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| SUB-COMMITTEE ON SHIP DESIGN AND CONSTRUCTION5th sessionAgenda item 10 | SDC 5/10DateOriginal: ENGLISH  |

**REVISED SOLAS REGULATION II-1/3-8 AND
ASSOCIATED GUIDELINES (MSC.1/CIRC.1175) AND
NEW GUIDELINES FOR SAFE MOORING OPERATIONS FOR ALL SHIPS**

**Report of the Correspondence Group on Safe Mooring Operations**

**- Part 1 TORs .1 to .4-**

**Submitted by Denmark and Japan**

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| **SUMMARY** |
| **Executive summary:** | This document provides the report of the Correspondence Group on Safe Mooring Operations, part 1, regarding TORs .1 to .4. |
| **Strategic direction:** | 5.2 |
| **High-level action:** | 5.2.1 |
| **Planned output:** | 5.2.1.1 |
| **Action to be taken:** | Paragraph 36 |
| **Related documents:** | MSC 97/19/2, MSC 97/22, SDC 4/11, SDC 4/11/1, SDC 4/11/2, SDC 4/11/3, SDC 4/INF.3 and SDC 4/16 |

**GENERAL**

**Terms of Reference**

1 The Sub-Committee, at its 4th session (SDC 4), re-established the Correspondence Group on Safe Mooring Operations, under the coordination of Denmark and Japan, and instructed it, taking into account documents MSC 97/19/2, MSC 97/22 (paragraph 19.15), SDC 4/11, SDC 4/11/1, SDC 4/11/2, SDC 4/11/3 and SDC 4/INF.3, and the comments made and decisions taken at this session, to:

.1 further consider the draft revised SOLAS regulation II-1/3-8, based on annex 1 to document SDC 4/11, regarding the design of arrangements and selection of equipment for safe mooring;

.2 further consider the draft new Guidelines for safe mooring operations on all ships, supporting the draft revised SOLAS regulation II-1/3-8, based on annex 2 to document SDC 4/11, regarding the design of arrangements and selection of equipment for safe mooring;

.3 review MSC.1/Circ.1175 and the draft new Guidelines in light of:

.1 recent updates to IACS Unified Requirement (UR) A2, and IACS Recommendation 10; and

.2 ensuring that no duplications or unintended consequences of application are included in the draft new Guidelines referred to in subparagraph .2 above;

.4 consider the references in the draft revised SOLAS regulation II-1/3-8 to the Guidelines as referred to in subparagraphs .2 and .3 above;

.5 develop separate guidelines on safe mooring operations, taking into account the need for any additional guidance on selection, identification, inspection, maintenance and use of mooring lines;

.6 in line with paragraph 3.2.1.3.10 of the Guidance on drafting of amendments to the 1974 SOLAS Convention and related mandatory instruments (MSC.1/Circ.1500), consider any consequential amendments to relevant IMO instruments; and

.7 submit a report to SDC 5.

**Participants to the CG**

2 The group was participated by delegations from the following Member Governments:

Antigua & Barbuda Norway

Australia Netherlands

China Poland

Denmark Republic of Korea

Finland Singapore

France Sweden

Germany United Kingdom

Italy United States

Japan Vanuatu

Marshall Islands

and observers from the following non-governmental organizations in consultative status:

International Chamber of Shipping (ICS)

BIMCO

International Association of Classification Societies (IACS)

ICHCA International (ICHCA)

Oil Companies International Marine Forum (OCIMF)

International Association of Independent Tanker Owners (INTERTANKO)

Society of International Gas Tanker and Terminal Operators Limited (SIGTTO)

Cruise Lines International Association (CLIA)

International Association of Dry Cargo Shipowners (INTERCARGO)

International Harbour Masters’ Association (IHMA)

The Nautical Institute

**Work of the CG**

3 Three rounds were conducted and the draft report was circulated as follows:

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|  | Date of commencement | Deadline of the comments |
| 1st round | 4th of April | 27th of April |
| 2nd round | 15th of May | 13th of June |
| 3rd round (Final round) | 7th of July | 7th of August |
| Draft report check | 5th of September | 26th of September |

**DRAFT REVISED SOLAS REGULATION II-1/3-8 (TOR .1)**

4 The outcome of the Correspondence Group is attached to this report as Annex 1. Unsolved issues that need further consideration by the Sub-Committee are in square brackets.

5 It is the perception of the coordinator that this part of the TORs would not benefit from further consideration by a Correspondence Group. Henceforth, the various alternatives have been identified and considered. The remaining issues should be dealt with directly by the Sub-Committee. In this respect, it is recommended to establish a corresponding Working Group during SDC 5.

6 The deliberations have shown the complexity of establishing a framework that maintains the current regulations for existing ships while introducing additional regulations for new ships. The attached Annex 1 has been drafted to accommodate this balance.

7 The entry into force dates remain in square brackets in order to be flexible as regards the final approval of these amendments.

8 It was considered whether mooring lines should be directly mentioned as part of the regulation. While some members of the CG found that it would already be part of the equipment, others felt that this should be further clarified. This issue has not been fully agreed by the CG and has, consequently, been placed in square brackets.

9 During this second round of the CG, it was proposed to use the term “human centred design” rather than the more common term “occupational health”. Being a fairly new term which may not be familiar to all, and which may have a wider scope than health preservation of seafarers just as it may still be undergoing a development and knowledge phase, it has not been possible to agree on which of the terms to take on board. Accordingly, the two alternatives remain in square brackets.

