2017 May 15

**Coordinator’s remarks on comments in the first round, TOR .3**

**3 Draft revised MSC.1/Circ.1175 (TOR .3)**

**ANNEX 3**

**Draft revised annex to MSC.1/Circ.1175**

**Japan**

To clarify that MSC.1/Circ.1175 will be revised, Japan proposes to replace the title of the Annex 3 with “Draft annex to MSC.1/Circ.1175/Rev.1”.

**United States**

The draft amendments to Circ.1175 are quite substantial and need to be carefully considered.

For example, the amendments will introduce new weld markings (TOW) on deck fittings that are used for towing. Existing mooring fittings that have already been evaluated under current Circ.1175 strength criteria are marked with SWL; will they need to be re-evaluated under new strength criteria and re-marked with TOW? And fittings used for both mooring and towing will be dual-marked with SWL and TOW. It seems likely that dual-marked fittings will have different SWL and TOW limits; will this cause confusion for the deck crew? Are there training implications here?

Although the United States is willing to review possible amendments to Circ.1175 in the future, we believe it is secondary to the objectives of our current safe mooring initiative (the circular focuses on structural engineering aspects of mooring fittings, whereas the draft Guidelines focus differently on safe arrangement of mooring equipment and line handling).

In view of the short timeframe for accomplishing TORs 1 and 2, we believe amendment of Circ.1175 (TOR 3) should be deferred as a separate initiative.

Coordinators remarks: The amendment proposed by Japan has been included. While sympathizing with the comments from the United States, the CG has been instructed to also carry on, on this issue. Accordingly the comments received have been taken into account underneath.

CG is invited to agree to the revised title.

**SHIPBOARD EQUIPMENT, FITTINGS AND SUPPORTING HULL STRUCTURES**

**ASSOCIATED WITH TOWING AND MOORING**

**ICS**

In order to remove any in-consistencies between the amended IACS UI A1 and recommendation No.10, and the MSC.1/Circ.1175, the amendments to the MSC circular can at this stage be supported in principle.

It should be noted that some of the amendments, particularly relating to the mooring arrangement plan in the draft revised MSC.1/Circ.1175 make some of the provisions in paragraph 5.2.7 of Annex 2 to the Coordinator’s remarks unnecessary. The Guidelines should be read in conjunction with MSC.1/Circ.1175.

**Australia**

“Attachment” should be mentioned in this circular where appropriate. It is the welding which is the most vulnerable to give way.

**Italy**

We are of the view that a paragraph related to the requirements of the minimum length of the mooring lines should be added with the admissible reductions.

Coordinators remarks: Comments duly noted.CG is invited to provide corresponding proposals during round 2.

**1 Application**

1.1 Under regulation II-1/3-8 of the 1974 SOLAS Convention, as adopted by resolution MSC.194(80) in 2005, 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.

**Japan**

To clarify the application of MSC.1/Circ.1175 and MSC.1/Circ.1175/Rev.1, Japan proposes to insert new paragraph 1.2 as follows:

“1.2 MSC.1/Circ.1175/Rev.1 should apply to ships constructed on or after [date of entry into force]. To ships constructed on or after 1 January 2007 and before [date of entry into force], MSC.1/Circ.1175 should apply”,

and to renumber the remaining paragraph numbers accordingly.

Coordinators remarks: Text has been included.

CG is invited to consider revised text.

1.2 This circular is intended to provide standards for the design and construction of shipboard fittings and supporting hull structures associated with towing and mooring, which Administrations are recommended to implement. The provisions of this guidance do not require tow lines nor mandate standards for mooring lines onboard the ship. Furthermore, this guidance is not applicable to 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; and

.3 *Emergency towing for tankers*: Towing service to assist tankers in case of emergency. It should be referred to paragraph 1 of SOLAS regulation II-1/3-4.

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

**2 Definitions**

For the purpose of this guidance

2.1 *Normal towing* means towing operations necessary for maneuvering in ports and sheltered waters associated with the normal operations of the ship.

