

New SOLAS Requirements for Mooring Equipment

**ARCSOPT, 1st November 2023
ClassNK Hull Department**

- ◆ New SOLAS Regulations for Mooring Equipment
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 - For New Ships
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SOLAS Ch.II-1 Reg.3-8 original version, 2007

Strength of Fittings,
Minimum Breaking Strength
(MBS or MBL)
(MSC.1/Circ.1175 original)

Mooring Accidents

- **Complex mooring arrangements**
- **Lack of maintenance and inspection**

Corresponding measures drafted by ICS, OCIMF, IACS, etc.

SOLAS Ch.II-1 Reg.3-8 (First Amendment)(@MSC 102nd session)

Strength of Fittings,
Ship Design Minimum
Breaking Load
(MSC.1/Circ.1175/Rev.1)

Arrangement, Selecting
(MSC.1/Circ.1619)

Inspection, Maintenance
(MSC.1/Circ.1620)

◆ **New Ships** (SOLAS Ch.II-1 Reg.3-8 Para.7 or 8)

These regulations only apply to ships:

- Building contract is placed on or after **1st January 2024**;
- In the absence of a building contract, the keel laying or a similar stage of construction on or after 1st July 2024;
- Delivered on or after **1st January 2027**.

Strength of Fittings,
Ship Design Minimum
Breaking Load
(MSC.1/Circ.1175/Rev.1)

Arrangement, Selecting
(MSC.1/Circ.1619)

◆ **All Ships** (SOLAS Ch.II-1 Reg.3-8 Para.9)

Inspection, Maintenance
(MSC.1/Circ.1620)

All ships, both new and existing ships, are subject to compliance with MSC.1/Circ.1620.

Summary of Requirements

New Terms and Definitions

◆ **MBL_{SD}**: Ship Design Minimum Breaking Load. The minimum breaking load of new, dry, mooring lines for which shipboard fittings and supporting hull structures are designed in order to meet mooring restraint requirements.

	Ships of which keel is laid before 1 Jan. 2007	Ships, keel of which is laid on or after 1 Jan. 2007	Ships, the building contract is placed on or after 1 Jul. 2018	Ships, the building contract is placed on or after 1 Jan. 2022	Ships, the building contract is placed on or after 1 Jan. 2024; or the delivery of which is on or after 1 Jan. 2028
Applied Circular	Nil	MSC.1/Circ.1175			MSC.1/Circ.1175/Rev.1
Applied UR	UR A2 original & Rev.1	UR A2 Rev.2 & 3	UR A2 Rev.4	UR A2 Rev.5 (Adopting certain parts of Circ.1175/Rev.1 in advance)	
MBL	Determined based on E.N. ^{*1),3)}		E.N. ≤ 2000: Determined based on E.N. ^{*2),3)} E.N. > 2000: Calculated based on ship's side project area		
MBL _{sd} *3)	MBL stated in Equipment Number Calculation Sheet		MBL stated in Equipment Number Calculation Sheet or Towing and Mooring Fittings Arrangement	MBL _{sd} stated in Equipment Number Calculation Sheet or Towing and Mooring Fittings Arrangement	

*1) It can be obtained from Table 5 of IACS Rec.10 Rev.2.

*2) It can be obtained from Table 5 of IACS Rec.10 Rev.3. For vessel that load cargo on deck, it is necessary to separately calculate Equipment Number taking into account the influence of deck cargo on the ship's side projected area A. E.N. in NK-SHIPS cannot be used directly in such cases.

*3) It is recommended to verify "Equipment Number calculation Sheet" provided as final drawings onboard.

Summary of Requirements

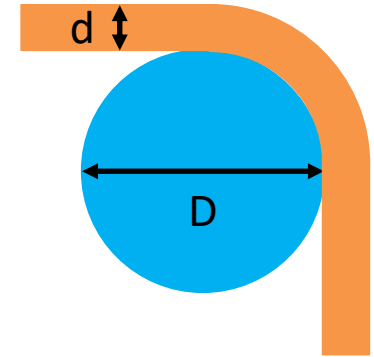
New Terms and Definitions

◆ D/d ratio

Obtained by dividing the diameter D of the mooring equipment by the diameter d of the mooring lines wound around or running along the mooring equipment.

