RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

Part C Hull Construction and Equipment

Rules for the Survey and Construction of Steel Ships
Part C 2021 AMENDMENT NO.2
Guidance for the Survey and Construction of Steel Ships
Part C 2021 AMENDMENT NO.2

Rule No.61 / Notice No.58 27 December 2021
Resolved by Technical Committee on 28 July 2021

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NIPPON KAIJI KYOKAI

An asterisk (*) after the title of a requirement indicates that there is also relevant information in the corresponding Guidance.

RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

RULES

Part C Hull Construction and Equipment

2021 AMENDMENT NO.2

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Rule No.61 27 December 2021
AMENDMENT TO THE RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

"Rules for the survey and construction of steel ships" has been partly amended as follows:

Part C HULL CONSTRUCTION AND EQUIPMENT

Amendment 1-1

Chapter 18 SUPERSTRUCTURES

Section 18.4 has been amended as follows.

18.4 Additional Requirements for Bulk Carriers, Ore Carriers and Combination Carriers, etc.*

Bulk ~~C~~carriers defined in **1.3.1(13)**~~,~~ of **Part B ~~of the Rules~~** and self-unloading ships defined in **1.3.1(19)** of **Part B** are to be provided with forecastles in accordance with the following requirements. ~~In~~However, the forecastle deck arrangements of ships ~~of~~for which the application of this requirement is, for some ~~special~~ reason~~s~~, difficult are ~~not applicable, the arrangement of the forecastle deck is~~ to be at the direction of the Society.

(1) The forecastle is to be an enclosed superstructure.

(2) The forecastle is to be located on the freeboard deck with its aft bulkhead fitted in way or aft of the forward bulkhead of the foremost hold. (See **Fig. C18.2**)

(3) The forecastle height H_F above the main deck is to be not less than the value given in the following **(a)** or **(b)**, whichever is ~~the~~ greater:
   (a) $H_C + 0.5$ (m), where H_C is the height of the forward transverse hatch coaming of the foremost cargo hold.
   (b) The standard height of superstructure as given in **Table C18.2**. Intermediate values of L_f are to be obtained by linear interpolation.

(4) With respect to the design loads for the hatch covers and forward transverse hatch coamings of foremost cargo holds, ~~T~~to reduce the load on the ~~hatch cover~~ forward transverse hatch coaming of the foremost cargo hold ~~specified in **20.2.3-1.(1)(a)**~~ and/or the pressure applying abaft on the ~~forward transverse hatch coaming specified in **Table C20.8**~~ hatch cover of the foremost cargo hold, the horizontal distance l_F (m) from the hatch coaming to all points of the aft edge of the forecastle deck is to satisfy the following formula:

$$l_F \leq 5\sqrt{H_F - H_C}$$

H_F and H_C: As specified in **(3)**

(5) A breakwater is not to be fitted on the forecastle deck with the purpose of protecting the hatch coaming or hatch covers. If fitted for other purposes, it is to be located such that its aft edge at the centre line is forward of the aft edge of the forecastle deck ~~a~~ at the horizontal distance l_w (m) satisfying the following formula:

$$l_w \geq H_B/\tan 20^\circ$$

H_B: Height of the breakwater above the forecastle.

Fig. C18.2

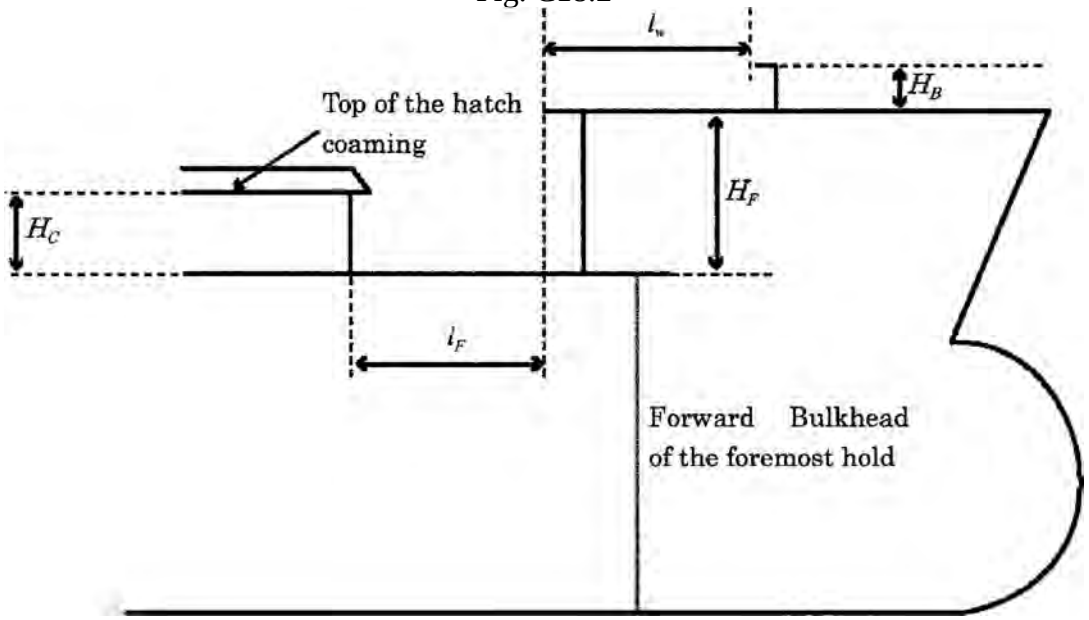


Table C18.2 Standard Height of Superstructure

Length of ship for freeboard (L_f)	Standard Height of Superstructure (m)
75 m or less	1.80
125 m or more	2.30

Chapter 34 LOADING MANUAL AND LOADING COMPUTER

34.2 Additional Requirements for Newly-built Bulk Carriers

34.2.1 General

Sub-paragraphs -1 and -2 have been amended as follows.

1 Bulk carriers, coming under the following **(1)** or **(2)**, of not less than 150 *m* in length L_f are to be provided with a loading manual and a loading computer in accordance with the requirements in **34.2.2** and **34.2.3**.

(1) Bulk carriers as defined in **1.3.1(13)**~~,~~ of **Part B**, which are contracted for construction on or after 1 July 1998

(2) Bulk carriers as defined in **31A.1.2(1)**, which are at the beginning stage of construction on or after 1 July 2006

(3) Self-unloading ships as defined in **1.3.1(19)** of **Part B**, which are contracted for construction on or after 1 July 2020

2 Notwithstanding the provisions of **-1** above, the bulk carriers defined in **31A.1.2(1)** (excluding those bulk carriers specified in **1.3.1(13)** of **Part B** or the self-unloading ships specified in **1.3.1(19)** of **Part B**) need not comply with the requirements of **34.2.2-1(4)**, **34.2.2-2(4)** and **34.2.3-1(2)**. In addition, the requirements of **34.2.2-1(3)** may be modified so that loading manuals are to include the maximum allowable load per hold. The requirements of **34.2.2-2(7)** and **(8)** may be also modified so that loading manuals are to include general restrictions and/or instructions for loading, unloading, ballasting and de-ballasting with regard to the strength of the ship's structures.

3 Bulk carriers, coming under the provisions of **-1(2)** above, of less than 150 *m* in length L_f are to be provided with a loading manual in accordance with the requirements in **34.2.2**. Notwithstanding the above, items to be included in the loading manual may be in accordance with the provisions of **-2** above.

EFFECTIVE DATE AND APPLICATION (Amendment 1-1)

1. The effective date of the amendments is 27 December 2021.

Amendment 1-2

Chapter 27 EQUIPMENT

Title of Section 27.1 has been amended as follows.

27.1 Anchors~~,~~ and Chain Cables ~~and Mooring Ropes~~

Paragraph 27.1.1 has been amended as follows.

27.1.1 General*

1 All ships~~, according to their equipment numbers,~~ are to be provided with anchors~~,~~ and chain cables ~~and mooring ropes which are not less than that given in **Table C27.1**~~, and ~~**Table C27.2** or **27.1.5**~~ specified in this chapter. ~~In the case of anchoring equipment for ships in deep and unsheltered waters, the Society may require special consideration be given to such equipment.~~ All ships are to be provided with suitable appliances for handling anchors and lines.

2 Anchors~~,~~ and chain cables ~~and mooring ropes~~ for ships having equipment numbers ~~not more than 50 or~~ more than 16,000 are to be as determined by the Society.

~~**3** Two of the anchors given in **Table C27.1** are to be connected to their cables and be positioned on board ready for use.~~

~~**4** Anchors, chain cables, wire ropes and fibre ropes used for mooring lines are to be in compliance with the requirements in **Chapter 2**, **3.1** of **Chapter 3**, **Chapters 4** and **5, Part L**, respectively.~~

3 The anchoring equipment subject to the requirements specified in this chapter is based on the following conditions of intended use. The Society, however, may require special consideration be given to anchoring equipment intended for use in deep and unsheltered waters.

(1) The anchoring equipment required herewith is intended for temporary mooring of a ship within a harbour or sheltered area when the ship is awaiting berth, tide, etc. The equipment is, therefore, not designed to hold a ship off fully exposed coasts in rough weather or to stop a ship which is moving or drifting.

(2) The anchoring equipment required herewith is designed to hold a ship in good holding ground conditions so as to avoid dragging of the anchor. In poor holding ground conditions, the holding power of the anchors is significantly reduced.

(3) Anchoring equipment is used under the environmental condition that an assumed maximum current speed of 2.5 *m/s*, a maximum wind speed of 25 *m/s* and a minimum scope of chain cable of 6, the scope being the ratio between the paid-out length of the chain and water depth. However, for ships with a ship length L_2 (as defined in **27.1.2-1**) greater than 135 *m*, the required anchoring equipment may alternatively be considered applicable to a maximum current speed of 1.54 *m/s*, a maximum wind speed of 11 *m/s* and waves with maximum significant height of 2 *m*.

(4) It is assumed that under normal circumstances a ship uses only one bow anchor and chain cable at a time.

4 Sheltered waters are generally calm stretches of water (e.g. harbours, estuaries, roadsteads, bays, lagoons) where the wind force does not exceed 6 on the Beaufort scale.

Paragraph 27.1.2 has been amended as follows.