10 It has been discussed to which extent the new requirements should involve ships below 3,000 gross tonnage and, consequently, whether the corresponding draft text should contain the term “shall” or “should”. This part needs to be further considered.

**DRAFT NEW GUIDELINES FOR SAFE MOORING OPERATIONS (TOR .2)**

11 The outcome of the CG is attached to this report as Annex 2. Unsolved issues that need further consideration by the Sub-Committee are in square brackets. It is noted that some of the unresolved issues have a direct lead to the open issues of the draft revised SOLAS regulation II-1/3-8.

12 It is the perception of the coordinator that this part of the TORs would not benefit from further consideration by a CG. Henceforth, the different alternatives have been identified and considered. The remaining issues should be dealt with directly by the Sub-Committee. In this respect, it is recommended to establish a corresponding Working Group during SDC 5.

13 It has been discussed whether the guideline should be restricted to normal mooring operations only; an issue that could be clarified in the definitions. The reasoning behind is that planned mooring operations can be taken on board during the design stage, while exceptional situations need a more flexible type of approach.

14 While striving to take into account the variety of ships that may be impacted by the guidance, it was proposed to include some flexibility in a number of paragraphs by using the wording “so far as is reasonably practicable”. Positions on whether this would be acceptable have, however, been divided.

15 It has been noted that, for some of the functional objectives in Section 4 (e.g. tripping risks, mooring line failure and maintenance), there are no related provisions in Section 5. This needs to be further considered in order to finalise the guideline.

16 As to section 5, a completely new alternative section was proposed during the first round of comments in the CG. As the CG was instructed to base its work on annex 2 to document SDC 4/11 regarding the design of arrangements and selection of equipment for safe mooring, this new section 5 has not been further considered in substance.

During the three rounds of the CG, several members have expressed the view that any specific guidance provided by this alternative text and not considered by the current draft text should be picked up and discussed in order to increase the relevance of the final guidance. The alternative text has been included as an appendix to this annex of the report.

17 For item 5.2.3 no related functional objectives could be identified in section 4. It was proposed that this could be rectified in section 4, e.g. by adding a functional objective: “it ensures flexibility for exceptional conditions”.

18 The heading of section 5 involved a number of proposals; the key words, however, being “design”, “equipment” and “functionality”. The current text was drafted to accommodate these wishes.

19 The text in 5.1.6 has become quite specific, which is an outcome of the preference for prescriptive rather than goal based guidance. To maintain flexibility, corresponding wording has been included in square brackets.

20 In 5.1.6.7 indication of snap back zones has been placed in square brackets as current research indicates that marking of snap back zones provides a false sense of safety as the movements and the impacts of broken mooring lines are very hard to predict.

21 In 5.1.7 some members of the CG question if appropriate spooling equipment is available for the shipping industry. Accordingly, this part of the guidance is maintained in square brackets.

22 In 5.2.3 which should ensure flexibility when mooring and towing operations occur outside the normal (planned) scope, it is being discussed whether to use the terms exceptional or emergency mooring operations. In this respect, it should be noted that a similar discussion remains under TOR 3. The final wording should follow the corresponding outcome of TOR 3.

23 During the considerations of the CG, a new term, “Line Design Brake Force”, was introduced. This term was proposed as an alternative to the more commonly used term “minimum breaking load”. While taking into account that this new term has not (yet) been defined and that industry may not be fully familiar with it, both terms are in square brackets for further consideration.

24 As to the part on the mooring manual, it was recognised that a number of the issues that ought to be part of this plan had already been dealt with in MSC.1/Circ.1175, which is currently under revision by the CG (TOR 3). In this respect, the final wording should not duplicate the MSC circular, though it may well supplement it. The final draft guideline should ensure this.

25 It was noted that it would be worthwhile to give additional information on the most appropriate lead of mooring lines during common mooring operations; however, this would be better placed in the separate guidelines on mooring operations, etc.

26 There was general agreement that section 6 of annex 2 to document SDC 4/11 would imply the use of risk assessment techniques; tools that may complicate the efficient use of the guideline. Accordingly, the CG agreed to delete this section.

**DRAFT REVISED MSC.1/CIRC.1175 (TOR .3)**

27 The outcome of the Correspondence Group is attached to this report as Annex 3. Unsolved issues that need further consideration are in square brackets. It is noted that some of the unresolved issues have a direct lead to the open issues of the draft revised SOLAS regulation II-1/3-8.

28 As base document for the considerations the coordinator assisted by IACS prepared the draft revised MSC.1/Circ.1175, for further consideration by the CG. A document taking into account IACS UR A2 and IACS recommendation 10.

29 While there is a common understanding that there is a difference between “normal towing” operations and those that are not normal towing operations and that also the latter situations should be covered by the circular, positions are split on whether to call them “other towing” or “emergency towing”. This needs to be settled by the Sub-Committee.

30 Another issue that has evolved is the preferred use of safety limits of mooring lines. Should it be the term “safe working load”, “sufficient working load limit” or “minimum breaking load ship design (MBLSD)”. While there seems to be considerable support for using MBLSD, this standard has not been further defined in the draft circular just as it seems to differ from IACS Unified Requirement (UR) A2, and IACS Recommendation 10.

31 As to paragraph 3.1, positions are divided whether to include strength of attachments. In this respect, it is noted it was generally agreed to delete the corresponding definition in original 2.5.

