INTERNATIONAL MARITIME ORGANIZATION

E

SUB-COMMITTEE ON SHIP DESIGN AND CONSTRUCTION
11th session
Agenda item 3

SDC 11/3/2
7 October 2024
Original: ENGLISH
Pre-session public release: ☒

DEVELOPMENT OF GUIDELINES FOR EMERGENCY TOWING ARRANGEMENTS FOR SHIPS OTHER THAN TANKERS

Proposal to revise MSC.1/Circ.1175/Rev.1

Submitted by IACS

SUMMARY

Executive summary:	This document proposes to amend MSC.1/Circ.1175/Rev.1 to update the technical guidance provided by the circular.
Strategic direction, if applicable:	2
Output:	2.20
Action to be taken:	Paragraph 18
Related documents:	SDC 8/16, SDC 8/18 (paragraphs 16.1 and 16.2); MSC 107/17/3, MSC 107/20 (paragraphs 17.13 and 17.14), MSC 107/20/Add.1 (Annex 25); SDC 10/17 (paragraphs 3.13 and 3.14) and MSC 108/20 (paragraphs 15.3 and 15.4)

Background

1 SDC 8 had for its consideration document SDC 8/16 (IACS), proposing to amend the *Revised guidance on shipboard towing and mooring equipment* (MSC.1/Circ.1175/Rev.1) so as to align it with IACS unified requirements (URs) A1 and A2 and Recommendation No.10 (SDC 8/18, paragraph 16.1).

2 Having noted that the proposal to amend MSC.1/Circ.1175/Rev.1 would require a new output proposal, SDC 8 invited IACS to liaise with the interested Member States, with a view to submitting a new output proposal to MSC (SDC 8/18, paragraph 16.2).

3 MSC 107 considered document MSC 107/17/3 (Marshall Islands et al.), proposing a new output to review appendices A and B of the Revised guidance (MSC.1/Circ.1175/Rev.1) (MSC 107/20, paragraph 17.13).

4 Following consideration, MSC 107 agreed to include in its post-biennial agenda an output on "Revision of appendices A and B of the Revised guidance on shipboard towing and mooring equipment (MSC.1/Circ.1175/Rev.1)" (MSC 107/20, paragraph 17.14).

5 SDC 10 agreed to recommend to the Committee to expand the scope of the existing output to incorporate the post-biennial output under the existing output with the following revised output title: "Development of Guidelines for emergency towing arrangements for ships other than tanker and revision of appendices A and B of MSC.1/Circ.1175/Rev.1" (SDC 10/17, paragraph 3.14).

6 MSC 108 agreed to the expansion of output 2.20 on "Development of Guidelines for emergency towing arrangements for ships other than tankers" by moving the output on the "Revision of appendices A and B of the Revised guidance on shipboard towing and mooring equipment (MSC.1/Circ.1175/Rev.1)" from the Committee's post-biennial agenda and including it under existing output 2.20, i.e. to incorporate draft amendments to MSC.1/Circ.1175/Rev.1 deriving from the update of IACS UR A2 and Recommendation No.10 (MSC 108/20, paragraph 15.4).

Exclusion of the requirements for emergency towing arrangements for ships other than tankers in MSC.1/Circ.1175/Rev.1.

7 Currently, MSC.1/Circ.1175/Rev.1 covers "Emergency towing for ships other than tankers" as "other towing".

8 Noting that MSC 107 approved draft amendments to SOLAS regulation II-1/3-4 relating to new requirements of emergency towing for all new ships other than tankers, and Guidelines on emergency towing arrangements for ships other than tankers will be separately developed, the requirements of MSC.1/Circ.1175/Rev.1 should not be applicable to "Emergency towing for ships other than tankers" like "Emergency towing for tankers". However, the circular should still be applied to both "tankers of less than 20,000 tonnes deadweight" and "ships other than tankers of less than 20,000 gross tonnage".

Revisions of IACS URs A1 and A2, and IACS Recommendation No.10

9 MSC.1/Circ.1175/Rev.1, *inter alia*, aligned the provisions of its annex and appendices with IACS requirements and recommendations set out in UR A2/Rev. 4 and Recommendation No.10.