2.2 *Other towing* means towing by another ship or a tug, e.g. such as to assist the ship in case of emergency as given in SOLAS Regulation II-1/3-4 Paragraph 2 for ships, not subject to SOLAS Regulation II-1/3-4 Paragraph 1, but intended to be fitted with equipment for other towing.

2.3 *Shipboard fittings* mean bollards and bitts, fairleads, stand rollers and chocks used for normal mooring of the ship and similar components used for normal or other towing of the ship. Other components such as capstans, winches, etc. are not covered by this guidance. Any weld, bolt or other fastening connecting the shipboard fitting to the supporting hull structure is part of the shipboard fitting and subject to any industry standard applicable to such fitting.

**OCIMF**

Slight revision suggested from stand to pedestal rollers as follows:

“Shipboard fittings mean bollards and bitts, fairleads, pedestal rollers and chocks used for normal mooring of the ship and similar components used for normal or other towing of the ship. Other components such as capstans, winches, etc. are not covered by this guidance. Any weld, bolt or other fastening connecting the shipboard fitting to the supporting hull structure is part of the shipboard fitting and subject to any industry standard applicable to such fitting.”

2.4 *Supporting hull structure* means that part of the ship structure on/in which the shipboard fitting is placed and which is directly submitted to the forces exerted on the shipboard fitting. The hull structure supporting capstans, winches, etc. used for normal or other towing and mooring operations mentioned above should also be subject to this guidance.

**Australia**

Add a definition for “attachment” and renumber 2.5 to 2.6. Suggested definition:

“2.5 Attachment means the welding which attaches a shipboard fitting to the supporting hull structure.”

2.5 *Industry standard* means international or national standards which are recognized in the country where the ship is built, subject to the approval of the Administration.

Coordinators remarks: Proposed text has been included.

CG is invited to consider revised text.

**3 Towing**

**3.1 Strength**

The strength of shipboard fittings used for normal towing operations and their supporting hull structures should comply with the provisions of 3.2 to 3.6. Where a ship is equipped with shipboard fittings intended to be used for other towing services, also the strength of these fittings and their supporting hull structures should comply with these provisions.

**Australia**

Add the word “attachment” where appropriate, and rewrite as below:

“3.1 The strength of shipboard fittings used for normal towing operations, their attachments and supporting hull structures should comply with the provisions of 3.2 to 3.6. Where a ship is equipped with shipboard fittings intended to be used for other towing services, also the strength of these fittings, attachments and their supporting hull structures should comply with these provisions.”

**3.2 Arrangements**

Shipboard fittings for towing should be located on stiffeners and/or girders, which are part of the deck construction so as to facilitate efficient distribution of the towing load. Other equivalent arrangements may be accepted (for chocks in bulwarks, etc.) provided the strength is confirmed adequate for the intended service.

**3.3 Load considerations**

3.3.1 The minimum design load applied to supporting hull structures for shipboard fittings

**Vanuatu**

Regarding 3.3.1, Do we need to consider winch line pull or winch brake holding power in the design of the structure? Bollard pull is often significantly lower than the winches line pull or brake holding power. (see 4.3.1.2)

.1 for normal towing operations should be 1.25 times the intended maximum towing load (e.g. static bollard pull) as indicated on the towing and mooring arrangements plan;

.2 for other towing service should be the minimum breaking strength of the tow line defined in Appendix A; and

.3 for fittings intended to be used for, both, normal and other towing operations, should be the greater of the design loads according to (1) and (2).

3.3.2 The design load should be applied to fittings in all directions that may occur by taking into account the arrangement shown on the towing and mooring arrangements plan. Where the towing line takes a turn at a fitting the total design load applied to the fitting is equal to the resultant of the design loads acting on the line. However, in no case does the design load applied to the fitting need to be more than twice the design load on the line as specified in 3.3.1 (see figure below).