27.1.2 Equipment Numbers*

~~**1** Equipment number is the value obtained from the following formula:~~

~~$W^{\frac{2}{3}} + 2.0hB + 0.1A$~~

~~Where:~~

~~W: Full load displacement (t)~~

~~h and A: Values specified in the following **(1)**, **(2)** and **(3)**~~

~~(1) h is the value obtained from the following formula:~~

~~$f + h'$~~

~~f: Vertical distance (m), at the midship, from the designed maximum load line to the top of the uppermost continuous deck beam at side~~

~~h': Height (m) from the uppermost continuous deck to the top of uppermost superstructure or deckhouse having a breadth greater than $B/4$~~

~~In the calculation of h', sheer and trim may be ignored. Where a deckhouse having a breadth greater than $B/4$ is located above a deckhouse with a breadth of $B/4$ or less, the narrow deckhouse may be ignored.~~

~~(2) A is the value obtained from the following formula:~~

~~$fL_2 + \Sigma h'' l$~~

~~f: Value specified in **(1)**~~

~~L_2: Length (m) of ship specified in **2.1.2, Part A** or 0.97 *times* the length of ship on the designed maximum load line, whichever is smaller. The fore end of L_2 is the perpendicular to the designed maximum load draught at the forward side of the stem, and the aft end of L_2 is the perpendicular to the designed maximum load draught at a distance L_2 aft of the fore end of L_2.~~

~~$\Sigma h'' l$: Sum of the products of the height h'' (m) and length l (m) of superstructures, deckhouses or trunks which are located above the uppermost continuous deck within L_2 and also have a breadth greater than $B/4$ and a height greater than $1.5m$~~

~~(3) In the application of **(1)** and **(2)**, screens and bulwarks more than $1.5m$ in height are to be regarded as parts of superstructures or deckhouses.~~

1 The equipment number (EN) is the value obtained from the following formula:

$$W^{\frac{2}{3}} + 2.0\left(hB + S_{fun}\right) + 0.1A$$

W: Full load displacement (t)

B: Breadth of ship (m) (See **2.1.4, Part A of the Rules**)

h: Effective height (m) defined as follows: $h = a + \sum h_i$

a: Vertical distance (m), at the midship, from the designed maximum load line to the top of the uppermost continuous deck beam at side

h_i: Height (m) at the centreline of each tier of deckhouses having a breadth greater than $B/4$; for the lowest tier h_1 is to be measured at the centreline from the upper deck or from the notional deck line where there is local discontinuity in the upper deck (See **Fig. C27.1**)

S_{fun}: Effective front projected area of the funnel (m^2) defined as follows: $S_{fun} = A_{FS} - S_{shield}$

A_{FS}: Front projected area of the funnel (m^2) calculated between the upper deck at the centreline (or the notional deck line where there is local discontinuity in the upper deck) and the effective height h_F. The value for A_{FS} is to be taken as zero if the funnel breadth is $B/4$ or less at all elevations along the funnel's height.

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

S_{shield}: Section of the front projected area A_{FS} (m^2) which is shielded by all deckhouses having

breadth greater than $B/4$. To determine S_{shield}, the deckhouse breadth is assumed B for all deckhouses having breadth greater than $B/4$ (See **Fig. C27.2**)

A: Side projected area (m^2) of the hull, superstructures, deckhouses and funnels above the designed maximum load line which are within the length of the ship L_2 and also have a breadth greater than $B/4$. The side projected area of the funnel is to be considered in A when A_{FS} is greater than zero. In such cases, the side projected area of the funnel is to be calculated between the upper deck at the centreline (or the notional deck line where there is local discontinuity in the upper deck) and the effective height h_F.

L_2: Length (m) of ship specified in **2.1.2, Part A of the Rules** or 0.97 *times* the length of ship on the designed maximum load line, whichever is smaller. The fore end of L_2 is the perpendicular to the designed maximum load draught at the forward side of the stem, and the aft end of L_2 is the perpendicular to the designed maximum load draught at a distance L_2 aft of the fore end of L_2.

Fig. C27.1 Effective Height

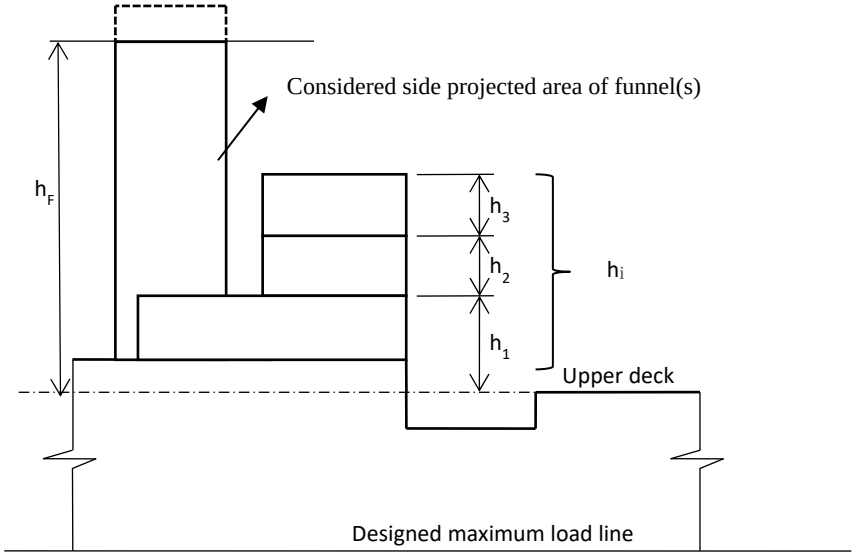
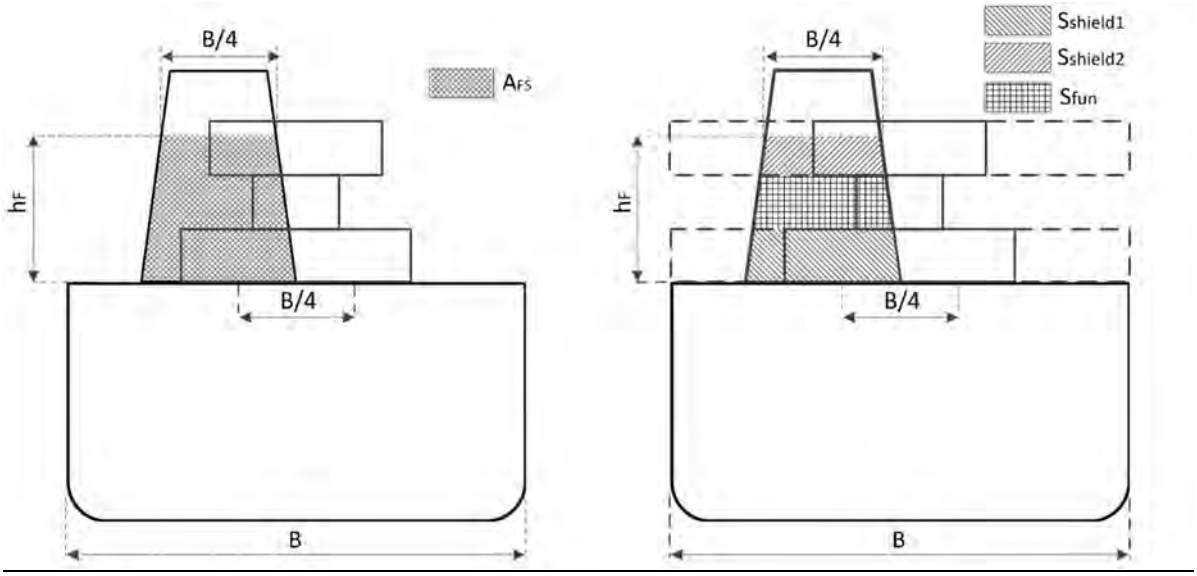
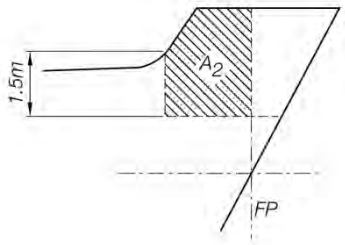


Fig. C27.2 Front Projected Area of Funnel



2 Screens or bulwarks 1.5 *m* or more in height are to be regarded as parts of deckhouses 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 in **Fig. C27.3** as A_2 is to be included in *A*.

Fig. C27.3 Effective Areas for Screens, Bulwarks, etc.



3 When several funnels are fitted on the ship, the above parameters are to be taken as follows:

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

A_{FS}: Sum of the front projected area of each funnel (m^2), calculated between the upper deck at the centreline (or the notional deck line where there is local discontinuity in the upper deck) and the effective height h_F. The value for A_{FS} is to be taken as zero if the sum of each funnel breadth is *B*/4 or less at all elevations along the funnel's height.

A: Side projected area (m^2) of the hull, superstructures, deckhouses and funnels above the designed maximum load line which are within the length of the ship L_2. The total side projected area of the funnel is to be considered in the side projected area of the ship (*A*) when A_{FS} is greater than zero. The shielding effect of funnels in transverse direction may be considered in the total side projected area (i.e. when the side projected areas of two or more funnels fully or partially overlap), the overlapped area needs only to be counted once.

~~2~~**4** Notwithstanding **-1**, for tugs, the equipment number is to be obtained from the following formula:

$$W^{\frac{2}{3}} + 2.0(~~f~~aB + \sum ~~h'' b~~ h_i b_i) + 0.1A$$

W, ~~f~~ a, h_i and A: As specified in **-1** above

~~$\sum h'' b$: Sum of the products of the height h'' (m) and the breadth b(m) of each superstructure and deckhouse which have a breadth greater than $B/4$ and are located above the uppermost continuous deck~~

b_i: Breadth (m) of the widest superstructure or deckhouse of each tier having a breadth greater than B/4

Paragraph 27.1.3 has been amended as follows.

27.1.3 Anchors

1 All ships are to be provided with the anchors which are not less than that given in **Table C27.1** according to their equipment number.

2 Two of the anchors given in **Table C27.1** are to be connected to their cables and be positioned on board ready for use.

3 Anchors are to comply with the requirements in **Chapter 2, Part L of the Rules**.

~~1~~**4** The mass of individual anchors may vary by ±7 % of the mass given in **Table C27.1**, provided that the total mass of anchors is not less than that obtained from multiplying the mass per anchor given in the table by the number installed on board. However, where approval by the Society is obtained, anchors which are increased in mass by more than 7 % may be used.

~~2~~**5** Where stocked anchors are used, the mass, excluding the stock, is not to be less than 0.80 *times* the mass shown in the table for ordinary stockless anchors.

~~3~~**6** Where high holding power anchors are used, the mass of each anchor may be 0.75 *times* the mass shown in the table for ordinary stockless anchors.

~~4~~**7** Where super high holding power anchors are used, the mass of each anchor may be 0.5 *times* the mass required for ordinary stockless anchors. However, super high holding power anchor mass is not to exceed 1,500 *kg*.

Paragraph 27.1.4 has been amended as follows.

27.1.4 Chain Cables*

1 All ships are to be provided with chain cables which are not less than that given in **Table C27.1** according to their equipment number.

2 Chain cables for anchors are to be stud link chains of Grade 1, 2 or 3~~,~~ as specified in **3.1** of **Chapter 3, Part L of the Rules**. However, Grade 1 chains made of Class 1 chain bars (*KSBC*31) are not to be used in association with high holding power anchors.