32 As to the selection of double bollards, it is unsettled what the preferred method of attachment should be. Is it “at least one round turn followed by figure-of-eight …” or would “figure-of-eight” suffice. Furthermore, it is unclear how to establish the strength when not in compliance with industry standards.

33 Another issue not yet solved is the marking of the Safe Working Load (SWL) and Safe Towing Load (TOW). In this respect, some members of the CG prefer the marking of both on each fitting used for both mooring and towing, while others prefer only the marking based on the highest safe working load.

34 While agreeing that a towing and arrangement plan should be established, it seems that – at this stage – there are divided positions as to what this plan should include.

**REFERENCES TO THE GUIDELINES IN THE DRAFT REVISED SOLAS REGULATION II‑1/3-8 (TOR .4)**

35 The footnotes have been agreed by the CG pending the final outcome of the corresponding draft guideline (TOR 2) and draft MSC Circular (TOR 3), to which the footnotes refer.

**ACTIONS REQUESTED OF THE SUB-COMMITTEE**

36 The Sub-Committee is invited to:

.1 With regard to draft revised SOLAS regulation II-1/3-8 (TOR .1):

.1 Consider if mooring lines should be referred directly in the draft SOLAS regulation (paragraph 8).

.2 Consider if “human centred design” or “occupational health” should be the focus of the draft SOLAS amendments (paragraph 9).

.3 Consider if the term “shall” or “should” are to be used to describe the requirements for ships less than 3.000 gross tonnage (paragraph 10).

.4 Pending decisions taken by the Sub-Committee, agree on the draft revised SOLAS regulation II-1/2-8 as attached as Annex 1 (paragraphs 4 to 6).

.2 With regard to draft new guidelines for safe mooring operations (TOR .2), establish an appropriate working arrangement that may further consider:

.1 If exceptional mooring- and towing operations should be reflected in the guideline (paragraph 13).

.2 If the proposed flexibility expressed by the wording “so far as is reasonably practicable”, currently in square brackets at several places in Annex 2, should be retained or be deleted (paragraph 14).

.3 An appropriate interrelation of the functional objectives in section 4 and the achievement of the functional objectives in section 5 (paragraphs 15 and 22).

.4 To include relevant parts of the appendix attached to Annex 2 (prepared by ICS and OCIMF) in the draft guidance (paragraph 16).

.6 The relevant terms and definitions to be used on line safety (paragraph 23).

.7 Which information should be included supplementary to the mooring arrangements plan (paragraph 24).

.8 To finalise the draft guidelines for safe mooring operations based on Annex 2 to this document (paragraphs 11, 12, 18-22, 25 and 26).

.3 With regard to draft revised MSC.1/Circ.1175 on shipboard towing and mooring equipment (TOR .3), establish an appropriate working arrangement that may further consider:

.1 The definition of “not normal” towing operations (paragraph 29).

.2 The definition of safety limits of mooring lines (paragraph 30).

.3 If the strength of attachments should be included in the circular (paragraph 31).

.4 The attachment and selection of double bollards (paragraph 32).

.5 The appropriate marking of fittings used for both mooring and towing purposes (paragraph 33).

.6 The final content of the towing and arrangements plan (paragraph 34).

.7 To finalise the draft guidance on shipboard towing and mooring equipment based on Annex 3 to this document (paragraph 27).

.4 With regard to references to the guidelines in the draft revised SOLAS regulation II-1/3-8 (TOR .4):

.1 Agree, pending the final outcome of the considerations on TORs 1-3 to the references contained in Annex 1 to this document (paragraph 35).

.5 Approve the report in general.

\* \* \*

**ANNEX 1**

**DRAFT REVISED SOLAS REGULATION II-1/3-8**

1 This regulation applies to all ships constructed on or after 1 January 2007.

.1 Paragraphs 5 and 6 additionally apply to ships constructed on or after [1 January 2024].

.2 This regulation does not apply to towing arrangements provided in accordance with regulation 3-4.

.3 For the purpose of this paragraph, the expression ship constructed on or after date of entry into force means:

.1 for which the building contract is placed on or after [date of entry into force]; or

.2 in the absence of a building contract, the keel of which is laid or which is at a similar stage of construction on or after [date of entry into force] plus 6 months; or

.3 the delivery of which is on or after [date of entry into force] plus three years.

2 Ships shall be provided with arrangements, equipment [including lines] and fittings of sufficient safe working load to enable the safe conduct of all towing and mooring operations associated with the normal operation of the ship;

3 Arrangements, equipment [including lines] and fittings provided in accordance with paragraph 2 above shall meet the appropriate requirements of the Administration or an organization recognized by the Administration under regulation I/6;\* and

4 Each fitting or item of equipment provided under this regulation shall be clearly marked with any Limitation associated with its safe operation, taking into account the strength of the supporting ship's structure and its attachment to it.

5 For ships of 3,000 gross tonnage and above the design of the mooring arrangement and the selection of appropriate mooring equipment shall be based on guidelines developed by the Organization\*\*, to ensure [occupational health/human centred design] during mooring operations and whilst the vessel remains berthed.

6 Ships of less than 3,000 gross tonnage [shall/should] comply with the requirement in paragraph 5 above as far as reasonable and practicable, or with applicable national standards of the Administration which provide an equivalent level of safety.