Recommended by the manufacturer as a parameter for bending loss in the strength of mooring lines. (This value is recommended to be equal to or more than 15 in OCIMF MEG.4)

It is recommended that designers of mooring arrangements aim for mooring fitting designs that result in a D/d of at least 15.



◆ 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.

LDBF is to be **100% to 105% of MBL_{SD}**

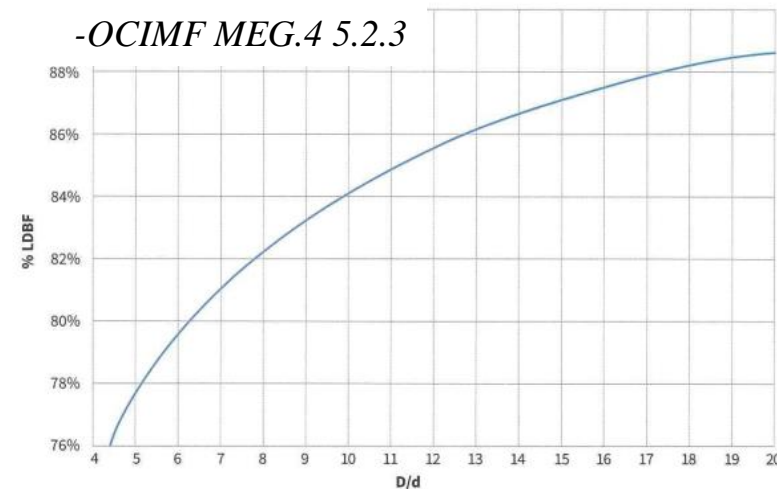
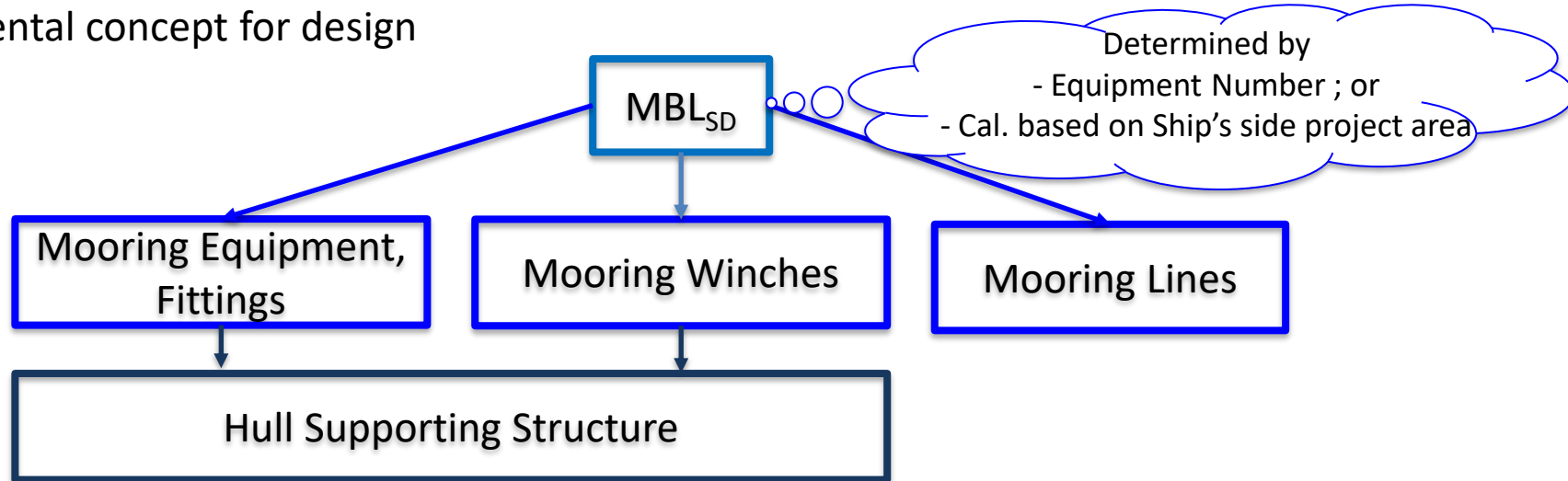