**3.4 Shipboard fittings**

3.4.1 Shipboard fittings may be selected from an industry standards accepted by the Administration and at least based on the following loads

.1 For normal towing operations, the intended maximum towing load (e.g. static bollard pull) as indicated on the towing and mooring arrangements plan;

.2 for other towing service, the minimum breaking strength of the tow line according to Appendix A; and

.3 for fittings intended to be used for, both, normal and other towing operations, the greater of the loads according to .1 and .2.

[3.4.2 Towing bitts (double bollards) may be chosen for the towing line attached with eye splice if the industry standard distinguishes between different methods to attach the line, i.e. figure-of-eight or eye splice attachment.]

**OCIMF**

Added a phrase for clarity – square brackets can be removed:

“Towing bitts (double bollards) may be chosen for the towing line attached with eye splice if the industry standard distinguishes between different methods to attach the line, i.e. at least one round turn followed by figure-of-eight or eye splice attachment.”

3.4.3 When the shipboard fitting is not selected from an accepted industry standard, the strength of the fitting and of its attachment to the ship should be in accordance with 3.3 and 3.5. [Towing bitts (double bollards) should at least resist the loads caused by the towing line attached with eye splice.]

**Australia**

Replace “ship” with “supporting hull structure’, modified text as below

“3.4.3 When the shipboard fitting is not selected from an accepted industry standard, the strength of the fitting and of its attachment to the supporting hull structure should be in accordance with 3.3 and 3.5. [Towing bitts (double bollards) should at least resist the loads caused by the towing line attached with eye splice.]”

**OCIMF**

Delete last sentence and square brackets can be removed.

Coordinators remarks: Proposed text has been included. Regarding OCIMF proposal for 3.4.3 the intent is not quite clear (if the last sentence is removed there would be no need to lift the square brackets). CG is invited to consider revised text.

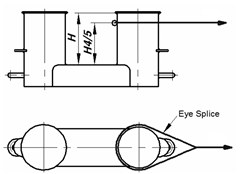
**3.5 Supporting hull structure**

3.5.1 The design load applied to supporting hull structures should be in accordance with 3.3.

3.5.2 The reinforcing members beneath shipboard fittings should be effectively arranged for any variation of direction (horizontally and vertically) of the towing forces acting upon the shipboard fittings. Proper alignment of fitting and supporting hull structure should be ensured.

3.5.3 The acting point of the towing force on shipboard fittings should be taken at the attachment point of a towing line or at a change in its direction. [For bollards and bitts the attachment point of the towing line should be taken not less than 4/5 of the tube height above the base (see figure below).]

[]



Design Load on Line

3.5.4 Under the design load conditions as specified in 3.3 the allowable normal stress should be taken as 100% and the allowable shearing stress as 60% of the specified yield point for the material used. Normal stress is the sum of bending stress and axial stress with the corresponding shearing stress acting perpendicular to the normal stress. No stress concentration factors being taken into account.

**3.6 Safe towing load (TOW)**

3.6.1 The safe towing load (TOW) is the load limit for towing purpose.

3.6.2 TOW used for normal towing operations should not exceed 80% of the design load as given in 3.3.1 (1) and TOW used for other towing operations should not exceed 80% of the design load as given in 3.3.1 (2). For fittings used for, both, normal and other towing operations, the greater of the safe towing loads should be used.

3.6.3 For fittings intended to be used for, both, towing and mooring, 4 applies to mooring.

3.6.4 TOW, in t, of each shipboard fitting should be marked (by weld bead or equivalent) on the deck fittings used for towing. For fittings intended to be used for, both, towing and mooring, SWL, in t, according to 4.6 should be marked in addition to TOW.

**Japan**

In paragraph 3.6.4, it is required that both SWL and TOW should be marked for fittings intended to be used for both towing and mooring. Japan understands that the requirement is reasonable from the viewpoint of design. However, Japan considers that the marking of two values SWL and TOW may be confusing from the viewpoint of operation. The requirement may have a negative influence on the safe mooring operation. This is the problem of IACS UR itself. Japan therefore requests the CG to consider this issue.