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\* Refer to the Guidance on shipboard towing and mooring equipment, MSC.1/Circ.1175) for ships constructed on or after 1 January 2007 and before [date of entry into force] and MSC.1/Circ.1175/rev.1 for the ships constructed on or after [date of entry into force]).

\*\* Refer to the Guidelines on the design of safe mooring arrangements (MSC.1/Circ.[…])."

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**ANNEX 2**

**DRAFT GUIDELINES ON THE DESIGN OF MOORING ARRANGEMENTS
AND THE SELECTION OF APPROPRIATE MOORING EQUIPMENT
AND FITTINGS** **FOR SAFE MOORING**

**1 Introduction**

1.1 Historical evolution in ship designs, especially the design of large ships have resulted in optimized performance and a greater degree of complexity; this has not been extended to the design of ships mooring arrangements. In order to improve occupational health and enable safety during towing and mooring operations on new ships, new design methods for mooring operations should be introduced also taking into account likely mooring configurations.

1.2 The International Convention for the Safety of Life at Sea (SOLAS), as amended, requires in chapter [II-1, part A, regulation 3-8] that the mooring arrangement in ships of 3,000 gross tonnage or above constructed on or after [1 January 2024] shall be designed and arranged to enable the safe conduct of all towing and mooring operations associated with the normal operation of the ship. Ships less than 3,000 gross tonnage constructed on or after [1 January 2024] [shall/should] comply with the above requirement, so far as is reasonably practicable, or with applicable national standards of the Administration which provide an equivalent level of safety.

1.3 These guidelines provide recommendations on how to interpret and apply the provisions of the SOLAS requirements [for towing and mooring].

**2 Definitions**

For the purposes of these guidelines:

2.2 Mooring area refers to the dedicated area where mooring equipment is installed and line-handling takes place. It also includes areas where there is a risk of personnel injury in event of snap-back or other failure of mooring equipment. There may be multiple mooring areas on a vessel.

2.3 “Mooring arrangements means the configuration of the mooring equipment and fittings and other design features of the ships related to the mooring operation i.e. lighting and communication equipment.”

2.4 Mooring equipment and fittings means items such as mooring winches, capstans, bollards, bitts, fairleads, rollers, chocks etc. and also includes mooring lines.

2.5 Mooring operations means mooring and unmooring of the ship and in-port towing operations related to mooring and unmooring of the ship [according to the normal operation of the ship].

2.6 *“*Mooring personnel includes all personnel engaged in mooring operations including crew, shore based personnel and personnel in mooring boats”.

 **3 Goals**

The equipment selection and mooring arrangement design safety objectives should be to facilitate safe mooring operations and reduce the risk to mooring personnel caused by inappropriate selection and arrangement of equipment [and fittings].

**4 Functional objectives**

To achieve the goals as set out above, the mooring arrangement should be designed and arranged to ensure that:

.1 it provides unobstructed access to and operation of the mooring equipment;

.2 it minimizes the need for complex mooring line configurations [and simplifies line handling] during the normal operation of the ship;

.3 it is appropriate for the specific ship type and its usual mooring configuration;

.4 there is [so far as is reasonably practicable] an unobstructed view of the mooring area for those taking part in the mooring operation.

.5 it minimizes the exposure of mooring personnel, including personnel monitoring lines and supervising the mooring area, to the hazards associated with mooring lines under tension or dynamic load;

.6 mooring lines are compatible with the mooring equipment and fittings installed on board.

.7 to provide a clear view of the mooring area at all times.

.8 [It provides adequate lighting for clear visibility of the mooring areas at all times];

.9 the mooring area provides sufficient working space;.

.10 those involved in mooring operations are not at risk of being struck or harmed by mooring lines in or around the mooring area, and while the mooring line is in service;

.11 the risk of mooring line failure is minimized;

.12 [any hindrance to effective communication between those involved in the mooring operation is minimized];

.13 a mooring area surface, which minimizes tripping and slipping hazards, in all anticipated weather conditions, is provided;

.14 wear and tear on mooring lines are minimized; and

.15 it can be properly maintained in good condition for its intended purpose.

**5 [Achievement of the functional objectives]**

To meet the functional objectives, the following design and equipment features should be considered from the earliest stage in the design process.

[Selection of equipment, fittings and mooring lines should not be undertaken independently. In order to facilitate safe mooring operations it is necessary for mooring equipment, fittings and mooring lines to be considered as a complete system within which all components are compatible.]

The guidance in this section on design of equipment and fittings arrangements should be read in conjunctions with the revised guidance on shipboard towing and mooring equipment (MSC/Circ.1175/[Rev.1]), with particular reference to the distribution of load.

**5.1 Design**

5.1.1 The need for complex mooring line configurations during the normal operation of the ship should be minimized. This should include the use of direct leads from the mooring winch to the fairlead, i.e. mooring arrangements involving a complex mooring line lead across the mooring area by means of guide rollers, pedestal rollers, guide pulleys, bollards, and fairleads should be avoided as far as reasonably possible. [Furthermore, the mooring arrangement should be so designed that it, so far as is reasonably practicable, provides a dedicated fairlead for each mooring line.]

5.1.2 The position of the mooring area and of the fairleads should be planned with respect to the typical mooring pattern corresponding to the type of ship and to berth configurations typically encountered by the type of ship. In this respect it should be possible to obtain a sufficient length of hawser line from the fairlead to the quayside bollard. Furthermore, the mooring area should as far as foreseeable be arranged with respect to the vertical distance to the quayside in order to provide for an efficient pull of the mooring lines towards the quayside

5.1.3 Communication (verbal, hand signals, radio, etc.) for mooring personnel should not be impaired by machinery noise or obstructed lines-of-sight.