Figure 5.5: Instantaneous bend loss estimation for HMSF lines and steel wire ropes

Quoted from OCIMF MEG.4

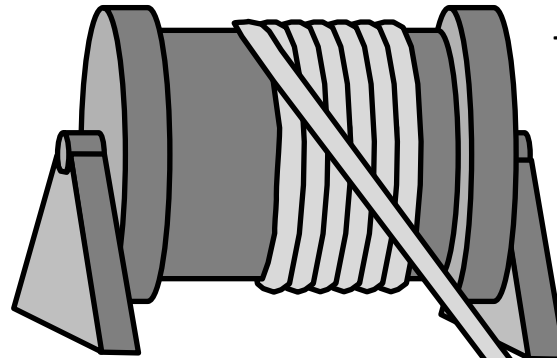
Summary of Requirements

Fundamental concept for design



Example

When **MBL_{SD} = 50 ton**



Mooring Winch [Go to slide 10](#)
- Brake Holding Capacity \leq **50 ton**

Mooring Lines [Go to slide 8](#)
- **50 ton** \leq LDBF \leq **52.5 ton**

Mooring Fittings [Go to slide 9](#)
- SWL of Fittings $>$ **50 ton**
SWL marked on Fittings \leq 50 ton

For New Ships

◆ Selection of Mooring Lines (MSC.1/Circ.1619 Para.5.2.3)

- LDBF to be 100 to 105% of MBL_{SD}
- Take into account D/d ratio recommended by the mooring lines manufacturer

$$MBL_{SD} \leq LDBF \leq 105\% \text{ of } MBL_{SD} \quad (\text{New requirement})$$

*Previous criteria for selecting mooring lines:

- For polyamide lines : $120\% \text{ of } MBL_{SD} \leq LDBF$
- For other synthetic lines : $110\% \text{ of } MBL_{SD} \leq LDBF$

No upper limit for LDBF !!

Currently deleted



Summary of Requirements

For New Ships

New ships

◆ Selection of Mooring Fittings (MSC.1/Circ.1619 Para.5.2.2)

- Mooring fittings are to be selected from industry standards in principle, deemed appropriate by ClassNK and are to be at least based on MBL_{SD} .

SWL > MBL_{SD} (as before)

- Take into account D/d ratio Recommended by the mooring lines manufacturer

FAQ

Difference between “SWL” Specified in National/International Standard and “SWL” Marked on the Deck Fittings

● “SWL” specified in National/International Standards > MBL_{SD}

“SWL” specified national/international standards refers to the strength specifications of the mooring fittings themselves.

● “SWL” marked on the mooring fittings \leq MBL_{SD}

“SWL” marked on the deck fittings (Safe Working Load, specified in Para.4.6.1 of MSC.1/Circ.1175/Rev.1) is determined based on MBL_{SD} and represents the safe load limit of shipboard fittings used for mooring purposes.



Summary of Requirements

For New Ships

New ships

◆ Selection of Mooring Winches (MSC.1/Circ/1619 Para.5.2.1, 5.2.4)

- To avoid overload on mooring winches, fittings and mooring lines, consideration should be given to select mooring winches with brake capacity of less than MBL_{SD} of the mooring line or with adjustable brake capacity.

Brake Capacity \leq MBL_{SD} (New requirement)

FAQ

There are **no provisions** for the value of **Brake Rendering Set Point** in the IMO Requirement.