Paragraph 27.1.5 has been deleted.

~~**27.1.5 Mooring Lines***~~

Paragraph 27.1.6 has been deleted.

~~**27.1.6 Tow Lines**~~

Paragraph 27.1.7 has been renumbered to Paragraph 27.1.5.

27.1.~~7~~5 Chain Lockers*

(-1 to -8 are omitted.)

Paragraph 27.1.8 has been renumbered to Paragraph 27.1.6, and has been amended as follows.

27.1.~~8~~6 Supporting Hull Structures of Anchor Windlasses and Chain Stoppers

1 The supporting hull structures of anchor windlasses and chain stoppers are to be sufficient to accommodate operating loads and sea loads

(1) Operating loads are to be taken as not less than the following:
   (a) For chain stoppers, 80 % of the chain cable breaking load
   (b) For windlasses, where no chain stopper is fitted or a chain stopper is attached to the windlass, 80 % of the chain cable breaking load
   (c) For windlasses, where chain stoppers are fitted but not attached to the windlass, 45 % of the chain cable breaking load

(2) Sea loads are to be taken according to **2.1.6, Section 4, Chapter 11, Part 1 of Part CSR-B&T of the Rules**

2 The permissible stresses for supporting hull structures of windlasses and chain stoppers~~, based on gross thicknesses,~~ are not to be greater than the following permissible values:

~~(1) Normal stress: 1.00 R_{eH}~~

~~(2) Shear stress: 0.60 R_{eH}~~

(1) For strength assessment by means of beam theory or grillage analysis:
   (a) Normal stress: 1.00 R_{eH}
   (b) Shear stress: 0.60 R_{eH}
   R_{eH}: The specified minimum yield stress of the material

(2) For strength assessment by means of finite element analysis:
   (a) Von Mises stress: 1.00 R_{eH}

(3) Normal stress referred to in **(1)** above 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 are to be considered.

3 For strength assessments of supporting hull structures, beam theory or finite element analysis using net scantlings is to be applied as appropriate. Where finite element analysis is used, the provisions of **27.2.3-5** are to be applied. In addition, the total corrosion addition is to be 2.0 *mm*.

Title of Section 27.2 has been amended as follows.

27.2 Towing and Mooring ~~Fittings~~Arranagement

Paragraph 27.2.1 has been amended as follows.

27.2.1 General*

1 The requirements in **27.2** apply to shipboard fittings used for towing and mooring operations associated with the normal operation of the ship~~, and~~ as well as their supporting hull structures. ~~With respect to this requirement, towing is limited to the following:~~

~~(1) Normal towing: towing operations necessary for manoeuvring in ports and sheltered waters associated with the normal operation of the ship~~

~~(2) Other towing: emergency towing by another ship or a tug.~~

~~**2** Ships are to be adequately provided with shipboard fittings.~~

~~**3** Shipboard fittings are to comply with the requirements of **27.2.2** and **27.2.3** respectively.~~

~~**4** When the shipboard fittings are not selected from industry standards deemed appropriate by the Society, the corrosion additions specified in **27.2.4** are to be applied to shipboard fittings and their supporting structures such as foundations.~~

~~**5** When the shipboard fittings are not selected from industry standards deemed appropriate by~~

~~the Society, the wear down allowances specified in **27.2.5** are to be applied to shipboard fittings.~~

~~**6** The scantlings of supporting hull structures are to be built at least with the gross scantlings obtained by adding the corrosion addition specified in **27.2.4** to the net scantlings obtained by applying the criteria specified in this section.~~

~~**7** The scantlings of supporting hull structures are to be in accordance with the relevant chapters or sections in addition to this section.~~

2 Ships are to be adequately provided with shipboard fittings which are selected from industry standards deemed appropriate by the Society. The "shipboard fittings" referred to in **27.2** are bollards, bitts, fairleads, stand rollers, chocks used for normal mooring of the ship and other similar components used for normal or other towing of the ship. Other components such as capstans, winches, etc. are not included. Any welds, bolts or equivalent devices connecting shipboard fittings to their supporting structures are considered to be part of the shipboard fitting if selected in accordance with industry standards deemed appropriate by the Society.

3 The definitions of terms which appear in this section are as follows.

(1) Maximum towing load

"Maximum towing load" is the largest load that can be assumed or intended in normal towing such as static bollard pull

(2) Safe Towing Load (*TOW*)

"Safe Towing Load" (*TOW*) is the safe load limit of shipboard fittings used for towing purpose. However, it does not represent the actual strength of shipboard fittings and their supporting hull structures

(3) Safe Working Load (*SWL*)

"Safe Working Load" (*SWL*) is the safe load limit of shipboard fittings used for mooring purpose. However, it does not represent the actual strength of shipboard fittings and their supporting hull structures

(4) Line Design Break Force (*LDBF*)

"Line Design Break Force" (*LDBF*) is the minimum force that a new, dry, spliced, mooring line will break at. This is for all synthetic cordage materials.

(5) Ship Design Minimum Breaking Load (MBL_{sd})

"Ship Design Minimum Breaking Load" (MBL_{sd}) is the minimum breaking load of new, dry mooring lines or tow lines for which shipboard fittings and supporting hull structures are designed in order to meet mooring restraint requirements or the towing requirements of other towing services.

(6) Ships intended to be regularly moored to jetty-type piers

Ships intended to be regularly moored to jetty-type piers are oil tankers, chemical tankers or gas carriers which are assumed to be moored to jetty-type piers.

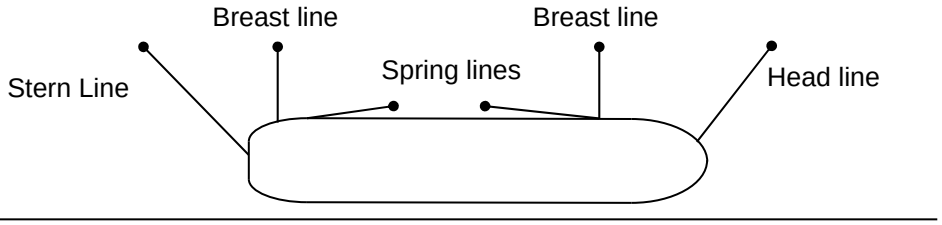
(7) Breast lines, head lines, stern lines and spring lines are defined as follows. (See **Fig. C27.4**)

(a) Breast line: A mooring line that is deployed perpendicular to the ship, restraining the ship in the off-berth direction.

(b) Spring line: A mooring line that is deployed almost parallel to the ship, restraining the ship in either the fore or aft direction.

(c) Head/Stern line: A mooring line that is oriented between the longitudinal and transverse directions, restraining the ship in the off-berth direction as well as in either the fore or aft direction. The amount of restraint in these directions depends on their relative line angles.

Fig. C27.4 Sample Arrangement of Mooring Lines



(8) Maximum wind speed v_w and acceptable wind speed v_w^*
Wind speed is considered representative of a 30 *second* mean speed from any direction and at a height of 10 *m* above the ground

(9) Current speed for maximum current speed
The current speed is considered representative of the maximum current speed acting on bow or stern ($\pm 10°$) 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 currents.

(10) Ship nominal capacity condition
"Ship nominal capacity condition" is the theoretical condition in which the maximum possible amount of deck cargoes (in their respective positions) is included in the ship arrangement. For container ships, the nominal capacity condition represents the theoretical condition in which the maximum possible number of containers (in their respective positions) is included in the ship arrangement.

(11) Supporting hull structure
Supporting hull structures are the parts of the ship structure on or in which shipboard fittings are attached and which are directly subjected to the forces acting on such fittings.

(12) Sheltered waters
Sheltered waters are generally calm stretches of water (e.g. harbours, estuaries, roadsteads, bays, lagoons) where the wind force does not exceed 6 on the Beaufort scale.

(13) Towing
For the application of this section, towing means the towing operations specified in the following **(a)** and **(b)** but not including **(c)**.

(a) Normal towing means towing operations necessary for manoeuvring in ports and sheltered waters associated with the normal operation of the ships.

(b) Other towing means towing by another ship or a tug (e.g. such as to assist the ship in cases of emergency) but does not include the towing specified in **27.3**.

(c) Towing services not covered by this section are as follows.

i) Escort towing: A towing service for laden oil tankers or LNG carriers, particularly as required in specific estuaries. Its main purpose is to control the ship in cases of propulsion or steering system failure.

ii) Canal transit towing: A towing service for ships transiting canals (e.g. the Panama Canal).

iii) Emergency towing for tankers: A towing service to assist tankers in cases of emergency as specified in **27.3**.

Paragraph 27.2.2 has been added as follows.

27.2.2 Tow Lines

Where ships are provided with tow lines, it is advised that tow lines are to be in accordance with the following **(1)** and **(2)**.

(1) Wire ropes and fibre ropes used as tow lines are to comply the requirements in **Chapter 4** and

Chapter 5, Part L of the Rules, respectively. The specifications of tow lines (e.g. breaking load, length) and the number of tow lines are to be in accordance with **Table C27.1** according to ship equipment number. However, when calculating the equipment number, the effect of deck cargoes at the ship nominal capacity condition is to be considered with respect to the side-projected area *A*.

(2) Fibre ropes used as tow lines are to be not less than 20 mm in diameter in consideration of rope age degradation and wear. Therefore, the line design break force for such ropes is to be in accordance with the following **(a)** or **(b)**:

(a) Polyamide ropes: *LDBF* ≥ 120 % of the minimum breaking load specified in **Table C27.1** according to equipment number,

(b) Other synthetic ropes: *LDBF* ≥ 110 % of the minimum breaking load specified in **Table C27.1** according to equipment number.

Paragraph 27.2.2 has been renumbered to Paragraph 27.2.3, and has been amended as follows.

27.2.~~2~~3 Towing Fittings*

1 Strength

The strength of shipboard fittings used for towing operations at the bow, sides and stern as well as their supporting hull structures are to comply with the requirements of **27.2.3**. For fittings intended to be used for both towing and mooring, the requirements of **27.2.6** are to be applied.

~~1~~2 Arrangement

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

(2) When towing fittings cannot be located as specified in **(1),** appropriate reinforced members are to be provided directly underneath the towing fittings.

~~2~~3 Selection

(1) Towing fittings are to be selected from industry standards deemed appropriate by the Society, and are to be at least based on the following loads. However, the increase of the line design break force for synthetic ropes (according to **27.2.2(2))** need not be considered for the loads applied to shipboard fittings and their supporting hull structures.

(a) For normal towing operations, the intended maximum towing load ~~(e.g. static bollard pull) as indicated on the towing and mooring arrangements plan specified in **27.2.6**~~.