5.1.4 The mooring area should be arranged to give the crew the best possible view of the mooring area. This should involve that:

.1 the officer in charge has the ability to safely obtain an unobstructed view of the mooring area as well as the berth arrangements planned to be used;

.2 the mooring winch-operator has an unobstructed view of the mooring area involved;

.3 mooring personnel, have an unobstructed view of the mooring area in which they are planned to operate; and

.4 illumination is provided which allows a clear view of the mooring area and the equipment and lines being worked during hours of darkness or in conditions of [restricted] visibility.

5.1.5 To provide adequate space for the mooring personnel to safely and effectively operate the equipment involved, mooring operations should not be impeded by e.g. restricted space for the mooring operation due to ships' structural elements, accommodation, ventilation exhausts, cargo equipment or similar obstacles. This should involve that:

.1 Throughout the operation, at each mooring station there should be sufficient space for a minimum of two people.

.2 Next to, or behind, bollards the clear space should [so far as is reasonably practicable] be at least 0.4 meters.

.3 at the place where a person works on securing or releasing lines, there should be a clear breadth of [so far as is reasonably practicable] at least 1.2 meters.

.4 Space behind the mooring winch head, i.e. the place where a person stands when casting, is [so far as is reasonably practicable] at least 2 meters. Alongside the mooring warping end there is [so far as is reasonably practicable] a [clear] space of at least 1 meter.

.5 Next to the wire drum, there is a clear space with a breadth [so far as is reasonably practicable] of at least 0.6 meter.

.6 The distance between shipside fairleads and mooring winches is [so far as is reasonably practicable] at least [1.8m].

5.1.6 To design the mooring arrangement so that the mooring personnel is at no stage exposed to lines under tension through snap back or by sudden movements of mooring lines, the following measures should be considered:

.1 to establish short distances from mooring winch to fairlead,

.2 placing - as far as possible - the mooring winch directly in front of the fairlead,

.3 enclosing the mooring line(s) behind barrier(s),

.4 alternative design(s) where crew members do not need to work close to or have to pass mooring lines under tension or potentially under tension., or

.5 use of appropriate, alternative means to moor the ship, including but not limited to automated mooring systems.

.6 mooring lines so far as is reasonably practicable are permanently fixed to a mooring winch;

[.7 the indication of snapback zone.]

5.1.7 To minimize manual handling of towing and mooring lines, the following should be considered:

.1 use of dedicated mooring lines on mooring winches,

[.2 use of spooling equipment,]

.3 placing mooring winches close to the fairleads of ship side served, or

[.4 a sufficient number of mooring winches, fairleads, bollards and other fittings.]

**5.2 Equipment**

5.2.1 A sufficient number of mooring winches should be installed so that, during normal mooring operations, manual use of warping ends, stoppers, capstans and bitts are minimized as far as possible.

5.2.2 Mooring winches that are designed to prevent unsafe and unhealthy work situations through manual handling of mooring lines should be selected. If e.g. split-drum type mooring winches are fitted, the layout should be designed to prevent manual intervention in transfer of the mooring line from storage drum to mooring winch drum and vice versa.

5.2.3 Mooring lines with reduced recoil risk or snapback protection should be used.

5.2.3 The mooring arrangement should be designed to ensure flexibility during [exceptional/ emergency] mooring operations, e.g.

.1 a sufficient number of mooring winch drum ends/capstans, bollards and fittings related to mooring should be available at each mooring area; and

.2 additional (loose) mooring lines should be stored in positions which are easily accessible to the winch drum/bollard where they are expected to be used.

.3 storage provided for additional (loose) mooring lines should minimize the exposure to harmful environments (e.g.: water, chemical, cargo, extreme temperature).

5.2.4 To avoid overload on mooring winches, fittings (such as chocks, fairleads and stand rollers) and mooring lines, considerations should be given to:

.1 fit/adjust mooring winches with brake capacity of less than the minimum breaking load of the mooring line,

.2 mooring lines with integrated high stress indicators, or

.3 mooring winches which monitor the stress load on the mooring lines.

5.2.5 The mooring equipment and arrangement should be designed such that chafing of the mooring line at fairleads and chocks is prevented. This may be achieved by:

.1 suitable line leads,

.2 sufficient large radius of bearing surfaces at chocks, or

.3 smooth contact surfaces.

5.2.6 The mooring equipment and the mooring lines should at all times be compatible in e.g. design, diameter, strength and suitability, and maintained in line with the original purpose and concept of the mooring arrangement. [Next to information given by the mooring and towing arrangement plan as required by MSC.1/Circ.1175.Rev.1 this should be enabled through the following additional information given by the mooring manual (which may be part of the SMS) as described in the guidelines for safe mooring operations MSC[…]:

.1 [a mooring arrangement plan or other means of information about the mooring equipment (i.e. numbers and location of mooring winches, pedestal leads, fair leads and rollers);]

.2 the mooring winches installed, design limitations and safe working loads;

.3 the appropriate mooring lines, including tails, and connecting apparatus to be used and the planned operating parameters/minimum breaking load;

.4 the planned mooring arrangement, including the most appropriate lead of mooring lines during common mooring operations;

5.2.7 Mooring ropes, wires, tails and associated attachments should be [controlled and] certified. Manufacturer's certificates for mooring lines, joining shackles and synthetic tails should be kept in a file or with the mooring manual, clearly showing to which mooring winch each particular component has been fitted.