10 Since the approval of MSC.1/Circ.1175/Rev.1, IACS has revised its URs A1 and A2, and Recommendation No. 10 based on IACS members' experience gained through the application thereof.

11 Revision 5 of UR A2 came into force on 1 January 2022. The requirement refers to IACS Recommendation No.10, Rev.4, *inter alia*, containing guidance on mooring restraint. Further, Recommendation No.10 makes reference to UR A1 containing the definition of the Equipment Number. Revision 7 of UR A1 also came into force on 1 January 2022.

12 With revision 5 of UR A2, the determination of deck cargoes' side-projected area was clarified. Deck cargoes at the ship nominal capacity condition should be included for the determination of side-projected area. In the proposed revision of MSC.1/Circ.1175/Rev.1 in the annex, this clarification was included in paragraph 1.3 of appendix A "Mooring and Tow Lines".

13 With revision 4 of Recommendation No.10, the definition of mooring loads for ships with EN > 2,000 was clarified, noting that the loads could be underestimated for some ships in ballast condition. It was clarified that side projected area, A_1, in general, should be calculated on the lightest ballast draft unless cargo is considered in the calculation of the area. In addition, for ships with small variation in draft, e.g. passenger or ro-ro ships, the side projected area can

be calculated at full load draft as considered for the Equipment Number. In the proposed revision of MSC.1/Circ.1175/Rev.1 contained in the annex, this clarification was included in paragraph 3.1.2 of appendix A "Mooring and Tow Lines". In addition, Recommendation No.10 was provided with guidance on direct mooring analysis, which may be performed alternatively to the prescriptive formulations given for the determination of recommended mooring restraint. The further growth in size of some ship types, in particular container ships and cruise ships, inflicted excessive mooring restraint requirements on large new ships, which suggested to provide for means allowing to design more efficient mooring systems than those determined with the existing prescriptive formulations. In the proposed revision of MSC.1/Circ.1175/Rev.1 set out in the annex, this alternative option for the determination of mooring restraint has been included in paragraph 1.4 of appendix A "Mooring and Tow Lines", referring to IACS Recommendation No.10 for guidance.

14 With revision 7 of UR A1, the definition of the Equipment Number was updated to consider increased funnel sizes due to the installation of equipment, such as SO_x scrubbers. In the proposed revision of MSC.1/Circ.1175/Rev.1 contained in the annex, this update was included in appendix B "Equipment Number".

15 In addition to the above-described changes, some minor corrections and editorial changes were included in the proposed revision of MSC.1/Circ.1175/Rev.1 contained in the annex. These are mainly the correction of the caption of table 1 in appendix A "Mooring and Tow Lines" and the replacement of "minimum breaking load" or "minimum breaking strength" by "ship design minimum breaking load" of the mooring lines in several places.

Proposal

16 In order to not apply the requirements of MSC.1/Circ.1175/Rev.1 to Emergency towing for ships other than tankers, IACS proposes a revision of the annex to MSC.1/Circ.1175/Rev.1, as set out in the annex, for the consideration of the Sub-Committee.

17 To align the *Revised guidance on shipboard towing and mooring equipment* with IACS URs A1/Rev.7 and A2/Rev.5, and Recommendation No.10/Rev.4, as far as possible, IACS proposes a further revision of appendices A and B of the annex to MSC.1/Circ.1175/Rev.1, as contained in the annex, for the consideration of the Sub-Committee.

Action requested of the Sub-Committee

18 The Sub-Committee is invited to consider the foregoing, the proposal in paragraphs 16 and 17 and to take action, as appropriate.

***

ANNEX*

DRAFT REVISED MSC.CIRC/1175/Rev.1

SHIPBOARD EQUIPMENT, FITTINGS AND SUPPORTING HULL STRUCTURES ASSOCIATED WITH TOWING AND MOORING

1 Application

1.1 Under regulation II-1/3-8 of the 1974 SOLAS Convention, as adopted by resolution MSC.473(102), new displacement type ships, except high-speed craft and offshore units, shall be provided with arrangements, equipment and fittings of sufficient safe working load to enable the safe conduct of all towing and mooring operations associated with the normal operations of the ship. The arrangements, equipment and fittings shall meet the appropriate requirements of the Administration or an organization recognized by the Administration.