(b) For other towing services, the minimum breaking ~~strength~~ load of the tow line specified in **Table C27.1** according to ~~the~~ equipment number ~~determined in **27.1.2**~~.

(c) For fittings intended to be used for both normal and other towing operations, the greater of the loads specified in **(a)** and **(b)**.

(2) When towing fittings are not selected from industry standards deemed appropriate by the Society, the strength of the fitting and of its attachment to the ship are to be in accordance with **-~~3~~4** and **-~~4~~5**. For strength assessments, beam theory or finite element analysis using net scantlings is to be applied as appropriate. At the discretion of the Society, load tests may be accepted as alternatives to strength assessments by calculations.

(3) Towing bitts (double bollards) are to be of sufficient strength to withstand the loads caused by ~~the~~ tow lines attached with eye splices.

~~3~~4 ~~Design Load~~ Supporting Hull Structures

(1) Design load for the supporting hull structures of towing fittings are to be as specified in **(~~1~~a)** to **(~~7~~c)** below:

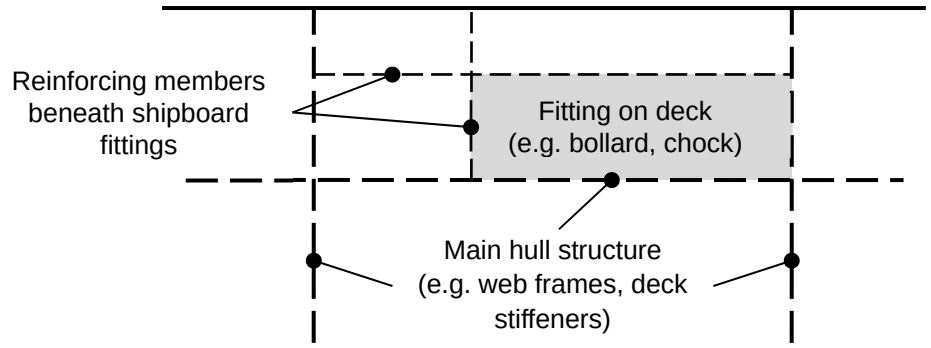
(~~1~~a) For ~~the~~ normal towing operations ~~specified in **27.2.1-1(1)**~~, ~~the minimum design load is to be~~ 1.25 *times* the intended maximum towing load.

(~~2~~b) For ~~the~~ other towing services ~~specified in **27.2.1-1(2)**, the minimum design load is to be~~ the breaking ~~strength~~ load of the tow lines specified in **Table C27.1** ~~according to the equipment number determined in **27.1.2**~~.

(~~3~~c) For fittings intended to be used for both normal and other towing operations, ~~the minimum design load is to be~~ the greater of the design loads specifies in **(1)** and **(2)**.

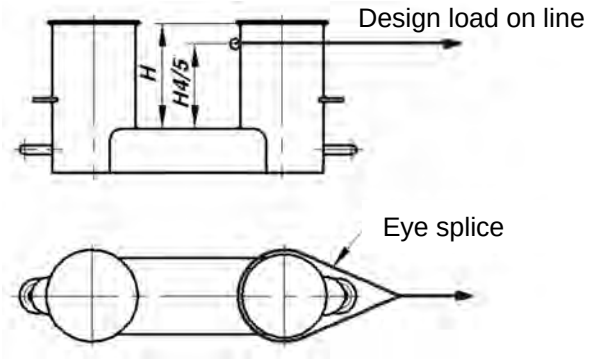
(2) The reinforced members beneath shipboard fittings are to be effectively arranged for any variation of direction (horizontally and vertically) of the towing forces acting upon the shipboard fittings, and the proper alignment of the fittings and their supporting hull structures is to be ensured. (See **Fig. C27.5** for a sample arrangement.)

Fig. C27.5 Sample Arrangement of Shipboard Fittings and Supporting Hull Structures



(~~5~~3) The acting point ~~where~~of the towing force ~~acts~~ on ~~towing~~ shipboard fittings is to be taken ~~as~~ at the attachment point of ~~the~~a tow line or at a change in its direction. For bollards and bitts, the attachment point of the tow line is to be taken as not less than 4/5 of the tube height above the base (see **Fig. C27.~~1~~6**).

Fig. C27.~~1~~6 Acting ~~p~~Point of ~~t~~Towing ~~f~~Force



(4) The design load is to be applied to fittings in all directions that may occur ~~by taking into account~~ in consideration of the arrangements shown in the towing and mooring arrangements plan specified in **27.2.~~6~~9**.

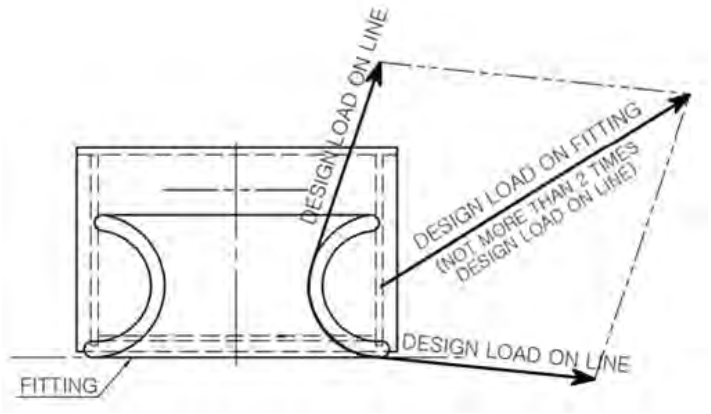
(~~6~~5) Where the tow line is ~~takes a turn at~~ a paid-out through a fitting, the design load is to be equal to the resultant force of the design loads acting on the line, but need~~s~~ not exceed twice the design load on the line. The design load acting on the line is to be the minimum design load specified in **(1)** and **(2)** (see **Fig. C27.~~2~~7**).

~~(7) Notwithstanding the requirements in **(1)** to **(6)**, when a safe towing load (*TOW*) greater than that determined according to **-5** is requested by the applicant, the design load is to be~~

~~increased in accordance with the appropriate *TOW*/design load relationship given by -3 and -5.~~

(6) The strength of supporting hull structures is to be evaluated based on net scantling calculation.

Fig. C27.~~2~~7 Design Load



~~4~~**5** Allowable Stresses

Allowable stresses of supporting hull structures are not to be more than the following:

(1) For strength assessments using beam theory or grillage analysis:
  (a) Normal stress: 100 % of the specified minimum yield ~~point~~ stress of the material
  (b) Shearing stress: 60 % of the specified minimum yield ~~point~~ stress of the material

(2) For strength assessments using finite element analysis:
  (a) ~~Equivalent~~ Von Mises stress: 100 % of the specified minimum yield ~~point~~ stress of the material

(3) The normal stress referred to in **(1)** above is the sum of bending stress and axial stress with the corresponding shearing stress acting perpendicular to the normal stress. No stress concentration factors are to be considered.

(4) The followings are recommended to be followed for the strength assessment by means of finite element analysis referred to in **(2)** above.
  (a) The geometry is to be idealized as realistically as possible.
  (b) The ratio of element length to width is not to exceed 3.
  (c) Girders are to be modelled using shell or plane stress elements.
  (d) Symmetric girder flanges may be modelled by beam or truss elements.
  (e) The element height of girder webs is not to exceed one-third of the web height.
  (f) In way of small openings in girder webs the web thickness is to be reduced to a mean thickness over the web height.
  (g) Large openings are to be modelled
  (h) Stiffeners may be modelled by using shell, plane stress, or beam elements.
  (i) Stresses are to be read from the centre of the individual element.
  (j) For shell elements the stresses are to be evaluated at the mid-plane of the element.

~~5~~**6** Safe Towing Load (*TOW*)

(1) For towing fittings used for the normal towing operations ~~specified in **27.2.1-1(1)**~~, *TOW* is not to exceed 80 % of the minimum design load specified in ~~-3~~**4(1)(a)**.

(2) For towing fittings used for the other towing operations ~~specified in **27.2.1-1(2)**~~, *TOW* is not to exceed 80 % of the minimum design load specified in ~~-3~~**4(~~2~~1)(b)**.

(3) For towing fittings used for both normal and other towing operations, *TOW* is to be the greater of ~~the minimum design loads~~ *TOW* according to **(1)** and **(2)**

~~(4) For fittings intended to be used for both towing and mooring, *SWL* according to **27.2.3-5** is to be marked in addition to *TOW*.~~

(~~5~~4) The *TOW* (in tonnes) of each fitting is to be marked by weld beads and paint, or the equivalent, on the fitting.

(5) The towing and mooring arrangements plan specified in **27.2.9** is to define the method of use of tow lines.

Paragraph 27.2.4 has been added as follows.

27.2.4 Ship Design Minimum Breaking load (MBL_{sd})

1 MBL_{sd} is the design load for the selection of mooring lines, mooring fittings and for the design of supporting hull structures.

2 MBL_{sd} is to be at least not less than minimum breaking load (*MBL*) specified in **27.2.5**. Where the minimum breaking load (*MBL*) is adjusted based on the acceptable wind speed, the number of mooring lines, etc., MBL_{sd} is to be not less than the value *MBL** or *MBL***. MBL_{sd} may be determined in accordance with the method deemed appropriate by the Society.

3 Where the MBL_{sd} is determined by the widely recognized industry standards or the owner's standard, MBL_{sd} is to be not less than the minimum breaking load (*MBL*) specified in this section.

Paragraph 27.2.5 has been added as follows.

27.2.5 Mooring Lines

1 General

(1) Ships are to be provided with mooring lines of which *LDBF* is more than MBL_{sd}.

(2) Wire ropes or synthetic ropes used as mooring lines are to comply with the requirements in **Chapter 4 and Chapter 5, Part L of the Rules**, respectively.

(3) Fibre ropes used for mooring lines are to be not less than 20 *mm* in diameter. For considering rope age degradation and wear, the line design break force for such ropes is to be in accordance with the following **(a)** or **(b)**. However, neither **(a)** nor **(b)** need to be complied with in cases where consideration of rope age degradation and wear is included in the method specified in **27.2.4-3**.

(a) Polyamide ropes: $LDBF \geq 120\ \%$ of MBL_{sd}

(b) Other synthetic ropes: $LDBF \geq 110\ \%$ of MBL_{sd}

(4) For mooring lines connected with powered winches where the rope is stored on the drum, steel cord wire ropes of suitable flexible construction may be used instead of fibre cord wire ropes subject to the approval by the Society.

(5) The length of individual mooring lines may be reduced by up to 7 % of the lengths required in this section, provided that the actual total length of the stipulated number of mooring lines is not less than the required total length.

2 The minimum breaking load (*MBL*), the number, the length of mooring lines for ships with equipment numbers of 2,000 or less ($EN \leq 2{,}000$) are to be in accordance with the following **(1)** and **(2)**.