5.2.8 As far as possible, but at least for lines in the same service, (e.g. headlines, breastlines or springs), mooring lines of the same diameter and type (i.e. material) should be used.

**APPENDIX 1**

**Proposal for a new section 5 by OCIMF Based on proposal by ICS**

**5.1 Design of equipment and fittings arrangements**

5.1.1 The guidance in this section on design of equipment and fittings arrangements should be read in conjunctions with the [Revised] guidance on shipboard towing and mooring equipment (MSC/Circ.[1175/[Rev.1]]), with particular reference to the distribution of load and the symmetrical arrangement of mooring lines.

5.1.2 The design of equipment and fittings arrangements on mooring decks should be addressed at an early stage in the design process taking into account the following constraints

.1 mooring deck space, given the size and purpose of the ship;

.2 variations in shore-based mooring arrangements and the need to preserve flexibility in mooring line configurations to achieve an appropriate restraining capacity;

.3 ships' structural elements, including accommodation, ventilation exhausts, cargo equipment or similar obstacles, on access; and

.4 […]

5.1.3 When developing an appropriate design for the arrangement of equipment and fittings on mooring decks, the following considerations should be amongst those taken into account

.1 Within the constraints imposed by the size and purpose of the ship, equipment and fittings on mooring decks should be positioned in order to provide mooring personnel with unobstructed access to the following during mooring operations

.1 mooring winches and winch controls;

.2 fittings necessary to achieve an appropriate mooring line configuration;

.3 [emergency equipment];

.4 mooring lines and mooring line stowage; and

.5 [line of sight to to ensure all operations can be undertaken safely with adequate supervision and oversight]

.6 […]

.2 Mooring winch controls should be positioned so that the winch operator has a direct view of the line being worked without stepping away from the winch controls. So far as possible, winch controls should be positioned clear of hazards, […].

.3 To minimize the need for complex mooring line configurations during the normal operation of the ship, mooring winches and fairleads should be positioned in order to permit the use of direct, unobstructed leads from the mooring winch to the fairlead for each of the mooring lines described in the Mooring arrangement plan. Where a straight lead is not possible:

.3.1 the deviation from a straight lead, should be by means of pedestal fairleads or rolling fairleads only; and

.3.2 the leads should, so far as is reasonably practicable, minimize the distance the line traverses the mooring deck space from winch to the fairlead; and

.3.3 the need for frequent changes of direction of mooring line is minimized to prevent unintended reductions in mooring line strength due to bend loss and introduction of complex snap-back areas.

.4 To provide for the oversight and supervision of the mooring operations, including the operation of mooring equipment and the handling of mooring lines, the mooring deck should be arranged to give supervising personnel an unobstructed view of the mooring equipment and fittings installed on the mooring deck. This should include the provision of

.1 a platform, or other appropriate means, by which supervising personnel can obtain an unobstructed view of the mooring deck from a position clear of hazards;

.2 deck illumination which allows a clear view of the mooring deck and the equipment and lines being worked during hours of darkness or in conditions of limited visibility; and

.3 […]

.5 In order to reduce the exposure of shipboard personnel to the dynamic forces of mooring lines under tension or in the event of mooring line failure (snap-back), the design of equipment and fitting arrangements should

.1 locate, so far as possible, winches close to shipside fairleads. The positioning of winches should be such that the distance between shipside fairleads and winches is at least [1.8m] to permit mooring personnel to safely apply stoppers to mooring lines when necessary. However, the position of winches should not result in inappropriate mooring line orientations, or block or otherwise interfere with the use of shipside fairleads for additional mooring lines, connecting up of tugs for towage during mooring operations or the ability to safely moor the ship in exceptional conditions; or

.2 consider the use of enclosures from mooring lines to protect mooring personnel, provided that such enclosures do not adversely affect the performance of the mooring system and do not prevent effective inspection and maintenance of equipment, fittings and mooring lines; or

.3 consider the use of appropriate, alternative means to moor the ship, including but not limited to automated mooring systems; or

.4 […]

.6 In order to minimize the need for manual handling of towing and mooring lines, equipment and fitting arrangements should minimize the distance over which any mooring line may need to be handled and, where compatible with the operation of the ship, have equipment or fittings arranged to enable the use of fixed or dedicated mooring lines. The use of fixed or dedicated mooring lines should be carefully considered, taking into account the need to avoid inappropriate mooring line orientations, or block or otherwise interfere with the use of shipside fairleads for additional mooring lines, connecting up of tugs for towage during mooring operations or the ability to safely moor the ship in exceptional conditions;

.7 In order to allow for the need to connect up tugs during mooring operations and ensure flexibility to moor the ship securely during exceptional mooring operations

.1 a sufficient number of mooring winches, fairleads, bollards and other fittings should be available on each mooring deck to allow for flexibility in mooring line configurations; and

.2 additional mooring lines should be stored in the immediate vicinity of mooring winches, provided that such stowage does not interfere with the safe operation of the winch.

.8 Fittings, particularly shipside fairleads, should be positioned so as to minimize the potential for chaffing of mooring lines during the normal operation of the ship.

5.1.3 The design of arrangement of equipment and fittings on mooring decks should take into account the principles for effective mooring arrangements included in appropriate industry guidance on mooring equipment and fittings[[1]](#footnote-1).