1.2 The Revised guidance on shipboard towing and mooring equipment (MSC.1/Circ.1175/Rev.~~1~~ 2) should apply to ships constructed on or after ~~1 January 2024~~ 1 XXXX 20XX. To ships constructed on or after 1 January 2024 and before 1 XXXX 20XX, the Guidance on shipboard towing and mooring equipment (MSC.1/Circ.1175/Rev.1) should apply. To ships constructed on or after 1 January 2007 and before 1 January 2024, the Guidance on shipboard towing and mooring equipment (MSC.1/Circ.1175) should apply.

1.3 This circular provides standards for the design and construction of shipboard fittings and supporting hull structures associated with normal towing and mooring operations in harbours or sheltered waters, which Administrations are recommended to implement. This circular also contains design guidance for fittings of ships that are further intended to be towed by another ship or tug, e.g. in an emergency. This circular does not require tow lines nor mandate standards for mooring lines on board the ship. Furthermore, this guidance is not applicable to the design and construction of shipboard fittings and supporting hull structures used for special towing services defined as:

.1 Escort towing: Towing service required in some estuaries to control the ship in case of failures of the propulsion or steering system. It should be referred to local escort requirements;

.2 Canal transit towing: Towing service for ships transiting canals, e.g. the Panama Canal. It should be referred to local canal transit requirements;

.3 Emergency towing for tankers of not less than 20,000 tonnes deadweight: Towing service to assist tankers in case of emergency. It should be referred to paragraph 1 of SOLAS regulation II-1/3-4; and

.4 Emergency towing for ships other than tankers of not less than 20,000 gross tonnage: Towing service to assist ships other than tankers in case of emergency. It should be referred to paragraph 2 of SOLAS regulation II-1/3-4.

However, this circular is still applicable to both "tankers of less than 20,000 tonnes deadweight" and "ships other than tankers of less than 20,000 gross tonnage".

1.4 Equipment that is used for both towing and mooring should be in accordance with sections 3 and 4.

…

* The tracked changes are indicated using "strikeout" for deleted text and "grey shading" to highlight all modifications and new insertions, including deleted text.

APPENDIX A

MOORING AND TOW LINES

1 General

1.1 The mooring lines for ships with Equipment Number (EN) of less than or equal to 2,000 are given in section 2. For other ships the mooring lines are given in section 3.

1.2 The applicable provisions for tow lines are given in section 2.

1.3 The EN should be calculated in compliance with appendix B. Deck cargoes ~~as given by the loading manual~~at the ship nominal capacity condition should be included for the determination of side-projected area A. The nominal capacity condition is defined as the theoretical condition where the maximum possible deck cargoes are included in the ship arrangement in their respective positions. For container ships the nominal capacity condition represents the theoretical condition where the maximum possible number of containers is included in the ship arrangement in their respective positions.

1.4 Sections 2 and 3 specify the minimum recommended number and ship design minimum ~~strength~~breaking load of mooring lines (MBL_{SD}). The ship design minimum breaking load is defined as the minimum breaking load of new, dry mooring lines or tow line for which shipboard fittings and supporting hull structures are designed in order to meet mooring restraint requirements or the towing requirements of other towing service. As an alternative to Sections 2 and 3, the minimum recommendation for mooring lines may be determined by direct mooring analysis in line with the guidance given in Appendix A of IACS Recommendation No. 10. The designer should consider verifying the adequacy of mooring lines based on assessments carried out for the individual mooring arrangement, expected shore-side mooring facilities, and expected prevalent environmental conditions.