(1) The minimum breaking load (*MBL*), the number and the length of mooring lines are to be in accordance with **Table C27.2** according to the equipment number. However, when calculating the equipment number, the effect of deck cargoes at the ship nominal capacity condition is to be considered with respect to the side-projected area *A*.

(2) For ships having the ratio *A to EN* greater than 0.9 ($A/EN > 0.9$), the following number of ropes is to be added to the number required by **Table C27.2** for mooring lines.

Where *A/EN* is greater than 0.9 but 1.1 or less: 1

Where *A/EN* is greater than 1.1 but 1.2 or less: 2

Where *A/EN* is greater than 1.2: 3

3 The minimum breaking load and the number of mooring lines for ships with an equipment number greater than 2,000 (EN > 2,000) are to be based on the side-projected area A_1. The side-projected area A_1 is to be calculated similar to the side-projected area *A* according to **27.1.2** but in consideration of the following conditions:

(1) The lightest ballast draft is to be considered for the calculation of the side-projected area A_1. For ship types having small variation in the draft (e.g. passenger ships, RO-RO ships), the side-projected area A_1 may be calculated using the designed maximum load line.

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

(3) For ships that in which cargoes are loaded on deck, the side-projected are A_1 is to be the following **(a)** or **(b)**, whichever is the greater.

(a) Side-projected area at the lightest ballast condition.

(b) Side-projected area at the ship nominal capacity condition with cargoes loaded on deck. In such cases, the draft is to be the designed maximum load line.

4 The mooring lines for ships with an equipment number greater than 2,000 (EN > 2,000) are based on the following environmental conditions:

(1) Maximum current speed: 1.0 *m/s*

(2) Maximum wind speed v_w (*m/s)* as follows.

(a) $v_w = 25.0 - 0.002(A_1 - 2000)$ (*m/s*) for passenger ships, ferries, and car carriers with 2,000 $m^2 < A_1 \leq 4{,}000\ m^2$

(b) $v_w = 21.0$ (*m/s*) for passenger ships, ferries, and car carriers with 4,000 $m^2 > A_1$

(c) $v_w = 25.0$ (*m/s*) for other ships

5 Minimum breaking load (*MBL*) for ships with an equipment number greater than 2,000 (EN > 2,000) is to be in accordance with the following **(1)** to **(4)**.

(1) Minimum breaking load (*MBL*) is to be taken as follows:

$$MBL = 0.1A_1 + 350\ (kN)$$

A_1: Ship side-projected area specified in **3**.

(2) Where the minimum breaking load (*MBL*) exceeds 1,275 *kN*, the maximum wind speed v_w may be decreased in conjunction with an adjustment to the strength of the lines as the acceptable wind speed v_w^* using the following formula but is not to be less than 21 *m/s*:

$$v_w^* = v_w \sqrt{\frac{MBL^*}{MBL}}$$

MBL^*: The adjusted minimum breaking load of mooring lines (*kN*)

(3) In case that the maximum wind speed is raised up considering the ship's navigation area, the maximum wind speed may be increased in conjunction with an adjustment to the strength of lines (*MBL*). For the calculation of the acceptable wind speed, the formula specified in **(2)** above may be used.

(4) Head lines, stern lines, breast lines or spring lines in the same service are to be of the same characteristics in terms of strength and elasticity. The strength of spring lines is to be the same as that of the head, stern and breast lines.

6 The number of mooring lines for ships with an equipment number greater than 2,000 (EN > 2,000) is to be in accordance with the following **(1)** to **(4)**.

(1) The total number of head, stern and breast lines is to be obtained from the following formula

and rounded to the nearest whole number:

(a) for oil tankers, chemical tankers, bulk carriers and ore carriers

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

(b) for others

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

(2) Notwithstanding the requirement in **(1)**, 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^{**}, is to be taken as follows:

$MBL^{**} = 1.2MBL \cdot n/n^{**} \leq MBL(kN)$ for an increased number of lines

$MBL^{**} = MBL \cdot n/n^{**}(kN)$ for a reduced number of lines

n^{**}: The increased or decreased total number of head, stern and breast lines

n: The number of lines for the considered ship type as calculated by the formulae specified in **(1)** without rounding.

MBL : *MBL* specified in **5(1)** or *MBL****** specified in **5(2)**

(3) The total number of spring lines is to be taken as not less than the following:

Two lines when the equipment number is less than 5,000 (EN < 5,000)

Four lines when the equipment number is 5,000 or greater (EN ≥ 5,000)

(4) Where 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 number of spring lines is to be taken as follows but rounded up to the nearest even number.

$$n_s^* = MBL \ / MBL^{**} \cdot n_s$$

n_s: The number of lines specified in **(3)**

n_s^*: The increased or decreased total number of head, stern and breast lines.

MBL : *MBL* specified in **5(1)** or *MBL****** specified in **5(2)**

7 The strength of head, stern and breast lines may be increased in conjunction with an adjustment to the number of lines using the formula specified in **6(2)**.

8 The length of mooring lines for ships with an equipment number greater than 2,000 (EN > 2,000) is to be taken as not less than 200 *m.*

Paragraph 27.2.3 has been renumbered to Paragraph 27.2.6, and has been amended as follows.

27.2.~~3~~6 Mooring Fittings*

1 Strength

The strength of shipboard fittings used for towing operations at the bow, sides and stern as well as their supporting hull structures are to comply with the requirements of **27.2.6**. For fittings intended to be used for both towing and mooring, the requirements of **27.2.3** are to be applied.

~~1~~2 Arrangement

(1) Mooring fittings, mooring winches and capstans are to be located on stiffeners, girders, or both which are parts of the deck construction so as to facilitate efficient distribution of the mooring load.

(2) When mooring fittings, mooring winches and capstans cannot be located as specified in **(1),** appropriate reinforced members are to be provided directly underneath ~~them~~ the towing fittings.

~~2~~3 Selection

(1) Mooring fittings are to be selected from industry standards deemed appropriate by the Society and are to be at least based on ~~the minimum breaking strength of mooring line according to **27.1.5**~~MBL_{sd}.

(2) When mooring fittings are not selected from industry standards deemed appropriate by the

Society, the strength of the fitting and of its attachment to the ship are to be in accordance with ~~-3~~**4** and ~~-4~~**5** For strength assessments, beam theory or finite element analysis using net scantlings is to be applied as appropriate. At the discretion of the Society, load tests may be accepted as alternatives to strength assessments by calculations.

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

~~3~~4 ~~Design Load~~Supporting Hull Structure

(1) Design load for supporting hull structures ~~of mooring fittings~~ are to be as specified in **(~~1~~a)** to **(~~7~~c)** below:

(~~1~~a) For supporting hull structures of mooring fittings, ~~T~~the minimum design load is to be 1.15 *times* ~~the breaking strength of the mooring line according to **27.1.5**~~ MBL_{sd}.

(b) For supporting hull structures of mooring winches, the minimum design load is to be 1.25 *times* the intended maximum brake holding load, where the maximum brake holding load is to be assumed to be not less than 80 % of MBL_{sd}.

(c) For supporting hull structures of capstans, the minimum design load is to be 1.25 *times* the maximum hauling-in force.

(2) The design load is to be applied to fittings in all directions that may occur ~~by taking into account~~ inconsideration of the arrangements shown in the towing and mooring arrangements plan specified in **27.2.~~6~~9**.

(3) The point where the mooring force acts on mooring fittings is to be taken as the attachment point of the mooring line. For bollards and bitts, the attachment point of the mooring line is to be taken as not less than 4/5 of the tube height above the base (See **Fig. C27.~~3~~8(a)**). If fins are fitted to the bollard tubes to keep mooring lines as low as possible, the attachment point of the mooring line may be taken as the location of the fins. (See **Fig. C27.~~3~~8(b)**)

(4) Where the mooring line ~~takes a turn at~~ is paid-out through a fitting, the design load is to be equal to the resultant force of design load acting on the line, but need~~s~~ not exceed twice the design load acting on the line. The design load acting on the line is to be the minimum design load specified in **(1)**.

~~(5) Notwithstanding the requirements in **(1)** to **(4)**, when a safe working load (*SWL*), greater than that determined according to **-5** is requested by the applicant, the design load is to be increased in accordance with the appropriate *SWL*/design load relationship given by **-3** and **-5.**~~

~~(6) The minimum design load applied to supporting hull structures for mooring winches is to be 1.25 times the intended maximum brake holding load, where the maximum brake holding load is to be assumed not less than 80% of the minimum breaking strength of the mooring line according to **27.1.5.**~~

~~(7) The minimum design load applied to supporting hull structures for capstans is to be 1.25 times the intended maximum hauling-in force.~~

(5) The reinforced members beneath shipboard fittings are to be effectively arranged for any variation of direction (horizontally and vertically) of the towing forces acting upon the shipboard fittings, and the proper alignment of the fittings and their supporting hull structures is to be ensured. (See **Fig. C27.5** for a sample arrangement.)

~~4~~5 Allowable Stresses

Allowable stresses of supporting hull structures are ~~not~~ to be ~~more than the following:~~ in accordance with **27.2.3-5**.

~~(1) For strength assessments using beam theory or grillage analysis:~~

~~(a) Normal stress: 100% of the specified minimum yield point of the material~~

~~(b) Shearing stress: 60% of the specified minimum yield point of the material~~

~~(2) For strength assessments using finite element analysis:~~
~~(a) Equivalent stress: 100% of the specified minimum yield point of the material~~

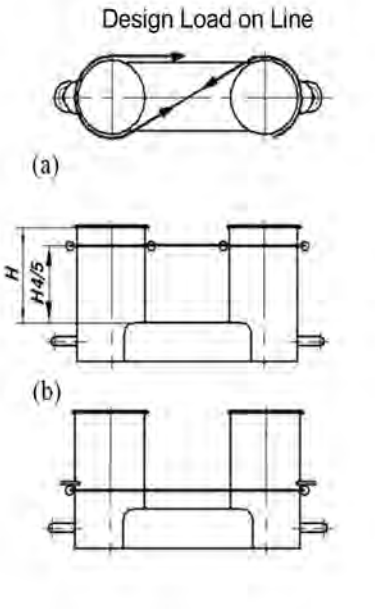
~~5~~**6** Safe Working Load (*SWL*)

(1) ~~Unless a greater *SWL* is requested by the applicant according to **3(5)**,~~ *SWL* is not to exceed ~~the minimum breaking strength of the mooring line according to **27.1.5**~~*MBL*sd.

(2) The *SWL* (in *tonnes*) of each fitting, excluding mooring winches and capstan, is to be marked by weld beads and paint, or the equivalent, on the fitting. For fittings intended to be used for both towing and mooring, the *TOW* according to **27.2.~~2~~ ~~5~~3** is to be marked in addition to *SWL*.

