship

h_B : Mean height, in m, of bulwark in a well of length ℓ_B.

5.1.3 Freeing port arrangement

Where a sheer is provided, two thirds of the freeing port area required is to be provided in the half of the well nearer the lowest point of the sheer curve.

One third of the freeing port area required is to be evenly spread along the remaining length of the well.

Where the exposed main deck or an exposed superstructure deck has little or no sheer, the freeing port area is to be spread along the length of the well.

However, bulwarks may not have substantial openings or accesses near the breaks of superstructures, unless they are effectively detached from the superstructure sides.

5.1.4 Freeing port positioning

The lower edge of freeing ports is to be as near the deck as practicable, at not more than 100 mm above the deck.

All the openings in the bulwark are to be protected by rails or bars spaced approximately 230 mm apart.

5.1.5 Freeing port closures

If shutters or closures are fitted to freeing ports, ample clearance is to be provided to prevent jamming. Hinges are to have pins or bearings of non-corrodible material. If shutters are fitted with securing appliances, these appliances are to be of approved construction.

5.1.6 Gutter bars

Gutter bars greater than 300 mm in height fitted around the weather decks of tankers, in way of cargo manifolds and cargo piping, are to be treated as bulwarks. The freeing port area is to be calculated in accordance with the applicable requirements of this Section.

5.2 Freeing port area in a well not adjacent to a trunk or hatchways

5.2.1 Freeing port area

Where the sheer in way of the well is standard or greater than the standard, the freeing port area on each side of the ship for each well is to be not less than that obtained, in m^2, in Tab 7.

In ships with no sheer, the above area is to be increased by 50%. Where the sheer is less than the standard, the percentage of increase is to be obtained by linear interpolation.

Wells on raised quarterdecks are to be treated as being on main decks.

5.2.2 Minimum freeing port area for a deckhouse having breadth not less than 0,8 B

Where a flush deck ship is fitted amidships with a deckhouse having breadth not less than 0,8 B and the width of the passageways along the side of the ship less than 1,5 m, the freeing port area is to be calculated for two separate wells, before and abaft the deckhouse. For each of these wells, the freeing port area is to be obtained from Tab 7, where ℓ_B is to be taken equal to the actual length of the well considered (in this case the limitation $\ell_B \leq 0,7$ L may not be applied).

5.2.3 Minimum freeing port area for screen bulkhead

Where a screen bulkhead is fitted across the full breadth of the ship at the fore end of a midship deckhouse, the weather deck is to be considered as divided into two wells, irrespective of the width of the deckhouse, and the freeing port area is to be obtained in accordance with [5.2.1].

Table 8 : Freeing port area in a well not adjacent to a trunk or hatchways

Location	Area A_1 of freeing ports, in m^2	
	$\ell_B \leq 20$	$\ell_B > 20$
main deck and raised quarterdecks	$0,7 + 0,035\ell_B + A_C$	$0,07\ell_B + A_C$
Superstructure decks	$0,35 + 0,0175\ell_B + 0,5A_C$	$0,035\ell_B + 0,5A_C$

Note 1:

ℓ_B : Length, in m, of bulwark in the well, to be taken not greater than 0,7 L

A_C : Area, in m^2, to be taken, with its sign, equal to:

$$A_C = \frac{\ell_W}{25}(h_B - 1,2) \quad \text{for } h_B > 1,2$$

$$A_C = 0 \quad \text{for } 0,9 \leq h_B \leq 1,2$$

$$A_C = \frac{\ell_W}{25}(h_B - 0,9) \quad \text{for } h_B < 0,9$$

h_B : Mean height, in m, of the bulwark in a well of length ℓ_B.

5.3 Freeing port area in a well contiguous to a trunk or hatchways

5.3.1 Freeing area for continuous trunk or continuous hatchway coaming

Where the ship is fitted with a continuous trunk not included in the calculation of damage stability or where continuous or substantially continuous hatchway side coamings are fitted between detached superstructures, the freeing port area is to be not less than that obtained, in m^2, from Tab 8.