2 Mooring lines for ships with EN ≤ 2000 and tow lines

2.1 The minimum recommended mooring lines for ships having an EN of less than or equal to 2,000 are given in table 1.

2.2 For ships having the ratio A/EN > 0.9 the following number of lines should be added to the number of mooring lines as given in table 1:

one line where $0.9 < \frac{A}{EN} \leq 1.1$,

two lines where $1.1 < \frac{A}{EN} \leq 1.2$,

three lines where $1.2 < \frac{A}{EN}$

2.3 The tow lines are given in table 1 and are intended as own tow line of a ship to be towed by a tug or another ship.

Table 1: Mooring lines for ships with EN ≤ 2000 and tow lines ~~for ships with EN ≤ 2000~~

EQUIPMENT NUMBER		MOORING LINES		TOW LINE*
Exceeding	Not exceeding	No. of mooring lines	Ship design minimum breaking load (kN)	Ship design minimum breaking load (kN)
1	*2*	*3*	*4*	*5*
50	70	3	37	98
70	90	3	40	98
90	110	3	42	98
110	130	3	48	98
130	150	3	53	98
150	175	3	59	98
175	205	3	64	112
205	240	4	69	129
240	280	4	75	150
280	320	4	80	174
320	360	4	85	207
360	400	4	96	224
400	450	4	107	250
450	500	4	117	277
500	550	4	134	306
550	600	4	143	338
600	660	4	160	370
660	720	4	171	406
720	780	4	187	441
780	840	4	202	479
840	910	4	218	518
910	980	4	235	559
980	1,060	4	250	603
1,060	1,140	4	272	647
1,140	1,220	4	293	691
1,220	1,300	4	309	738
1,300	1,390	4	336	786
1,390	1,480	4	352	836
1,480	1,570	5	352	888
1,570	1,670	5	362	941
1,670	1,790	5	384	1,024
1,790	1,930	5	411	1,109
1,930	2,080	5**	437**	1,168
2,080	2,230	**	**	1,259
2,230	2,380	**	**	1,356
2,380	2,530	**	**	1,453
2,530	-	**	**	1,471

* Information is provided in relation to 3.3.1.2 and 3.4.1.2 of the annex to the ~~Revised~~ revised guidance and provision on board of such a line is not necessary under this guidance.

** For ships with EN > 2,000 see section 3 of appendix A.

3. Mooring lines for ships with EN > 2,000

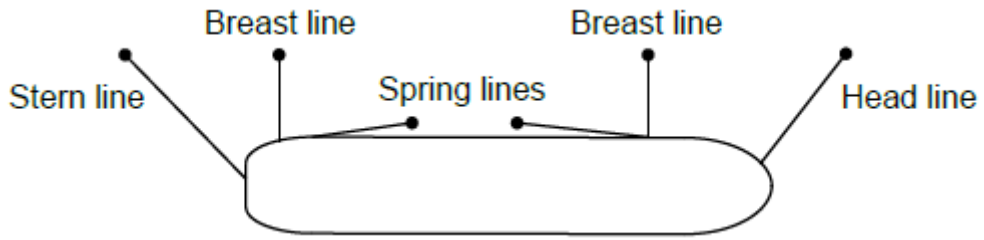
3.1 General

3.1.1 The following is defined with respect to the purpose of mooring lines (see also figure below):

.1 *Breast line*: A mooring line that is deployed perpendicular to the ship, restraining the ship in the off-berth direction;

.2 *Spring line*: A mooring line that is deployed almost parallel to the ship, restraining the ship in fore or aft direction;

.3 *Head/Stern line*: A mooring line that is oriented between longitudinal and transverse direction, restraining the ship in the off-berth and in fore or aft direction. The amount of restraint in fore or aft and off-berth direction depends on the line angle relative to these directions; and



.4 Breast lines provide the maximum transverse restraint and spring lines the maximum longitudinal restraint against vessel movement in athwart and in fore- aft direction, respectively. Head and stern lines are much less effective for these purposes. The applied mooring layout should follow these principles as far as possible with respect to the port facilities and as far as reasonable with respect to the vertical line angles.