(3) The towing and mooring arrangements plan specified in **27.2.9** is to define the method of use for mooring lines.

Fig. C27.~~3~~8 Acting Point of Mooring Force



Paragraph 27.2.4 has been renumbered to Paragraph 27.2.7, and has been amended as follows.

27.2.4~~7~~ Corrosion Additions

Corrosion additions are to be added to the scantlings of the supporting hull structures ~~specified in **27.2.1-6**~~ and shipboard fittings ~~specified in **27.2.1-4**~~ as ~~follows:~~ following **(1)** to **(3)**. However, if the shipboard fittings are selected from industry standards deemed appropriate by the Society and the corrosion additions are considered in the standard, following **(1)** to **(3)** may not be applied.

(1) Supporting hull structures: ~~According to other rules for the surrounding structures~~ total of 2.0 *mm*. (For container carriers, the corrosion additions specified in **32.1.3** may be applied to the supporting hull structures for which scantlings are determined by the net scantling method.)

(2) Pedestals and foundations fitted on decks which are not ~~a part of a~~ shipboard fittings selected ~~according to an~~ from industry standards deemed appropriate by the Society: total of 2.0 *mm*

(3) Shipboard fittings not selected from industry standards deemed appropriate by the Society: total of 2.0 *mm*

Paragraph 27.2.5 has been amended to Paragraph 27.2.8, and has been amended as follows.

27.2.~~5~~8 Wear Allowances

In addition to the corrosion additions referred to in **27.2.~~4~~7**, the wear allowances for shipboard fittings not selected from industry standards deemed appropriate by the Society are not to be less than 1.0 *mm*, added to surfaces which are intended to regularly contact the line.

Paragraph 27.2.6 has been renumbered to Paragraph 27.2.9, and has been amended as follows.

27.2.~~6~~9 Towing and Mooring ~~Fitting~~ Arrangements Plan*

1 The *SWL* and *TOW* for the intended use for each shipboard fitting is to be noted in the towing and mooring arrangements plan available on board for the Master. If not otherwise chosen, *TOW* is to be the load limit for a tow line attached with an eye~~s~~ splice.

2 Information provided on the plan is to include the following.

(1) Industry standard and referenced number of each towing and mooring fittings.

(2) For each towing and mooring fitting, the location on the ship, the purpose (mooring, normal towing, other towing, etc.), the *SWL* and/or *TOW* ~~and~~ as well as the manner of applying towing or mooring line loads including limiting fleet angles.

(3) An arrangement of mooring lines showing the number of lines. (~~Refer to~~See **Fig. C27.4**)

(4) ~~The minimum breaking load of each mooring line~~The Ship Design Breaking Load (MBL_{sd}).

(5) The acceptable environmental conditions ~~as given in **27.1.5**, for the minimum breaking strength of mooring lines~~ for ships with equipment numbers greater than 2,000 (EN > 2,000);

(a) Maximum wind speed or acceptable wind speed,

(b) Maximum current speed.

(6) Condition of use for additional mooring equipment not covered by this chapter.

(~~6~~7) Other information or notes related to the design of shipboard fittings or lines.

Notes of Table C27.1 has been amended as follows.

Table C27.1 Anchors, Chain Cables and Ropes
(Table is omitted.)

Notes:

1 Length of chain cables may include shackles for connection.

2 Tow line is not a condition of Classification, but is listed in this table only for guidance. (ref. **27.~~1.6~~2.2**)

~~3 Values given for anchoring equipment in this table are based on an assumed maximum current speed of 2.5 *m/s*, a maximum wind speed of 25 *m/s* and a minimum scope of chain cable of 6, the scope being the ratio between the paid-out length of the chain and water depth. However, for ships with a ship length L_2, as defined in **27.1.2-1**, greater than 135 *m*, alternatively the required anchoring equipment may be considered applicable to a maximum current speed of 1.54 *m/s*, a maximum wind speed of 11 *m/s* and waves with maximum significant height of 2 *m*.~~

EFFECTIVE DATE AND APPLICATION (Amendment 1-2)

1. The effective date of the amendments is 1 January 2022.

2. Notwithstanding the amendments to the Rules, the current requirements apply to ships for which the date of contract for construction* is before the effective date.

* "contract for construction" is defined in the latest version of IACS Procedural Requirement (PR) No.29.

IACS PR No.29 (Rev.0, July 2009)

1. The date of "contract for construction" of a vessel is the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. This date and the construction numbers (i.e. hull numbers) of all the vessels included in the contract are to be declared to the classification society by the party applying for the assignment of class to a newbuilding.

2. The date of "contract for construction" of a series of vessels, including specified optional vessels for which the option is ultimately exercised, is the date on which the contract to build the series is signed between the prospective owner and the shipbuilder.

For the purpose of this Procedural Requirement, vessels built under a single contract for construction are considered a "series of vessels" if they are built to the same approved plans for classification purposes. However, vessels within a series may have design alterations from the original design provided:

(1) such alterations do not affect matters related to classification, or

(2) If the alterations are subject to classification requirements, these alterations are to comply with the classification requirements in effect on the date on which the alterations are contracted between the prospective owner and the shipbuilder or, in the absence of the alteration contract, comply with the classification requirements in effect on the date on which the alterations are submitted to the Society for approval.

The optional vessels will be considered part of the same series of vessels if the option is exercised not later than 1 year after the contract to build the series was signed.

3. If a contract for construction is later amended to include additional vessels or additional options, the date of "contract for construction" for such vessels is the date on which the amendment to the contract, is signed between the prospective owner and the shipbuilder. The amendment to the contract is to be considered as a "new contract" to which **1.** and **2.** above apply.

4. If a contract for construction is amended to change the ship type, the date of "contract for construction" of this modified vessel, or vessels, is the date on which revised contract or new contract is signed between the Owner, or Owners, and the shipbuilder.

Note:
This Procedural Requirement applies from 1 July 2009.

Amendment 1-3

Chapter 4 SUBDIVISIONS

4.1 General

Paragraph 4.1.2 has been amended as follows.

4.1.2 Definitions*

For the purpose of this chapter, the following definitions apply.

((1) to (15) are omitted.)

(16) "Timber" means all types of wooden material covered by the *Code of Safe Practice for Ships Carrying Timber Deck Cargoes, 2011* (*IMO* resolution *A*.1048(27)), including both round and sawn wood but excluding wood pulp and similar cargo.

(1~~6~~7) "Timber deck cargo" means a cargo of timber carried on an uncovered part of a freeboard or superstructure deck. ~~The term does not include wood pulp or similar cargo.~~

(1~~7~~8) "Machinery spaces" are spaces between the watertight boundaries of a space containing the main and auxiliary propulsion machinery, including boilers, generators and electric motors primarily intended for propulsion.

EFFECTIVE DATE AND APPLICATION (Amendment 1-3)

1. The effective date of the amendments is 1 July 2022.

2. Notwithstanding the amendments to the Rules, the current requirements apply to ships for which the date of contract for construction* is before the effective date.

* "contract for construction" is defined in the latest version of IACS Procedural Requirement (PR) No.29.

IACS PR No.29 (Rev.0, July 2009)

1. The date of "contract for construction" of a vessel is the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. This date and the construction numbers (i.e. hull numbers) of all the vessels included in the contract are to be declared to the classification society by the party applying for the assignment of class to a newbuilding.

2. The date of "contract for construction" of a series of vessels, including specified optional vessels for which the option is ultimately exercised, is the date on which the contract to build the series is signed between the prospective owner and the shipbuilder.

For the purpose of this Procedural Requirement, vessels built under a single contract for construction are considered a "series of vessels" if they are built to the same approved plans for classification purposes. However, vessels within a series may have design alterations from the original design provided:

(1) such alterations do not affect matters related to classification, or

(2) If the alterations are subject to classification requirements, these alterations are to comply with the classification requirements in effect on the date on which the alterations are contracted between the prospective owner and the shipbuilder or, in the absence of the alteration contract, comply with the classification requirements in effect on the date on which the alterations are submitted to the Society for approval.

The optional vessels will be considered part of the same series of vessels if the option is exercised not later than 1 year after the contract to build the series was signed.

3. If a contract for construction is later amended to include additional vessels or additional options, the date of "contract for construction" for such vessels is the date on which the amendment to the contract, is signed between the prospective owner and the shipbuilder. The amendment to the contract is to be considered as a "new contract" to which **1.** and **2.** above apply.

4. If a contract for construction is amended to change the ship type, the date of "contract for construction" of this modified vessel, or vessels, is the date on which revised contract or new contract is signed between the Owner, or Owners, and the shipbuilder.

Note:
This Procedural Requirement applies from 1 July 2009.

GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

GUIDANCE

Part C Hull Construction and Equipment

2021 AMENDMENT NO.2

Notice No.58 27 December 2021

Resolved by Technical Committee on 28 July 2021

Notice No.58 27 December 2021
AMENDMENT TO THE GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

"Guidance for the survey and construction of steel ships" has been partly amended as follows:

Part C HULL CONSTRUCTION AND EQUIPMENT

Amendment 1-1

C18 SUPERSTRUCTURES

Title of Section C18.4 has been amended as follows.

C18.4 Additional Requirements for Bulk Carriers, Ore Carriers and Combination Carriers, etc.

C32 CONTAINER CARRIERS

C32.13 Special Requirements for Container Carriers Applying Extremely Thick Steel Plates

C32.13.3 Measures for Prevention of Brittle Fracture

Sub-paragraph -1 has been amended as follows.

1 "Other measures deemed by the Society to be equivalent in effectiveness to brittle crack arrest designs" in Note (1) of **Table C32.27, Part C of the Rules** means the non-destructive inspections, particularly those using the time-of-flight diffraction (*TOFD*) technique, or the phased array ultrasonic testing (*PAUT*) specified in **M8.4.3-2, Part M of the Guidance** is carried out at the locations specified in **8.4.3-8, Part M of the Rules**.

EFFECTIVE DATE AND APPLICATION (Amendment 1-1)

1. The effective date of the amendments is 27 December 2021.

Amendment 1-2

C27 EQUIPMENT

C27.1 Anchors~~,~~ and Chain Cables ~~and Mooring Ropes~~

C27.1.1 General

Sub-paragraph -1 has been amended as follows.

1 The "~~S~~special consideration" referred to in **27.1.1-~~1~~3, Part C of the Rules** means the evaluation of the design effectiveness of anchors, chain cables and windlasses. For ships for which L_2 is not less than 135 *m*, the ~~provisions of~~ following **(1)** to **(4)** may be used for the design or to assess the adequacy of the anchoring equipment. However, the application of these provisions is limited to anchoring operations in water of depths up to 120 *m*, currents up to 1.54 *m*/*s*, winds up to 14 *m*/*s* and waves with significant heights up to 3 *m*. Furthermore, the scope of chain cables, being the ratio between the paid-out length of the chain and water depth, is limited to between 3 and 4.
((1) to (3) are omitted.)