Coordinators remarks: CG is invited to comment on the observation by Japan, "that the marking of two values SWL and TOW may be confusing from the viewpoint of operation".

3.6.5 The above provisions on TOW apply for the use with no more than one line. [If not otherwise chosen, for towing bitts (double bollards) TOW is the load limit for a towing line attached with eye-splice.]

3.6.6 The towing and mooring arrangements plan described in section 5 should define the method of use of towing lines.

**4 Mooring**

**4.1 Strength**

The strength of shipboard fittings used for mooring operations and of their supporting hull structures as well as the strength of supporting hull structures of winches and capstans should comply with the provisions of 4.2 to 4.6.

**Australia**

Insert the word “attachment” where appropriate and rewrite as follows:

“4.1 The strength of shipboard fittings used for mooring operations, their attachments and supporting hull structures as well as the strength of supporting hull structures of winches and capstans should comply with the provisions of 4.2 to 4.6.”

Coordinators remarks: Text has been included.

CG is invited to consider revised text.

**4.2 Arrangements**

Shipboard fittings, winches, and capstans for mooring should be located on stiffeners and/or girders, which are part of the deck construction so as to facilitate efficient distribution of the mooring load. Other equivalent arrangements may be accepted (for chocks in bulwarks, etc.) provided the strength is confirmed adequate for the service.

**4.3 Load considerations**

4.3.1 The minimum design load applied to supporting hull structures

.1 for shipboard fittings should be 1.15 times the minimum breaking strength of the mooring line provided in accordance with Appendix A;

.2 for winches should be 1.25 times the intended maximum brake holding load, where the maximum brake holding load should be assumed not less than 80% of the minimum breaking strength of the mooring line according to Appendix A; and

.3 for capstans, 1.25 times the maximum hauling-in force.

4.3.2 The design load should be applied to fittings in all directions that may occur by taking into account the arrangement shown on the towing and mooring arrangements plan. Where the mooring line takes a turn at a fitting the total design load applied to the fitting is equal to the resultant of the design loads acting on the line. However, in no case does the design load need to be more than twice the design load on the line as specified in 4.3.1 (see figure in 3.3).

**4.4 Shipboard fittings**

4.4.1 Shipboard fittings may be selected from an industry standards accepted by the Administration and at least based on the minimum breaking strength of the mooring line according to Appendix A.

**OCIMF**

A footnote may be useful here referencing the Industry Standards, as has been done later in the document.

Coordinators remarks: CG is invited to provide a corresponding reference.

[4.4.2 Mooring bitts (double bollards) should be chosen for the mooring line attached in figure-of-eight fashion if the industry standard distinguishes between different methods to attach the line, i.e. figure-of-eight or eye splice attachment.]

**OCIMF**

OCIMF suggests deletion and replaced with the following text:

“All shipboard fitting’s (eg: bollards, bitts, fairleads, etc) should be chosen for the mooring line designed to be utilized with them. This means the SWL of the fitting should be equal to or greater than the breaking force of the mooring line.”

Coordinators remarks: CG is invited to consider the alternative text.

4.4.3 When the shipboard fitting is not selected from an accepted industry standard, the strength of the fittings and of its attachment to the ship should be in accordance with 4.3 and 4.5. [Mooring bitts (double bollards) should resist the loads caused by the mooring line attached in figure-of-eight fashion.]

**Australia**

Replace the word “ship” “supporting hull structure” (similar to as suggested for 3.4.3).

**OCIMF**

Remove square brackets

Coordinators remarks: Text has been included.

CG is invited to consider revised text.

**4.5 Supporting hull structure**

4.5.1 The design load applied to supporting hull structures should be in accordance with 4.3.

4.5.2 Arrangement of reinforcing members beneath shipboard fittings, winches and capstans should consider any variation of direction (horizontally and vertically) of the mooring forces acting upon the shipboard fittings. Proper alignment of fitting and supporting hull structure should be ensured.