3.1.2 The strength of mooring lines and the number of head, stern and breast lines for ships with an EN > 2,000 are based on the side-projected area A_1. Side-projected area A_1 should be calculated similar to the side-projected area A according to appendix B but considering the following conditions:

.1 ~~For oil tankers, chemical tankers, bulk carriers and ore carriers t~~The ~~lightest~~ ballast draft should be considered for the calculation of the side-projected area A_1. ~~For other ships the lightest draft of usual loading conditions should be considered if the ratio of the freeboard in the lightest draft and the full load condition is equal to or above two. Usual loading conditions mean loading conditions as given by the trim and stability booklet that are to be expected to regularly occur during operations, excluding light weight conditions, propeller inspection conditions, etc.~~ For ship types having small variation in the draft, like e.g. passenger and ro-ro vessels, the side-projected area A_1 may be calculated using the summer load waterline.;

.2 Wind shielding of the pier can be considered for the calculation of the side-projected area A_1 unless the ship is intended to be regularly moored to jetty-type piers. A height of the pier surface of 3 m above the waterline may be assumed, i.e. the lower part of the side-projected area with a height of 3 m above the waterline for the considered loading condition may be disregarded for the calculation of the side-projected area A_1; and

.3 Deck cargoes at the ship nominal capacity condition ~~as given by the loading manual~~ should be included for the determination of side-projected area A_1. For the condition with cargo on deck, the summer load waterline may be considered. Deck cargoes may not need to be considered if ~~a usual light~~ballast draft condition ~~without cargo on deck~~ generates a larger side-projected area A_1 than the full load condition with cargoes on deck. The larger of both side-projected areas should be chosen as side-projected area A_1. The nominal capacity condition is defined in 1.3.

3.1.3 The mooring lines as given hereunder are based on a maximum current speed of 1.0 m/s and the following maximum wind speed v_w, in m/s:

v_w = 25.0 - 0.002 (A_1 – 2,000) for passenger ships, ferries and car carriers with 2,000 $m^2 < A_1 \leq 4{,}000\ m^2$

= 21.0 for passenger ships, ferries and car carriers with $A_1 > 4{,}000\ m^2$

= 25.0 for other ships

3.1.4 The wind speed is considered representative of a 30 second mean speed from any direction and at a height of 10 m above the ground. The current speed is considered representative of the maximum current speed acting on bow or stern (±10°) and at a depth of one-half of the mean draft. Furthermore, it is considered that ships are moored to solid piers that provide shielding against cross current.

3.1.5 Additional loads caused by, for example, higher wind or current speeds, cross currents, additional wave loads or reduced shielding from non-solid piers may need to be particularly considered. Furthermore, it should be observed that unbeneficial mooring layouts can considerably increase the loads on single mooring lines.

3.2 Ship design minimum breaking load

3.2.1 The ship design minimum breaking load, in kN, of the mooring lines should be taken as:

$$MBL_{SD} = 0.1 \cdot A_1 + 350$$

3.2.2 The ship design minimum breaking load may be limited to 1,275 kN (130 t). However, in this case the moorings are to be considered as not sufficient for environmental conditions given by ~~A.~~3.1.3. For these ships, the acceptable wind speed v_w^*, in m/s, can be estimated as follows:

$$v_w^* = v_w \cdot \sqrt{\frac{MBL_{SD}^*}{MBL_{SD}}}$$

where v_w is the wind speed as per 3.1.3 above, MBL_{SD}* the ship design minimum breaking ~~strength~~ load of the mooring lines intended to be supplied and MBL_{SD} the ship design minimum breaking ~~strength~~ load as recommended according to the above formula. However, the ship design minimum breaking load should not be taken less than corresponding to an acceptable wind speed of 21 m/s:

$$MBL_{SD}^{*} \geq \left(\frac{21}{v_w}\right)^2 \cdot MBL_{SD}$$

3.2.3 If lines are intended to be supplied for an acceptable wind speed v_w* higher than v_w as per 3.1.3, the ship design minimum breaking load should be taken as:

$$MBL_{SD}^{*} = \left(\frac{v_w^{*}}{v_w}\right)^2 \cdot MBL_{SD}$$

3.3 Number of mooring lines

3.3.1 The total number of head, stern and breast lines should be taken as:

$$n = 8.3 \cdot 10^{-4} \cdot A_1 + 6$$

3.3.2 For oil tankers, chemical tankers, bulk carriers and ore carriers, the total number of head, stern and breast lines should be taken as:

$$n = 8.3 \cdot 10^{-4} \cdot A_1 + 4$$

3.3.3 The total number of head, stern and breast lines should be rounded to the nearest whole number.

3.3.4 The number of head, stern and breast lines may be increased or decreased in conjunction with an adjustment to the ship design minimum breaking load~~strength~~ of the lines. The adjusted ship design minimum breaking load~~strength~~, MBL_{SD}**, should be taken as:

MBL_{SD}** = 1.2 · MBL_{SD} · n/n** ≤ MBL_{SD} for increased number of lines,

MBL_{SD}** = MBL_{SD} · n/n** for reduced number of lines,

where MBL_{SD} is MBL_{SD} or MBL_{SD}* specified in 3.2, as appropriate~~;~~, n** is the increased or decreased total number of head, stern and breast lines and n the number of lines for the considered ship type as calculated according to 3.3.1 or 3.3.2 without rounding.