(4) Windlass design and testing as well as chain stopper design are to be in accordance with **Chapter 16, Part D of the Rules**. In addition, windlasses and chain stoppers are to be in accordance with the following **(a)** to **(c)**.

(a) The windlass unit prime mover is to be able to supply ~~for at least 30 minutes~~a continuous duty pull Z_{cont} (in *N*) ~~as given by~~ for at least 30 *minutes*. Z_{cont} is to be obtained as follows:

$$Z_{cont} = 35d^2 + 13.4m_A$$

d: chain diameter (*mm*) as per **Table C27.1.1-1**
m_A: HHP anchor mass (*kg*) as per **Table C27.1.1-1**

(b) As far as practicable for testing purposes, the test speed of the chain cable during hoisting of the anchor and cable is to be measured over 37.5 *m* of the chain cable and initially with at least 120 *m* of chain and the anchor submerged and hanging free. The mean speed of the chain cable during hoisting of the anchor from the depth of 120 *m* to the depth of 82.5 *m* is to be at least 4.5 *m*/*min*.

(c) For the supporting hull structures of anchor windlasses and chain stoppers, reference is made to the provisions ~~of~~ specified in **27.1.~~8~~6, Part C of the Rules**.

Table C27.1.1-1 has been amended as follows.

Table C27.1.1-1 Anchoring Equipment for Ships in Unsheltered Water of Depths up to 120 *m*

Equipment letter	Equipment number EN_1		High holding power stockless bower anchors		Stud link chain cable for bower anchors		
			Number	Mass per anchor	Length	Diameter	
						Grade 2	Grade 3
	~~Over~~ Equal to or greater than	~~Up to~~ Less than		*kg*	*m*	*mm*	*mm*
-	-	1790	2	14150	1017.5	105	84
*DG*2	1790	1930	2	14400	990	105	84
*DG*3	1930	2080	2	14800	990	105	84
*DG*4	2080	2230	2	15200	990	105	84
*DG*5	2230	2380	2	15600	990	105	84
*DH*1	2380	2530	2	16000	990	105	84
*DH*2	2530	2700	2	16300	990	105	84
*DH*3	2700	2870	2	16700	990	105	84
*DH*4	2870	3040	2	17000	990	105	84
*DH*5	3040	3210	2	17600	990	105	84
*DJ*1	3210	3400	2	18000	990	105	84
*DJ*2	3400	3600	2	18300	990	10~~5~~6	84
*DJ*3	3600	3800	2	19000	990	107	8~~7~~5
*DJ*4	3800	4000	2	19700	962.5	10~~7~~8	87
*DJ*5	4000	4200	2	20300	962.5	111	90
*DK*1	4200	4400	2	21100	962.5	114	92
*DK*2	4400	4600	2	22000	962.5	117	95
*DK*3	4600	4800	2	22900	962.5	~~120~~119	97
*DK*4	4800	5000	2	23500	962.5	12~~4~~2	99
*DK*5	5000	5200	2	24000	935	12~~7~~5	102
*DL*1	5200	5500	2	24500	907.5	~~132~~130	10~~7~~5
*DL*2	5500	5800	2	25000	907.5	13~~2~~3	107
*DL*3	5800	6100	2	25500	880	137	111
*DL*4	6100	6500	2	25700	880	14~~2~~0	11~~4~~3
*DL*5	6500	6900	2	26000	852.5	14~~2~~3	11~~7~~5
*DM*1	6900	7400	2	26500	852.5	147	11~~7~~8
*DM*2	7400	7900	2	27000	825	152	12~~2~~1
*DM*3	7900	8400	2	27500	825	154	12~~7~~3
*DM*4	8400	8900	2	28000	797.5	158	127
*DM*5	8900	9400	2	28900	770	162	132
*DN*1	9400	10000	2	29400	770		13~~7~~5
*DN*2	10000	10700	2	29900	770		1~~42~~39
*DN*3	10700	11500	2	30600	770		14~~2~~3
*DN*4	11500	12400	2	31500	770		147
*DN*5	12400	13400	2	33200	770		152
*DO*1	13400	14600	2	35000	770		157
-	14600	-	2	38000	770		162

Paragraph C27.1.2 has been amended as follows.

C27.1.2 Equipment Numbers

(-1 is omitted.)

~~**2 Structures to be included in the second term ($2.0hB$) of the formula in 27.1.2, Part C of the Rules**~~

~~(1) The following items are to be included in the calculation of h'.~~

~~(a) Superstructures~~

~~(b) Deckhouses having a breadth greater than $B/4$~~

~~(c) Screens or bulwarks higher than 1.5 m in continuation with the deckhouse, the total breadth of which exceeds $B/4$ (*See* **C27.1.2-4**)~~

~~(2) The structures specified in **(1)** above are to be divided at each deck into upper and lower structures, the breadths of which are to be measured as individual tiers. (*See* **C27.1.2-4**)~~

~~**3**~~**2** Measurement of breadth of structures for second term of the formula in **27.1.2, Part C of the Rules**

(1) Structures are to be treated as separated above and below by a deck level. A continuous superstructure or deckhouse situated on one tier is to be treated as a single structure irrespective of the mode of variation of their breadth and height, continuous or discontinuous, and the breadth is to be the largest one as shown in **Fig. C27.1.2-1**.

(2) As for detached independent deckhouses on one tier, breadths of respective deckhouses are to be measured separately to determine whether they ~~should~~are to be included or not. (*See* **Fig. C27.1.2-2**)

(3) Where a deckhouse having a breadth greater than $B/4$ is above a deckhouse with a breadth of $B/4$ or less, the narrow deckhouse may be ignored. (*See* **Fig. C27.1.2-3**)

(4) When calculating h, sheer and trim are to be ignored. (*See* **Fig. C27.1.2-4**)

~~**4 Measurement of heights (h') of structures**~~

~~(1) h' is to be the height at the centreline of the hull and is to be measured as shown in **Fig. C27.1.2-3**.~~

~~(2) Where there are detached structures, h' is to be determined for respective structures independently and the maximum value is to be taken as the height. (*See* **Fig. C27.1.2-4**)~~

~~(3) Where the tween deck height varies longitudinally, h' is to be the maximum value measured from the uppermost continuous deck in the longitudinal section along the ship's centreline. (*See* **Fig. C27.1.2-5**)~~

3 Side projected area A may be in accordance with following **(1)** and **(2)**.

(1) The area of deck camber may disregarded when determining side projected area A.

(2) Side projected area A may be calculated using following formula.

(a) A is the value obtained from the following formula:

$$aL_2 + \sum h''l$$

$\Sigma h''l$: Sum of the products of the height h'' (m) and length l (m) of superstructures, deckhouses, trunks or funnels which are located above the uppermost continuous deck within L_2 and also have a breadth greater than $B/4$ and a height greater than 1.5 m

(b) Structures are to be treated as separated above and below by a deck level. A continuous superstructure or deckhouse situated on one tier is to be treated as a single structure irrespective of the mode of variation of their breadth and height, continuous or discontinuous. The length of the single structure is to be the value at the largest point. However, if the height is not more than 1.5 m, the part of the single structure is to be ignored. (See **Fig. C27.1.2-5**)

(c) h'' is the height (m) at the centreline of each tier of deckhouses having a breadth greater than $B/4$.

~~**5**~~**4** Structures to be included in the third term ~~(0.1 A)~~ of the formula in **27.1.2, Part C of the**

Rules

(1) The following items ~~are to be included in $\sum h''l$.~~ may be excluded from ship side projected area A:

~~(a) Superstructures~~

~~(b) Deckhouses and trunks having breadths exceeding $B/4$ and heights exceeding 1.5 m (*See* **-4** above as to measurement of breadth)~~

~~(c) Screens and bulwarks higher than 1.5 m in continuation with superstructures or deckhouses having a breadth exceeding $B/4$ (*See* **C27.1.2-7** as to measurement of length)~~

~~Notes:~~

~~The following items may be excluded from the calculation of $\sum h''l$:~~

(a) portions outside the fore and aft ends of L

(b) derrick posts, ventilators, etc. in continuation with superstructures or deckhouses

~~- hatch coamings and hatch covers~~

~~- funnels~~

(c) cargoes loaded on decks ~~(In the case of calculating equipment numbers for the selection of tow lines and mooring lines, deck cargo as given by the Loading Manual is to be included in the calculations. of $\sum h''l$)~~

~~(2) The structures specified in **(1)** above are to be divided at each deck into upper and lower structures, and the values of $\sum h''l$ are to be calculated for individual tiers.~~

~~**6** Measurement of length of structures~~

~~(1) A continuous superstructure or deckhouse situated on one tier is to be treated as a single superstructure or deckhouse even when its breadth and/or height vary discontinuously. The length is to be the maximum extreme length of the structure. Where the structure varies in height and has a deckhouse not more than 1.5 m in height at the ends and/or midpoint of the structure, such portions are to be neglected. (*See* **Fig. C27.1.2-6**)~~

~~(2) Bulwarks in continuation with superstructures or deckhouses are to be treated in the same manner as **(1)** above. (*See* **Fig. C27.1.2-7**)~~

~~**7** Measurement of height (h'') of structures~~

~~(1) The height of structures (h'') covering the ship's centreline, such as superstructures, deckhouse, etc. is to be the tween deck height of respective tiers of structure at the centreline.~~

~~(2) Where the tween deck height varies longitudinally, h'' is to be determined as shown in **Fig. C27.1.2-8**.~~

~~(3) The height of structures not covering the ship's centreline is to be measured at the side facing the centreline.~~

~~**8** Where structures stand side by side~~

~~(1) Where two or more deckhouses stand side by side transversely, $h''l$ may be the projected area on the plane of longitudinal section. (*See* **Fig. C27.1.2-9**)~~

~~(2) Screens and bulwark are to be treated in the same manner as **(1)** above.~~

~~**9** Calculation of $h''l$ of pressurised LPG tank~~

~~The $h''l$ of the upper portions of LPG tanks above the upper deck which is included into $h''l$ according to **C27.1.2-7** is to be the projected area on the longitudinal section along the ship's centreline.~~