Industry Standard

Brake Holding Load = 80% MBL_{SD} (ISO), 60% MBL_{SD} (OCIMF)

Brake Rendering Load = 50% MBL_{SD} (ISO)



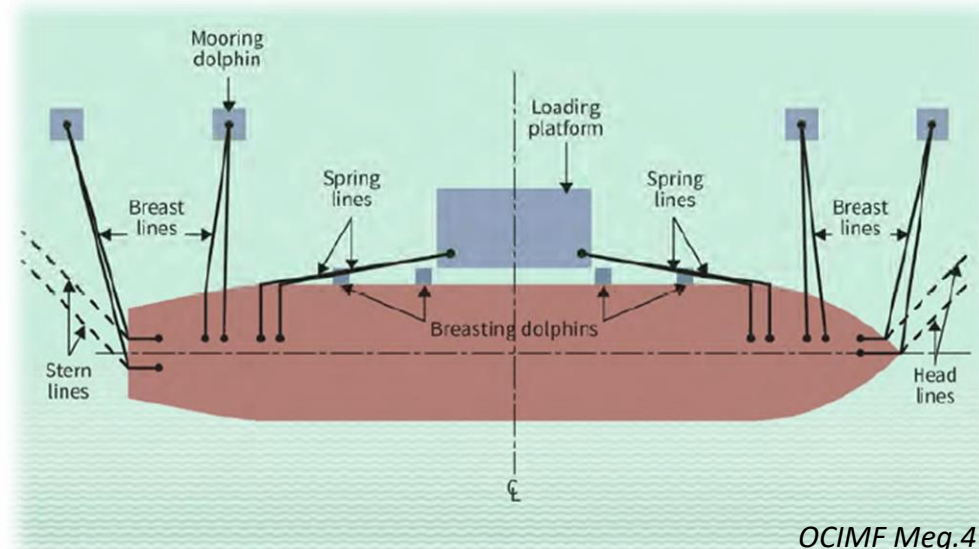
Summary of Requirements

For New Ships

New ships

◆ Arrangement of Mooring Line, Mooring Equipment, Capstan, and Winch (MSC.1/Circ.1619 Para.5.1)

- Mooring winches and fairleads should be positioned to allow the use of direct, a straight lead between winch to fairlead, as possible.
 - ✓ Steel fittings such as horns or bollards without chafe protection should be avoided
 - ✓ Shortest route
 - ✓ Minimize changes of direction of mooring line
- Unobstructed views for shipboard personnel and winch operator
- Consider the mooring arrangement to avoid snap-back or sudden movements of mooring lines
 - ✓ Locate winches close to shipside fairleads
 - ✓ Enclosing the mooring line behind barrier
 - ✓ Permanently fix mooring lines to a mooring winch
- Signage indicating the potential snap-back zones



Summary of Requirements

For Existing Ships

Existing ships

◆ Mooring Lines Replaced on or After 1st January 2024

(MSC.1/Circ.1620 Para.5.2)

- LDBF to be 100% to 105% of the MBL_{SD} ^{*1}
- Take into account Para.5.1 of MSC.1/Circ.1620

$$MBL_{SD} \leq LDBF \leq 105\% \text{ of } MBL_{SD} \quad (\text{New requirement})$$

*1 This regulation **does not mandate the immediate replacement** of mooring lines currently onboard exceeding 105% of MBL_{SD} by 2024.

Mooring lines should be selected not to exceed 105% of MBL_{SD} **only when replaced after 2024.**

FAQ

Necessity for Replacement of Moring Fittings and Winches

If LDBF of the replaced mooring lines continues to meet the criteria above.

Mooring fittings and winches are **NOT** required to be replaced nor reinforced.

If LDBF exceeds 105% of MBL_{SD} .

It is necessary to re-evaluate the strength of the fittings and their hull supporting structure. In most cases, as there is **no strength margin**, replacement or reinforcement is necessary.