Table 9 : Freeing port area in a well contiguous to a continuous trunk or hatchways

Breadth B_H, in m, of hatchway or trunk	Area A_2 of freeing ports, in m^2
$B_H \le 0,4B$	$0,2\ \ell_B\ h_B$
$0,4B < B_H < 0,75B$	$\left[0,2 - 0,286\left(\frac{B_H}{B} - 0,4\right)\right]\ell_B h_B$
$B_H \ge 0,75B$	$0,1\ \ell_B\ h_B$

Note 1:

ℓ_B : Length, in m, of bulwark in a well at one side of the ship

h_B : Mean height, in m, of bulwark in a well of length ℓ_B.

Where the ship is fitted with a continuous trunk having breadth not less than 0,6 B, included in the calculation of damage stability, and where open rails on the weather parts of the main deck in way of the trunk for at least half the length of these exposed parts are not fitted, the freeing port area in the well contiguous to the trunk is to be not less than 33% of the total area of the bulwarks.

5.3.2 Freeing area for non-continuous trunk or hatchway coaming

Where the free flow of water across the deck of the ship is impeded due to the presence of a non-continuous trunk, hatchway coaming or deckhouse in the whole length of the well considered, the freeing port area in the bulwark of this well is to be not less than that obtained, in m^2, from Tab 9.

5.4 Freeing port area in an open space within superstructures

5.4.1 General

In ships having superstructures on the freeboard or superstructure decks, which are open at either or both ends to wells formed by bulwarks on the open decks, adequate provision for freeing the open spaces within the superstructures is to be provided.

Table 10 : Freeing port area in a well contiguous to non-continuous trunk or hatchways

Free flow area f_P, in m^2	Freeing port area A_3, in m^2
$f_p \le A_1$	A_2
$A_1 < f_P < A_2$	$A_1 + A_2 - f_P$
$f_P \ge A_2$	A_1

Note 1:

f_P : Free flow area on deck, equal to the net area of gaps between hatchways, and between hatchways and superstructures and deckhouses up to the actual height of the bulwark

A_1 : Area of freeing ports, in m^2, to be obtained from Tab 6

A_2 : Area of freeing ports, in m^2, to be obtained from Tab 7.

5.4.2 Freeing port area for open superstructures

The freeing port area on each side of the ship for the open superstructure is to be not less than that obtained, in m^2, from the following formula:

$$A_S = A_1 c_{SH}\left[1 - \left(\frac{\ell_W}{\ell_T}\right)^2\right]\left(\frac{b_0 h_S}{2\,\ell_T h_W}\right)$$

where:

ℓ_T : Total well length, in m, to be taken equal to: $\ell_T = \ell_W + \ell_S$

ℓ_W : Length, in m, of the open deck enclosed by bulwarks

ℓ_S : Length, in m, of the common space within the open superstructures

A_1 : Freeing port area, in m^2, required for an open well of length ℓ_T, in accordance with Tab 6, where A_C is to be taken equal to zero

c_{SH} : Coefficient which accounts for the absence of sheer, if applicable, to be taken equal to:

c_{SH} = 1,0 in the case of standard sheer or sheer greater than standard sheer

c_{SH} = 1,5 in the case of no sheer

b_0 : Breadth, in m, of the openings in the end bulkhead of enclosed superstructures

h_S : Standard superstructure height, in m, defined in [1.2.1]

h_W : Distance, in m, of the well deck above the main deck.

5.4.3 Freeing port area for open well

The freeing port area on each side of the ship for the open well is to be not less than that obtained, in m^2, from the following formula:

$$A_W = A_1 c_{SH}\left(\frac{h_S}{2\,h_W}\right)$$

A_1 : Freeing port area, in m^2, required for an open well of length ℓ_W, in accordance with Tab 7

c_{SH}, h_S, h_W, ℓ_W:Defined in [5.4.2].

The resulting freeing port areas for the open superstructure A_S and for the open well A_W are to be provided along each

side of the open space covered by the open superstructure and each side of the open well, respectively.

6 Machinery space openings

6.1 Engine room skylights

6.1.1 Engine room skylights in positions 1 or 2 are to be properly framed, securely attached to the deck and efficiently enclosed by steel casings of suitable strength. Where the casings are not protected by other structures, their strength will be considered by the Society on a case by case basis.