**5.2 Selection of equipment and, fittings and mooring lines**

5.2.1 The design of arrangement of equipment and fittings on mooring decks should take into account the principles for effective mooring arrangements included in appropriate industry guidance on mooring equipment and fittings[[2]](#footnote-2).

MBLSD – (Ship Design Minimum Break Load). The minimum breaking load of new, dry, mooring lines for which a ship’s mooring system is designed, in order to meet mooring restraint requirements. The MBLSD determines the selection of all components of a ship’s mooring system, within defined tolerances.

WLL – (Working Load Limit). The maximum load that a mooring line should be subjected to in operational service, calculated from the relevant environmental mooring restraint requirement referred to in section 5.2.4.1. The WLL of mooring lines should be used as user operating limiting values, not to be exceeded. The WLL is expressed as a % of MBLSD and should be used as a limiting value in operational mooring analyses. Steel wires have a WLL of 55% of MBLSD and all other cordage (synthetic) have a WLL of 50% of the MBLSD.

LDBF – (Line Design Break Force). The minimum force that a new, dry, spliced, mooring line will break at. This is for all synthetic cordage materials except Nylon which is tested wet and spliced. When selecting lines, the LDBF of a line should be 100%-105% of the MBLSD.

5.2.2 Selection of equipment, fittings and mooring lines should not be undertaken independently. In order to facilitate safe mooring operations it is necessary for mooring equipment, fittings and mooring lines to be considered as a complete system within which all components are compatible.

5.2.3 The guidance in this section on selection of equipment [and][,] fittings [and mooring lines] should be read in conjunctions with the [Revised] guidance on shipboard towing and mooring equipment (MSC/Circ.[1175/[Rev.1]]).

5.2.4 The selection of mooring lines should take into account

.1 the mooring restraint requirements as per IACS UR A2 or Industry Guidance;

.1 the diameter of mooring fittings with respect to the mooring line diameters (D/d ratio) in order to reduce the potential for bend loss of strength;

.2 the compatibility of the MBLSD of mooring lines and the brake capacity of the mooring winches installed on board;

.3 the characteristics and limitations of mooring lines including material properties and environmental operating conditions anticipated during normal operation of the ship;

.4 the anticipated behavior of the mooring line in the event of failure;

.5 the influence on stored energy and the potential for snap-back of low elasticity mooring lines caused by the use of tails;

.6 […]

5.2.5 The selection of fittings should take into account

.1 the type of mooring line with which the fitting is designed to be used. The SWL of the fitting should be equal to or greater than the MBLSD of the mooring line and supporting structure to be in accordance with recognized standards[[3]](#footnote-3);

.2 the diameter of mooring fittings with respect to the mooring line diameters to reduce or mitigate bend loss strength issues (D/d);

.3 the need for the load bearing surfaces of fittings to minimize damage from chaffing and abrasion;

.4 […]

5.2.6 The selection of winches should take into account

.1 the availability of winches with alternative drum arrangements, including split drum arrangements, which can reduce the need for manual handling of mooring lines during mooring operations;

.2 the positioning of winch controls, including the availability of remote controls for winches to improve the line of sight and reduce operator exposure to snap-back;

.3 the availability of constant tension winches, and the appropriateness of these winches should be carefully considered for the normal operation of the ship (eg: not used on spring lines); and

.4 […]

**5.3 Maintenance and inspection of equipment and fittings**

5.3.1 Equipment and fittings should be properly inspected and maintained, based on the manufacturer's recommendations. Mooring equipment and fittings should be included in the on board maintenance plan or equivalent maintenance management system. The maintenance plan may be computer based.

5.3.2 Maintenance should include the preservation, by appropriate means, of the clear marking of information on equipment and fittings, including SWL and winch control instructions.

5.3.3 Records of maintenance and inspection, of equipment and fittings should be available on board.

5.3.4 Records of the original design philosophy, equipment, layout and requirements should be retained with the ship through lifecycle

**5.4 Inspection and replacement of mooring lines and mooring line tails**

5.4.1 In order to prevent the deterioration of mooring lines to a condition which may result in the failure of the line during mooring operations, the periodic inspection of mooring lines, mooring line tails and associated attachments should be included in the on board maintenance plan or equivalent maintenance management system. The maintenance plan may be computer based.

5.4.2 The requirements for inspection of individual mooring lines will be specific to the type of mooring line used on board. In general, on board inspection of mooring lines will be based on manufacturer recommendations and by visual inspection of the outside of the mooring line to identify excessive wear or damage. Such visual inspections should be based on:

5.4.2.1 The recommendations of the mooring line and/or tail manufacturer, particularly the criteria provided for the assessment of mooring line condition;

5.4.2.2 Operational experience regarding the performance of the mooring line and/or mooring line tail during previous mooring operations;

5.4.2.3 The environmental conditions to which the mooring lines and/or mooring line tails are routinely exposed;

5.4.2.4 Additional advice provided in industry guidance on mooring line and mooring line tail inspections; and

5.4.2.5 […].

5.4.3 In the case of jacketed synthetic fibre mooring lines, detailed visual inspection of the condition of the synthetic fibre line may not be possible. The condition of the external jacket is not an accurate indicator of the condition of the load bearing synthetic fibre material within the mooring line.

5.4.4 The replacement of in service mooring lines which have been assessed as no longer suitable for use should be based on the removal prior to failure and in accordance with criteria provided by the manufacturer, taking into account additional advice provided in industry guidance on removal of mooring lines from service.