For All Ships

New ships

Existing ships

◆ **Management plans for inspection and maintenance of mooring equipment** (MSC.1/Circ.1620, MSC.1/Circ.1362/Rev.2) **(MSMP/LMP)**

Since 1 January 2024, all ships are required to keep the management plans on board based on MSC.1/Circ.1620. The management plans shall include the following (1) to (6) contents.

(The numbers in parentheses refer to the paragraph numbers of MSC.1/Circ.1620.)

- (1) Procedures for mooring operations, inspection and maintenance of mooring equipment, including mooring lines (3.1)
- (2) Procedures to allow the identification and management of mooring lines, tails and associated attachments (3.3)
- (3) Manufacturers' criteria for mooring line replacement (4.3.1)
- (4) Records of mooring equipment inspections and maintenance, and mooring line inspections and replacement. (4.4.3 and 6.1)
- (5) Manufacturers' test certificates for mooring lines, joining shackles and synthetic tails (6.2)
- (6) Records of the original mooring design concepts, equipment, arrangements and specifications (4.4.4)



For All Ships

New ships

Existing ships

◆ Management plans for inspection and maintenance of mooring equipment

- Class Verification

- Surveyor to verify during onboard survey

- First survey:

- ✓ New Ships delivered on or after 1st January 2024: The Initial Survey of the SC Certificate
- ✓ Existing Ships: First Periodical Survey (Annual, Intermediate, or Renewal Survey) of the SC Certificate on or after 1st January 2024

- Every Periodical Survey

The records of followings should be kept onboard.

- ✓ Inspection and maintenance of mooring equipment
- ✓ Inspection and replacement of mooring lines

Required Preparation

Shipowner and Management Company

New ships

Existing ships

◆ Management plans for inspection and maintenance of mooring equipment

- Confirm MBL_{SD} of each ship [Go to slide 5](#)
Describe it as principle particular of ship in the Management plans
- Keep updated the records of:
 - Inspection and maintenance of mooring equipment;
 - Inspection and replacement of mooring lines.

*Format of Management Plans

ClassNK distribute its own simple format in response to the client's request.



Required Preparation

For Shipowner and Management Company

New ships

Existing ships

◆ Replacement of Mooring Lines on or After 1st January 2024

(MSC.1/Circ.1620 Para.5.2)

- Confirm MBL_{SD} of each ship [Go to slide 5](#)

MBL_{SD} should be obtained from:

- ✓ Equipment Number Calculation Sheet ;or
- ✓ Towing and Mooring Fittings Arrangement

- Compare **Specified Breaking Load (=LDBF)** in product certificate with MBL_{SD}

- ✓ LDBF of mooring ropes to be 100% to 105% of MBL_{SD}

FAQ

The way of determining MBL_{sd} by calculating backward from the LDBF of existing mooring line onboard or mooring winch brake holding capacity is **not appropriate**.

Confirm this value

Particulars	
Trade Name	High strength Polyethylene Rope
Kind	High strength Polyethylene Rope
No. of Strand	13
Nominal Diameter	40 mm
Nominal Length	210 m
Specified Linear Density	650 ~ 700 ktex
Actual Linear Density	680 ktex
Specified Breaking Test Load (kN)	735.75 kN
Specified Breaking Test Load (t)	75 t
Breaking Test (Applied Load) (kN)	882.9 kN (not broken)
Breaking Test (Applied Load) (t)	90 t (not broken)
Serial No.	XXXXXXXX
Reduced Recoil Risk Component	Applied

ClassNK NIPPON KAIJI KYOKAI

Certificate No. : XXXXXXXX Date : DD/MM/YYYY

CERTIFICATE
for
Synthetic Fiber Rope

THIS IS TO CERTIFY that the undersigned Surveyor to Nippon Kaiji Kyokai did at the request of the Applicant, attend the testing and examination of the product(s) described below in accordance with the applicable rules, standards, and found it/them satisfactory.