6.2 Closing devices

6.2.1 Machinery casings

Openings in machinery space casings in positions 1 or 2 are to be fitted with doors of steel or other equivalent materials, permanently and strongly attached to the bulkhead, and framed, stiffened and fitted so that the whole structure is of equivalent strength to the unpierced bulkhead and weathertight when closed. The doors are to be capable of being operated from both sides and generally to open outwards to give additional protection against wave impact.

Other openings in such casings are to be fitted with equivalent covers, permanently attached in their proper position.

6.2.2

Machinery casings are to be protected by an enclosed poop or bridge of at least standard height, or by a deckhouse of equal height and equivalent strength, provided that machinery casings may be exposed if there are no openings giving direct access from the main deck to the machinery spaces.

However, a weathertight door is permitted in the machinery casing, provided that it leads to a space or passageway which is as strongly constructed as the casing and is separated from the stairway to the engine room by a second weathertight door of steel or other equivalent material.

6.2.3 Height of the sill of the door

The height of the sill of the door is to be not less than:

- 600 mm above the deck if in position 1
- 380 mm above the deck if in position 2
- 230 mm in all other cases.

6.2.4 Double doors

Where casings are not protected by other structures, double doors (i.e. inner and outer doors) are required. An inner sill of 230 mm in conjunction with the outer sill of 600 mm is to be provided.

6.2.5 Fiddly openings

Fiddly openings are to be fitted with strong covers of steel or other equivalent material permanently attached in their proper positions and capable of being secured weathertight.

6.3 Coamings

6.3.1

Coamings of any fiddly, funnel or machinery space ventilator in an exposed position on the main deck or superstructure deck are to be as high above the deck as is reasonable and practicable.

In general, ventilators necessary to continuously supply the machinery space and, on demand, the emergency generator room are to have coamings whose height is in compliance with [8.1.2], but need not be fitted with weathertight closing appliances.

Ventilators necessary to continuously supply the emergency generator room, if this is considered buoyant in the stability calculations or protecting an opening leading below, are to have coamings of sufficient height to comply with [8.1.2], without having to fit weathertight closing appliances.

Where, due to the ship's size and arrangement, this is not practicable, lesser heights for machinery space and emergency generator room ventilator coamings, fitted with weathertight closing appliances in accordance with [8.1.3] or [8.1.4], may be permitted by the Society in combination with other suitable arrangements to ensure an uninterrupted, adequate supply of ventilation to these spaces.

7 Companionway

7.1 General

7.1.1 Openings in main deck

Openings in main deck other than hatchways, machinery space openings, manholes and flush scuttles are to be protected by an enclosed superstructure or by a deckhouse or companionway of equivalent strength and weathertightness.

7.1.2 Openings in superstructures

Openings in an exposed superstructure deck or in the top of a deckhouse on the main deck which give access to a space below the main deck or a space within an enclosed superstructure are to be protected by an efficient deckhouse or companionway.

7.1.3 Openings in superstructures having height less than standard height

Openings in the top of a deckhouse on a raised quarterdeck or superstructure of less than standard height, having a height equal to or greater than the standard quarterdeck height are to be provided with an acceptable means of closing but need not be protected by an efficient deckhouse or companionway provided the height of the deckhouse is at least the height of the superstructure.

7.2 Scantlings

7.2.1 Companionways on exposed decks protecting openings leading into enclosed spaces are to be of steel and strongly attached to the deck and are to have adequate scantlings.

7.3 Closing devices

7.3.1 Doors

Doorways in deckhouses or companionways leading to or giving access to spaces below the main deck or to enclosed superstructures are to be fitted with weathertight doors. The doors are to be made of steel, to be capable of being operated from both sides and generally to open outwards to give additional protection against wave impact.

Alternatively, if stairways within a deckhouse are enclosed within properly constructed companionways fitted with weathertight doors, the external door need not be watertight.

Where the closing appliances of access openings in superstructures and deckhouses are not weathertight, interior deck openings are to be considered exposed, i.e. situated in the open deck.

7.3.2 Height of sills

The height above the deck of sills to the doorways in companionways is to be not less than:

- 600 mm in position 1
- 380 mm in position 2.