5.4.5 Records of inspection of mooring lines and mooring line tails should be available on board. Consideration should be given to control and certification of mooring lines, wires, tails and associated attachments. Manufacturer's test certificates for mooring lines, joining shackles and synthetic tails should be kept onboard and properly linked back to the equipment.

\* \* \*

**ANNEX 3**

**Draft annex to MSC.1/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.194(80) in 2005~~ ,insert appropriate reference for the pending revision of II-1/3-8]*,* new displacement type ships, except high-speed craft and offshore units, shall be provided with arrangements, equipment and fittings of sufficient safe working load [and mooring lines of sufficient working load limit] 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 [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 / *This circular was originally developed as guidance for compliance with SOLAS Regulation II‑1/3‑8 for normal mooring and towing operations in harbor and sheltered locations; it was intended for ships constructed on or after 1 Jan 2007. This revision (Rev.1) supersedes the original circular for ships constructed on or after [1 Jan 2024].”*.

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 harbors 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 in an e.g. an emergency. This circular does not require towlines 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.

1.4 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*/*Emergency 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, pedestal rollers and chocks used for mooring of the ship and similar components used for normal or [other/emergency] towing services of the ship. 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/emergency]towingand mooring operations mentioned above should also be subject to this guidance.

2.6 *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.

2.7 Safe working load (SWL)” means the safe load limit of fixed or permanent fittings (e.g., bollards, bitts, rollers, chocks, etc.) used for normal towing and mooring operations in harbors or similar sheltered waters, using normal mooring lines.

2.8 Safe towing load (TOW)” means the safe load limit of towing fittings specifically intended for emergency towing by another ship or tug, using a high-strength tow line/wire.

2.9 Fleet angles means a “the angle of change in direction of a line at a fitting, e.g. a chock, fairlead or roller.

**3 Towing**

**3.1 Strength**

The strength of shipboard fittings used for normal towing operations[, their attachments] 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 [emergency towing/other towing services], the strength of these fittings and their supporting hull structures should also 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:

.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/emergency 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 [emergency towing/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/emergency towing] services, 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/emergency 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. [~~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 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.~~]

**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 working load(SWL) and safe towing load (TOW)**

3.6.2 [The SWL/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 [emergency towing/other towing] operations should not exceed 80% of the design load as given in 3.3.1 (2). [The SWL for normal mooring operations is given in 4.6.2.] 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 The safe working load SWL, in tonnes[**/**TOW, in tonnes,] of each shipboard fitting should be marked (by weld bead or equivalent) on each shipboard fitting/the deck fittings used for normal harbor towing and mooring operations, and TOW should be similarly marked on fittings specifically intended for [other/emergency towing]. Only one safe working load should be marked on any fitting, based on the highest design load for the fitting or hull structure./towing. [For fittings intended to be used for, both, towing and mooring, SWL, in tonnes, according to 4.6 should be marked in addition to TOW.]

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[, 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.

**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 of:

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

.2 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 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.

 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. 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.

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 supporting hull structure 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.

**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)**

[4.6.1 The Safe Working Load (SWL) is the load limit [for fixed or permanent equipment/ *of fittings and hull supporting structures]* for mooring purpose [(e.g. bollards, bitts, rollers, chocks, etc.)].

[4.6.2 The SWL should not exceed the [line design break force/minimum breaking strength] of the mooring line according to Appendix A.]

[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./

The safe working load SWL, in tonnes, should be marked (by weld bead or equivalent) on each shipboard fitting used for normal harbor towing and mooring operations, and TOW should be similarly marked on fittings specifically intended for [other/emergency towing]. Only one safe working load should be marked on any fitting, based on the highest design load for the fitting or hull structure.]

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

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.

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 (normal harbour towing & mooring operations, or [other/emergency towing]);

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

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

.1 the arrangement of mooring lines showing number of lines (N***)*** and type of material (fiber, wire rope, etc.);

.2 [the minimum breaking strength of each mooring line (MBLSD) and configuration (e.g., plain ends, eye splices, etc);]

.3 Length

*[.4 Breaking strength]*

*[.5 Elongation & snap-back characteristics]*

*[.6 Other relevant information]*

.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 Information provided on the plan should include the design environment (weather conditions) for the mooring line arrangements [(normal mooring, and “heavy wind” mooring)], similar to the parameters in Appendix A:

.1 Wind speed & direction

.2 Current speed & direction Configuration (e.g., plain ends, eye splices, etc)]

**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:

.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

.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.

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:

$$v\_{w}^{\*}=v\_{w}∙\sqrt{\frac{MBL^{\*}}{MBL}}$$

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:

$$MBL^{\*} \geq \left(\frac{21}{v\_{w}}\right)^{2}∙MBL$$

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:

$$MBL^{\*} =\left(\frac{v\_{w}^{\*}}{v\_{w}}\right)^{2}∙MBL$$

**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:

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

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).*

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1. OCIMF Mooring Equipment Guidelines - Written principally for tankers; however, mooring philosophy, guidance and recommendations are equally applicable to other vessel types. [↑](#footnote-ref-1)
2. OCIMF Mooring Equipment Guidelines latest edition- Written principally for tankers; however, mooring philosophy, guidance and recommendations are equally applicable to other vessel types. [↑](#footnote-ref-2)
3. Eg: ISO, IACS [↑](#footnote-ref-3)