4.5.3 The acting point of the mooring force on shipboard fittings should be taken at the attachment point of a mooring line or at a change in its direction. [For bollards and bitts the attachment point of the mooring line should be taken not less than 4/5 of the tube height above the base, see a) in figure below. However, if fins are fitted to the bollard tubes to keep the mooring line as low as possible, the attachment point of the mooring line may be taken at the location of the fins, see b) in figure below.]

[]



4.5.4 Under the design load conditions as specified in 4.3 the allowable normal stress should be taken as 100% and the allowable shearing stress as 60% of the specified yield point for the material used. Normal stress is the sum of bending stress and axial stress with the corresponding shearing stress acting perpendicular to the normal stress. No stress concentration factors being taken into account.

**4.6 Safe working load (SWL)**

**INTERTANKO**

INTERTANKO suggests that the CG takes into account input from OCIMF especially on 4.6.

4.6.1 The Safe Working Load (SWL) is the load limit for mooring purpose.

**OCIMF**

OCIMF seeks to clarify that SWL is the load limit for fixed equipment, not mooring lines, which should operate to the Working Load Limit (WLL) of the mooring line for mooring purposes. The way it reads now an ill-informed operator could see this as relate to MBL (minimum breaking load). Fixed equipment is understood as chocks, rollers, bits, etc. The steel fittings essentially. Suggested text below:

“The Safe Working Load (SWL) is the load limit for fixed or permanent equipment for mooring purposes (eg: bollards, bits, rollers, chocks, etc).”

Coordinators remarks: CG is invited to consider the proposed text by OCIMF.

4.6.2 The SWL should not exceed the minimum breaking strength of the mooring line according to Appendix A.

**OCIMF**

See Line Design Break Force in Annex 2 5.2.5. Suggested text becomes:

“The SWL should not exceed the line design break force of the mooring line according to Appendix A.”

Coordinators remarks: CG is invited to consider the alternative text by OCIMF.

4.6.3 The SWL, in t, of each shipboard fitting should be marked (by weld bead or equivalent) on the deck fittings used for mooring. For fittings intended to be used for, both, mooring and towing, TOW, in t, according to 3.6 should be marked in addition to SWL.

4.6.4 The above provisions on SWL apply for the use with no more than one mooring line.

**Japan**

Japan cannot understand the reason to include the requirement in paragraph 4.6.4. It should be noted that the fifth paragraph of section 3.9.2 in “Mooring Equipment Guidelines 3rd edition (MEG 3)” by OCIMF describes “Each designated STS - suitable closed chock should be accompanied by bitts capable of taking ***at least two mooring lines*** and rated to at least the same SWL as the chock”. Japan considers that an equipment can be used for plural lines when the SWL of the equipment is not less than the summation of the MBLs of the lines.



Coordinators remarks: CG is invited to comment on the observation by Japan.

4.6.5 The towing and mooring arrangements plan described in section 5 should define the method of use of mooring lines.

**5 Towing and mooring arrangements plan**

5.1 The SWL and TOW for the intended use for each shipboard fitting should be noted in the towing and mooring arrangements plan available on board for the guidance of the Master. It should be noted that TOW is the load limit for towing purpose and SWL that for mooring purpose. [If not otherwise chosen, for towing bitts it should be noted that TOW is the load limit for a towing line attached with eye-splice.]

**OCIMF**

Remove last three words, (with eye splice) and then remove square brackets.

Coordinators remarks: CG to consider the proposal by OCIMF.

5.2 Information provided on the plan should include in respect of each shipboard fitting

.1 location on the ship;

.2 fitting type;

.3 SWL / TOW;

.4 purpose (mooring/harbour towing/other towing);

.5 method of applying load of towing or mooring line including limiting fleet angles.