Where access is not provided from above, the height of the sills to doorways in a poop bridge or deckhouse on the main deck is to be 600 mm.

Where access is provided to spaces inside a bridge or poop from the deck as an alternative to access from the main deck, the height of the sills into the bridge or poop is to be 380 mm. This also applies to deckhouses on the main deck.

8 Ventilators

8.1 Closing appliances

8.1.1 General

Ventilator openings are to be provided with efficient weathertight closing appliances of steel or other equivalent material.

8.1.2 Closing appliance exemption

Ventilators need not be fitted with closing appliances, unless specifically required by the Society, if the coamings extend for more than:

- 4,5 m above the deck in position 1
- 2,3 m above the deck in position 2.

8.1.3 Closing appliances for ships of not more than 100 m in length

In ships of not more than 100 m in length, the closing appliances are to be permanently attached to the ventilator coamings.

8.1.4 Closing appliances for ships of more than 100 m in length

Where, in ships of more than 100 m in length, the closing appliances are not permanently attached, they are to be conveniently stowed near the ventilators to which they are to be fitted.

8.1.5 Ventilation of machinery spaces and emergency generator room

In order to satisfactorily ensure, in all weather conditions:

- the continuous ventilation of machinery spaces,
- and, when necessary, the immediate ventilation of the emergency generator room,

the ventilators serving such spaces are to comply with [8.1.2], i.e. their openings are to be so located that they do not require closing appliances.

8.1.6 Reduced height of ventilator coamings for machinery spaces and emergency generator room

Where, due to the ship's size and arrangement, the requirements in [8.1.5] are not practicable, lesser heights may be accepted for machinery space and emergency generator room ventilator coamings fitted with weathertight closing appliances in accordance with [8.1.1], [8.1.3] and [8.1.4] in combination with other suitable arrangements, such as separators fitted with drains, to ensure an uninterrupted, adequate supply of ventilation to these spaces.

8.1.7 Closing arrangements of ventilators led overboard or through enclosed superstructures

Closing arrangements of ventilators led overboard to the ship side or through enclosed superstructures are considered by the Society on a case by case basis. If such ventilators are led overboard more than 4,5 m above the main deck, closing appliances may be omitted provided that satisfactory baffles and drainage arrangements are fitted.

8.2 Coamings

8.2.1 General

Ventilators in positions 1 or 2 to spaces below main decks or decks of enclosed superstructures are to have coamings of steel or other equivalent material, substantially constructed and efficiently connected to the deck.

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

8.2.2 Scantlings

The scantlings of ventilator coamings exposed to the weather are to be not less than those obtained from Tab 10.

In exposed locations or for the purpose of compliance with buoyancy calculations, the height of coamings may be required to be increased to the satisfaction of the Society.

Table 11 : Scantlings of ventilator coamings

Feature	Scantlings
Height of the coaming, in mm, above the deck	h = 900 in position 1 h = 760 in position 2
Thickness of the coaming, in mm **(1)**	$t = 5,5 + 0,01\ d_v$ with $7,5 \le t \le 10,0$
Support	If h > 900 mm, the coaming is to be suitably stiffened or supported by stays.
(1) Where the height of the ventilator exceeds the height h, the thickness of the coaming may be gradually reduced, above that height, to a minimum of 6,5 mm.	
Note 1:	
d_v : Internal diameter of the ventilator, in mm.	

8.3 Strength check of ventilators subject to green sea loads

8.3.1 Application

The requirements in [8.3] apply to strength checks of the ventilator pipes and their closing devices located within the forward quarter length of the ship, for ships of length 80 m or more, where the height of the exposed deck in way of the item is less than 0,1L or 22 m above the waterline corresponding to the deepest draught, whichever is the lesser.