3.3.5 Vice versa, the ship design minimum breaking load~~strength~~ of head, stern and breast lines may be increased or decreased in conjunction with an adjustment to the number of lines.

3.3.6 The total number of spring lines should be taken not less than:

two lines where EN < 5,000; and

four lines where EN ≥ 5,000.

3.3.7 The ship design minimum breaking load~~strength~~ of spring lines should be the same as that of the head, stern and breast lines. If the number of head, stern and breast lines is increased in conjunction with an adjustment to the ship design minimum breaking load~~strength~~ of the lines, the number of spring lines should be taken as follows, but rounded up to the nearest even number:

$$n_S^* = MBL_{SD} / MBL_{SD}^{**} \cdot n_S$$

where MBL_{SD} is MBL_{SD} or MBL_{SD}^* specified in 3.2, as appropriate, MBL_{SD}^{**} the adjusted ship design minimum breaking load~~strength~~ of lines as specified in 3.3.4, n_S the number of spring lines as given in 3.3.6 and n_S^* the increased number of spring lines.

APPENDIX B

EQUIPMENT NUMBER

The equipment number (EN) should be calculated as follows:

~~$$EN = \Delta^{2/3} + 2.0hB + \frac{A}{10}$$~~

$$EN = \Delta^{\frac{2}{3}} + 2.0\,(hB + S_{fun}) + \frac{A}{10}$$

where:

Δ= Moulded displacement, in tonnes, to the Summer Load Waterline.

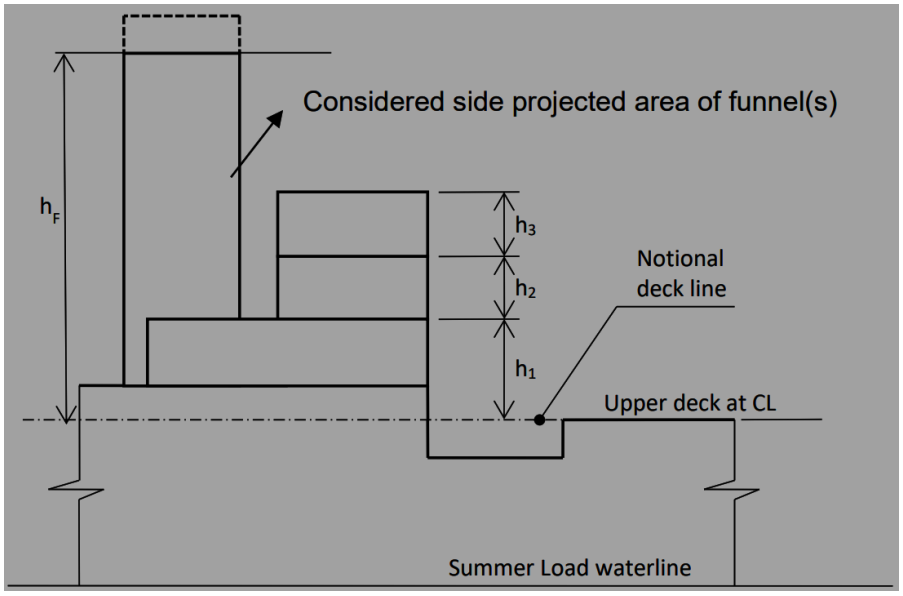
B = Moulded breadth, in metres.

h = Effective height, in metres, from the Summer Load Waterline to the top of the uppermost house~~; for the lowest tier 'h' should be measured at centreline from the upper deck or from a notional deck line where there is local discontinuity in the upper deck (see figure below for an example)~~.

$$h = a + \sum h_i$$

a = Vertical ~~D~~distance at hull side, in metres, from the Summer Load Waterline amidships to the upper deck.

h_i = Height, in metres, on the centreline of each tier of houses having a breadth greater than B/4; for the lowest tier h_1 is to be measured at centreline from the upper deck or from a notional deck line where there is local discontinuity in the upper deck, see figure below for an example.