**Japan**

The term “fleet angles” in paragraph 5.2.5 should be clearly defined or replaced with another term. In paragraph 3.15 of MEG 3, “fleet angles” is defined as “the maximum angle the line deviates from a direction perpendicular to the drum axis”.

Coordinators remarks: CG is invited to consider if "fleet angles" should be defined in paragraph 5.3.

[5.3 Furthermore, information provided on the plan is to include

.1 the arrangement of mooring lines showing number of lines (N);

.2 the minimum breaking strength of each mooring line (MBL);

**OCIMF**

OCIMF suggested change as follows:

“the line design break force of each mooring line and the Working Load Limit (WLL);”

Coordinators remarks: CG is invited to consider the proposal by OCIMF.

.3 the acceptable environmental conditions as given in Appendix A, A.3 for the recommended minimum breaking strength of mooring lines for ships with Equipment Number EN > 2000

.1 30 second mean wind speed from any direction (vW or vW\* according to A.3.1.3 or A.3.2.2, respectively); and

.2 Maximum current speed acting on bow or stern (±10°)]

[5.4 The information as given in 5.2 and 5.3 is to be incorporated into the pilot card in order to provide the pilot with proper information on harbour and other towing operations.]

**OCIMF**

Delete this paragraph.

Coordinators remarks: CG is invited to consider the proposal by OCIMF to delete this paragraph.

**APPENDIX A**

**MOORING AND TOW LINES**

**A.1 General**

A.1.1 The mooring lines for ships with Equipment Number EN of less than or equal to 2000 are given in A.2. For other ships the mooring lines are given in A.3.

A.1.2 The tow lines are given in A.2.

A.1.3 The Equipment Number EN should be calculated in compliance with Appendix B. Deck cargo as given by the loading manual should be included for the determination of side-projected area A.

**A.2** **Mooring lines for ships with EN ≤ 2000 and tow lines**

A.2.1 The minimum recommended mooring lines for ships having an Equipment Number EN of less than or equal to 2000 are given in Table A.1.

A.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 by Table A.1

One line where 0.9 <  ≤ 1.1,

two lines where 1.1 <  ≤ 1.2,

three lines where 1.2 < .

A.2.3 The tow lines are given in Table A.1 and are intended as own tow line of a ship to be

towed by a tug or other ship.

**Table A.1 Mooring and tow lines for ships with EN ≤ 2000**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **EQUIPMENT NUMBER** | | **MOORING LINES** | | **TOW LINE\*** |
| **Exceeding** | **Not exceeding** | **No. of  mooring lines** | **Minimum breaking strength (kN)** | **Minimum breaking strength (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 | 1060 | 4 | 250 | 603 |
| 1060 | 1140 | 4 | 272 | 647 |
| 1140 | 1220 | 4 | 293 | 691 |
| 1220 | 1300 | 4 | 309 | 738 |
| 1300 | 1390 | 4 | 336 | 786 |
| 1390 | 1480 | 4 | 352 | 836 |
| 1480 | 1570 | 5 | 352 | 888 |
| 1570 | 1670 | 5 | 362 | 941 |
| 1670 | 1790 | 5 | 384 | 1024 |
| 1790 | 1930 | 5 | 411 | 1109 |
| 1930 | 2080 | 5\*\* | 437\*\* | 1168 |
| 2080 | 2230 | \*\* | \*\* | 1259 |
| 2230 | 2380 | \*\* | \*\* | 1356 |
| 2380 | 2530 | \*\* | \*\* | 1453 |
| 2530 | - | \*\* | \*\* | 1471 |

\* Information is provided in relation to 3.3.1 and provision onboard of such a line is not necessary under this guidance.

\*\* For ships with EN > 2000 see A.3.

**A.3** **Mooring lines for ships with EN > 2000**

**A.3.1 General**

A.3.1.1 The following is defined with respect to the purpose of mooring lines, see also figure below

**OCIMF**

OCIMF suggested revision as a consequence of 5.2.12: The following is defined with respect to the purpose of mooring lines, see also figure below:

“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. (Sub sections remain)”

Coordinators remarks: Text has been included.