8.3.2 Green sea loads

The green sea pressure p acting on ventilator pipes and their closing devices is to be obtained, in kN/m, from the following formula:

$$p = 0,5\rho V^2 C_d C_s C_p$$

where:

ρ : density, t/m³, of sea water, to be taken equal to 1,025 t/m³

V : velocity, in m/s, of water over the fore deck, to be taken equal to 13,5 m/sec

C_d : shape coefficient:

- C_d= 0,5 for pipes
- C_d= 1,3 for ventilator heads in genera
- C_d= 0,8 for a ventilator head of cylindrical form with its axis in the vertical direction

C_s : slamming coefficient, to be taken equal to 3,2

C_p : protection coefficient:

- C_p : 0,7 for pipes and ventilator heads located immediately behind a breakwater or forecastle,
- C_p : 1,0 elsewhere and immediately behind a bulwark.

8.3.3 Green sea forces

Forces acting in the horizontal direction on the ventilator and its closing device are to be calculated from [8.3.2]using the largest projected area of each component.

8.3.4 Strength requirements

Bending moments and stresses in ventilator pipes are to be calculated at the following critical positions:

- at penetration pieces
- at weld or flange connections
- at toes of supporting brackets.

Bending stresses in the net section are to be equal to or less than 0,8 R_{eH}, where R_{eH} is the minimum yield stress or 0,2% proof stress, in N/mm^2, of the steel at room temperature, defined in Ch 4, Sec 1, [2]. Irrespective of corrosion protection, a corrosion addition equal to 2.0 mm is then to be applied to the net scantling.

Pipe thicknesses and bracket heights are to be obtained from Tab 11, for standard ventilators of 900 mm height closed by heads having projected area not greater than the one specified in Tab 11.

Where brackets are required, three or more radial brackets are to be fitted. Brackets thickness is to be not less than 8 mm, bracket length is to be not less than 100 mm and bracket height is to be obtained from Tab 11, but need not extend over the joint flange for the head. Bracket toes at the deck are to be suitably supported.

For ventilators of height greater than 900 mm, brackets or alternative means of support are to be fitted. Pipe thickness is not to be taken less than that specified in Pt C, Ch 1, Sec 10, [9.1.8] a).

All component parts and connections of ventilators are to be capable of withstanding the loads defined in [8.3.2].

Rotating type mushroom ventilator heads are deemed not suitable for application in the areas defined in [8.3.1].

9 Tank cleaning openings

9.1 General

9.1.1 Ullage plugs, sighting ports and tank cleaning openings may not be arranged in enclosed spaces.

10 Closure of chain lockers

10.1 General

10.1.1 *(1/1/2017)*

Spurling pipes and chain lockers are to be watertight up to the weather deck.

Bulkheads between separate chain lockers (see Fig 2), or which form a common boundary of chain lockers (see Fig 3), need not however be watertight.

Where means of access is provided, it is to be closed by a substantial cover and secured by closely spaced bolts.

Where a means of access to spurling pipes or cable lockers is located below the weather deck, the access cover and its securing arrangements are to be in accordance with recognised standards (e.g. ISO 5894-1999 or equivalent) for watertight manhole covers. Butterfly nuts and/or hinged bolts are prohibited as the securing mechanism for the access cover.

Table 12 : 900 mm Ventilator Pipe Thickness and Bracket Standards

Nominal pipe diameter (mm)	Minimum fitted gross thickness LL 36(c) (mm)	Maximum projected area of head (cm^2)	Height of brackets (mm)
80A	6.3	-	
100A	7.0	-	
150A	8.5	-	
200A	8.5	550	-
250A	8.5	880	-
300A	8.5	1200	-
350A	8.5	2000	-
400A	8.5	2700	-
450A	8.5	3300	-
500A	8.5	4000	-
Note 1: For other ventilator heights, the relevant requirements in [8.3.4] are to be applied.			

Spurling pipes through which anchor chains are led are to be provided with permanently attached closing appliances to minimise water ingress.

Figure 2 : Separate chain lockers

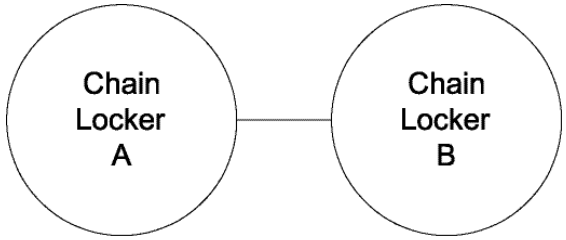


Figure 3 : Chain locker with a common boundary