Manufacturer : ABC Co. Ltd.
Place of Manufacture : DDD Street XXX-YY, Japan
Applicant : ABC Co. Ltd.
Place of Inspection : Japan
Intended Use : Bulk
First Date of Inspection : DD/MM/YYYY
Final Date of Inspection : DD/MM/YYYY
Rules/Standards Applied : THE RELEVANT REQUIREMENTS OF THE RULES OF NIPPON KAIJI KYOKAI
Total net(s) of Product :

Particulars	
Trade Name	High strength Polyethylene Rope
Kind	High strength Polyethylene Rope
No. of Strand	13
Nominal Diameter	40 mm
Nominal Length	210 m
Specified Linear Density	650 ~ 700 ktex
Actual Linear Density	680 ktex
Specified Breaking Test Load (kN)	735.75 kN
Specified Breaking Test Load (t)	75 t
Breaking Test (Applied Load) (kN)	882.9 kN (not broken)
Breaking Test (Applied Load) (t)	90 t (not broken)
Serial No.	XXXXXXXX
Reduced Recoil Risk Component	Applied

Test and Inspection
 Breaking Test : Good
 Visual Inspection : Good
 Dimensional Inspection : Good

Identification Mark
 For identification, the product(s) was/were stamped :
 (R) (S) (Serial No.)

Surveyor :
Office :

ClassNK NIPPON KAIJI KYOKAI

Required Preparation

For Shipowner and Management Company

New ships

Existing ships

◆ Get the guidelines and specification regarding the following Information for preparing management plans

➤ D/d ratio

For the derivation of the relationship between bending loss and D/d ration, please refer to OCIMF MEG.4 Appendix B5.6 and similar sources.

➤ Environmental conditions to be used

➤ Replacement Criteria

➤ Inspection

➤ Maintenance

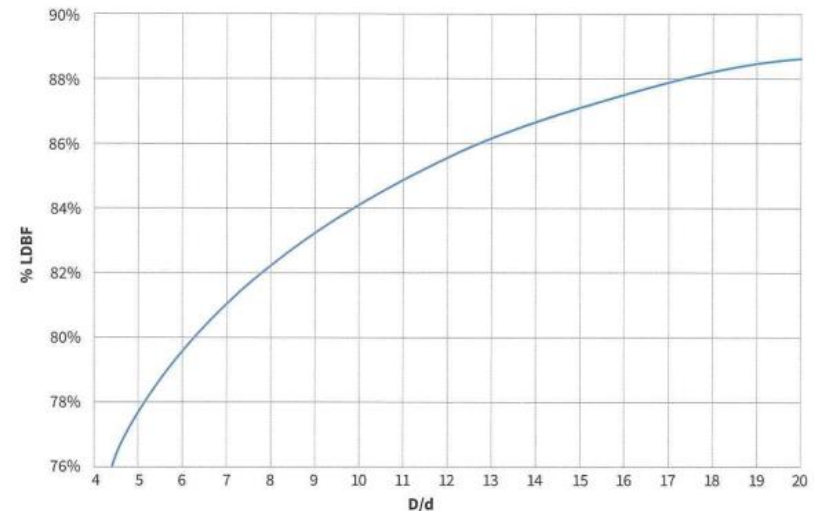


Figure 5.5: Instantaneous bend loss estimation for HMSF lines and steel wire ropes

Quoted from *OCIMF MEG.4*

◆ SOLAS Ch.II-1 Reg.3-8 was amended.

Reflecting several industry standards established as a response to mooring accidents,

For New Ships

New ships

MSC.1/Circ.1175/Rev.1: MBL_{SD} , Strength of fittings and their hull supporting structure

MSC.1/Circ.1619 : Arrangement and Selection of mooring equipment, fittings, lines, and winches

For All Ships

New ships

Existing ships

MSC.1/Circ.1620 : Inspection and Maintenance of mooring equipment, fittings, lines, and winches

For Existing Ships

Existing ships

Mooring Lines replaced on or after 1st January 2024

◆ Shipowners need to prepare in advance for the application, after 1st January 2024



THANK YOU

for your kind attention

If you have any questions or concerns, please feel free to contact hld@classnk.or.jp