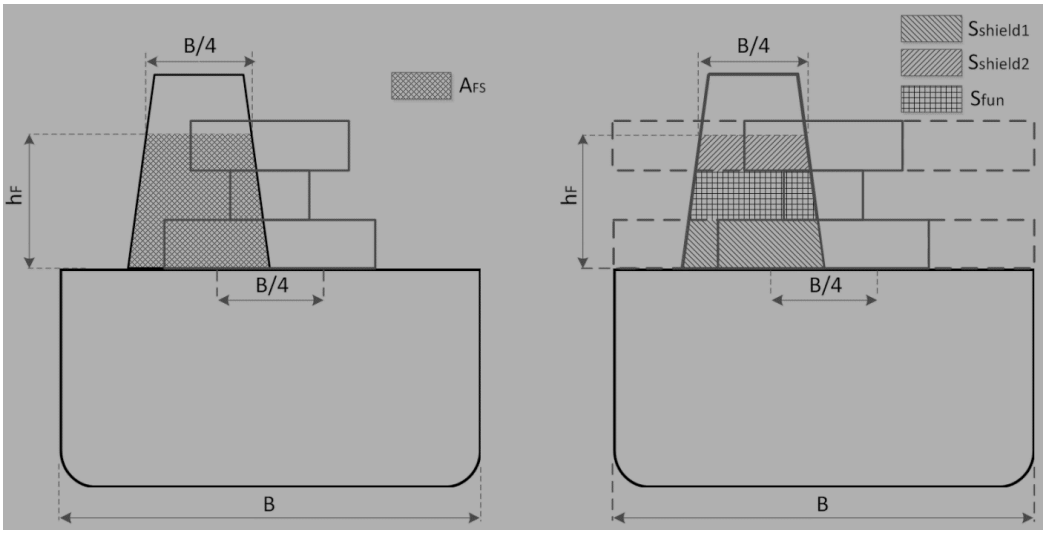
S_{fun} = Effective front-projected area of the funnel, in square metres, defined as:

$$S_{fun} = A_{FS} - S_{shield}$$

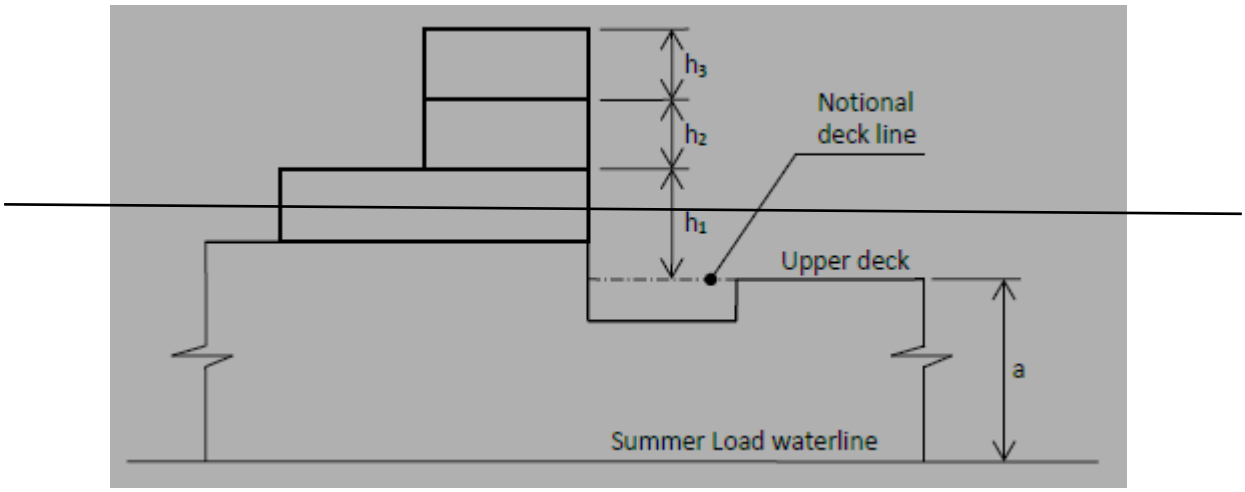
A_{FS} = Front-projected area of the funnel, in square metres, calculated between the upper deck at centreline, or notional deck line where there is local discontinuity in the upper deck, and the effective height h_F. A_{FS} is taken equal to zero if the funnel breadth is less than or equal to B/4 at all elevations along the funnel height.