CG is invited to consider revised text.

.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.

Breast line

Stern line

Spring lines

Head line

Breast line

A.3.1.2 The strength of mooring lines and the number of head, stern, and breast lines for ships with an Equipment Number EN > 2000 are based on the side-projected area A1. Side projected area A1 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 the lightest ballast draft should be considered for the calculation of the side-projected area A1. 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 operation and, in particular, excluding light weight conditions, propeller inspection conditions, etc.

.2 Wind shielding of the pier can be considered for the calculation of the side-projected area A1 unless the ship is intended to be regularly moored to jetty type piers. A height of the pier surface of 3 m over 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 A1.

.3 Deck cargo as given by the loading manual should be included for the determination of side-projected area A1. Deck cargo may not need to be considered if a usual light draft condition without cargo on deck generates a larger side-projected area A1 than the full load condition with cargo on deck. The larger of both side-projected areas should be chosen as side-projected area A1.

A.3.1.3 The mooring lines as given here under are based on a maximum current speed of 1.0 m/s and the following maximum wind speed vw, in m/s

vw = 25.0 - 0.002 (A1 – 2000) for passenger ships, ferries, and car carriers with 2000 m2 < A1 ≤ 4000 m2

= 21.0 for passenger ships, ferries, and car carriers with A1 > 4000 m2

= 25.0 for other ships

A.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.

A.3.1.5 Additional loads caused by, e.g., 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.

**A.3.2 Minimum breaking strength**

A.3.2.1 The minimum breaking strength, in kN, of the mooring lines should be taken as

MBL = 0.1 · A1 + 350

A.3.2.2 The minimum breaking strength may be limited to 1275 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 vw\*, in m/s, can be estimated as follows

where vw is the wind speed as per A3.1.3, MBL\* the breaking strength of the mooring lines intended to be supplied and MBL the breaking strength as recommended according to the above formula. However, the minimum breaking strength should not be taken less than corresponding to an acceptable wind speed of 21 m/s

A.3.2.3 If lines are intended to be supplied for an acceptable wind speed vw\* higher than vw as per A3.1.3, the minimum breaking strength should be taken as

**A.3.3 Number of mooring lines**

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

n = 8.3·10-4 · A1 + 6

A.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 = 8.3·10-4 · A1 + 4

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

A.3.3.4 The number of head, stern and breast lines may be increased or decreased in conjunction with an adjustment to the strength of the lines. The adjusted strength, MBL\*, should be taken as

MBL\* = 1.2 · MBL · n/n\* ≤ MBL for increased number of lines,

MBL\* = MBL · n/n\* for reduced number of lines

where n\* is the increased or decreased total number of head, stern and breast lines and in the number of lines for the considered ship type as calculated by the above formulas without rounding.

A.3.3.5 Vice versa, the strength of head, stern and breast lines may be increased or decreased in conjunction with an adjustment to the number of lines.

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

Two lines where EN < 5000,

four lines where EN ≥ 5000.

A.3.3.7 The 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 strength of the lines, the number of spring lines should be likewise increased, but rounded up to the nearest even number.

**APPENDIX B**

**EQUIPMENT NUMBER**

The equipment number (EN) should be calculated as follows

where

= moulded displacement, in t, to the Summer Load Waterline

B = moulded breadth, in m

h = effective height, in m, 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 + hi

a = distance, in m, from the Summer Load Waterline amidships to the upper deck

hi = height, in m, on the centreline of each tier of houses having a breadth greater than B/4

A = side-projected area, in m2, of the hull, superstructures and houses above the Summer Load Waterline which are within the equipment length of the ship and also have a breadth greater than B/4.

Summer Load waterline

a

h1

h2

h3

Notional deck line

Upper deck

***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 m 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 m 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).*