h_F = Effective height of the funnel, in metres, measured from the upper deck at centreline, or notional deck line where there is local discontinuity in the upper deck, and the top of the funnel. The top of the funnel may be taken at the level where the funnel breadth reaches B/4.

S_{shield} = The section of front-projected area A_{FS}, in square metres, which is shielded by all deck houses having breadth greater than B/4. If there are more than one shielded section, the individual shielded sections i.e $S_{shield1}$, $S_{shield2}$ etc., as shown in the figure below, to be added together. To determine S_{shield}, the deckhouse breadth is assumed B for all deck houses having breadth greater than B/4 as shown for $S_{shield1}$, $S_{shield2}$ in figure below.



A = Side-projected area, in square metres, of the hull, superstructures, ~~and~~ houses and funnels above the Summer Load Waterline which are within the equipment length of the ship and have a breadth greater than B/4. The side-projected area of the funnel is considered in A when A_{FS} is greater than zero. In this case, the side-projected area of the funnel should be calculated between the upper deck, or notional deck line where there is local discontinuity in the upper deck, and the effective height h_F.

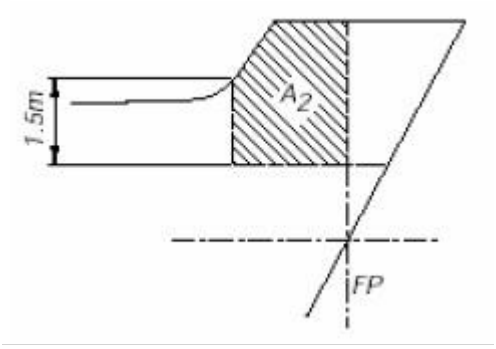


NOTES:

1 When calculating h, sheer and trim should be ignored, i.e. h is the sum of freeboard amidships plus the height (at centreline) of each tier of houses having a breadth greater than B/4.

2 If a house having a breadth greater than B/4 is above a house with a breadth of B/4 or less, then the wide house should be included but the narrow house ignored.

3 Screens or bulwarks 1.5 metres or more in height should be regarded as parts of houses when determining h and A. The height of the hatch coamings and that of any deck cargo, such as containers, may be disregarded when determining h and A. With regard to determining A, when a bulwark is more than 1.5 metres high, the area shown below as A2 should be included in A.



4 The equipment length of the ships is the length between perpendiculars but should not be less than 96% nor greater than 97% of the extreme length on the Summer Waterline (measured from the forward end of the waterline).

5 When several funnels are fitted on the ship, the above parameters are taken as follows:

h_F = Effective height of the funnel, in metres, measured from the upper deck, or notional deck line where there is local discontinuity in the upper deck, and the top of the highest funnel. The top of the highest funnel may be taken at the level where the sum of each funnel breadth reaches B/4.

A_{FS} = Sum of the front-projected area of each funnel, in square metres, calculated between the upper deck, or notional deck line where there is local discontinuity in the upper deck, and the effective height h_F. A_{FS} is to be taken equal to zero if the sum of each funnel breadth is less than or equal to B/4 at all elevations along the funnels height.

A = Side-projected area, in square metres, of the hull, superstructures, houses and funnels above the Summer Load Waterline which are within the equipment length of the ship. The total side-projected area of the funnels is to be considered in the side-projected area of the ship, A, when A_{FS} is greater than zero. The shielding effect of funnels in transverse direction may be considered in the total side-projected area, i.e., when the side-projected areas of two or more funnels fully or partially overlap, the overlapped area needs only to be counted once.

_____