Fig. C27.1.2-1

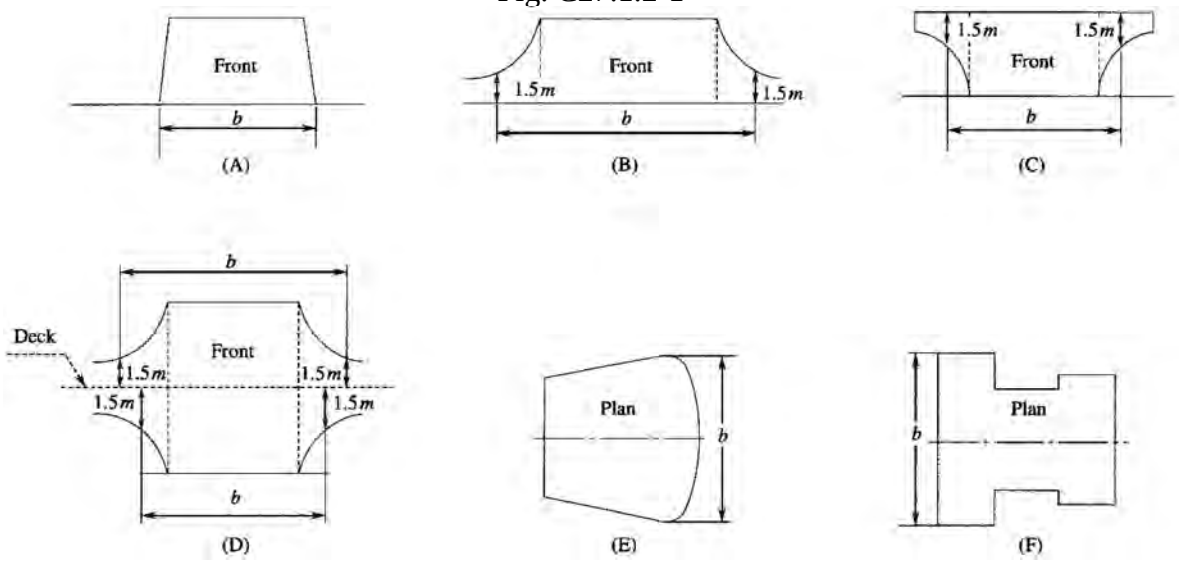
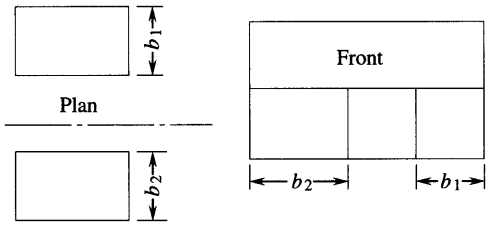


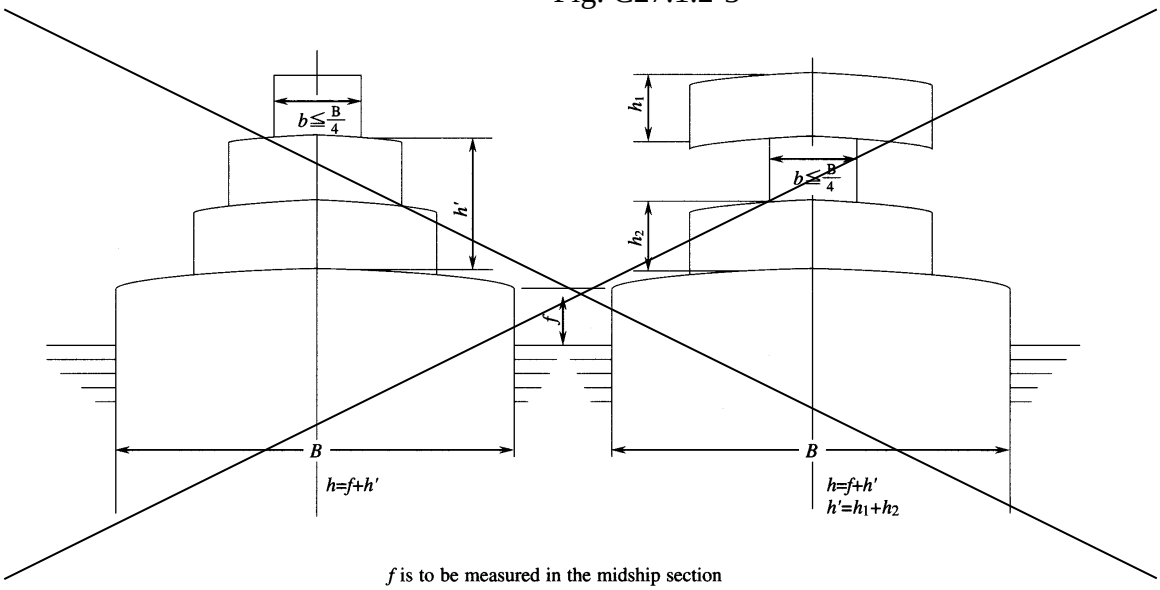
Fig. C27.1.2-2



Note:
If both b_1 and b_2 are less than $B/4$, they are not to be included (irrespective of the sum b_1+b_2)

Fig.C27.1.2-3 has been amended as follows.

Fig. C27.1.2-3



f is to be measured in the midship section

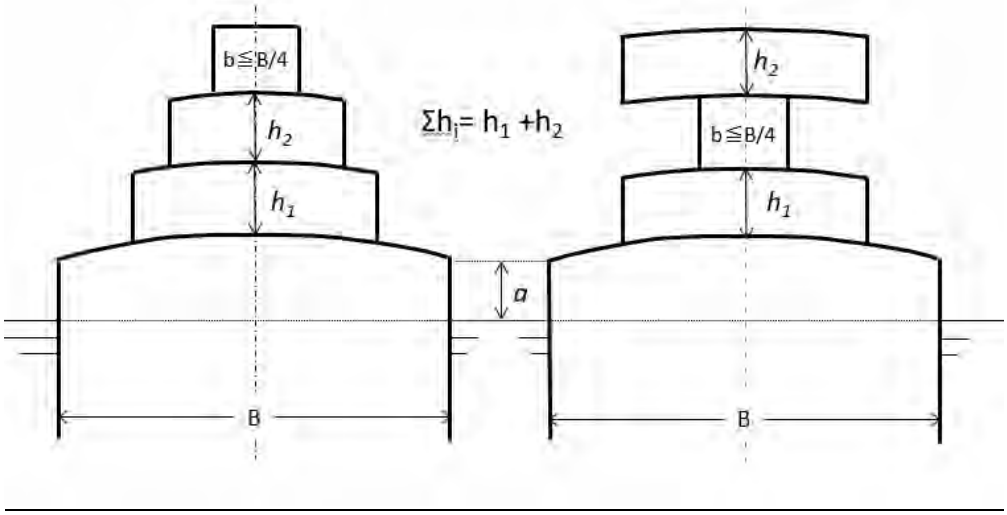
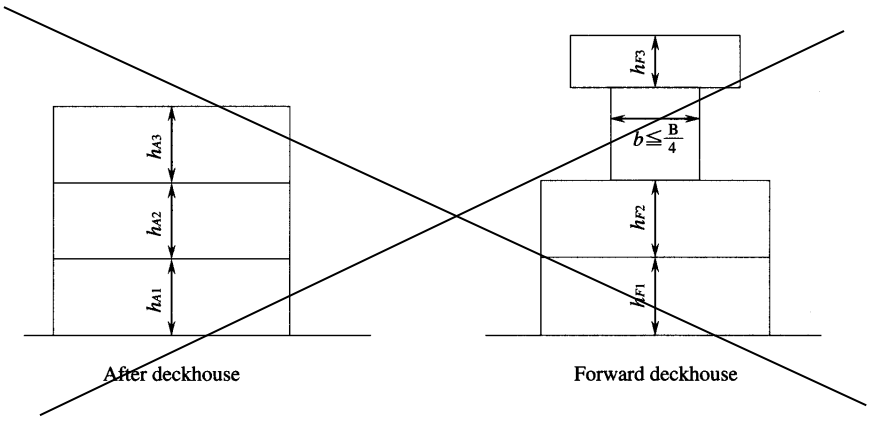


Fig. C27.1.2-4 has been deleted, Fig. C27.1.2-5 and Fig. C27.1.2-6 have been renumbered to Fig. C27.1.2-4 and Fig. C27.1.2-5.

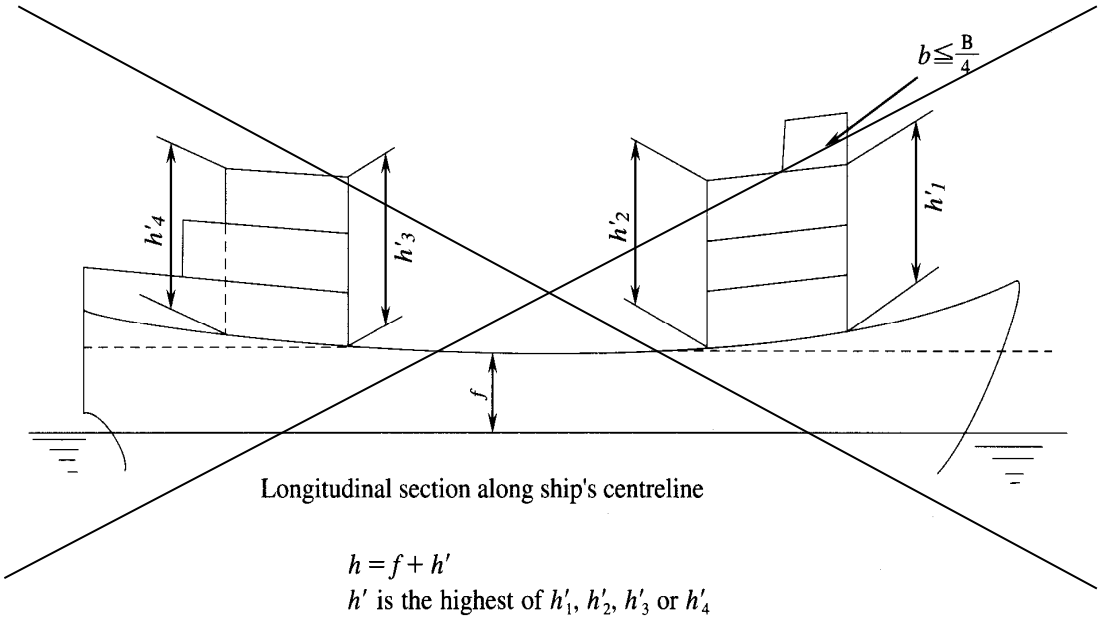
~~Fig. C27.1.2-4~~



h' is to be $(h_{A1} + h_{A2} + h_{A3})$ or $(h_{F1} + h_{F2} + h_{F3})$, whichever is greater

Fig. C27.1.2-4 has been amended as follows.

Fig. C27.1.2-~~5~~4



Longitudinal section along ship's centreline

$h = f + h'$

h' is the highest of h'_1, h'_2, h'_3 or h'_4

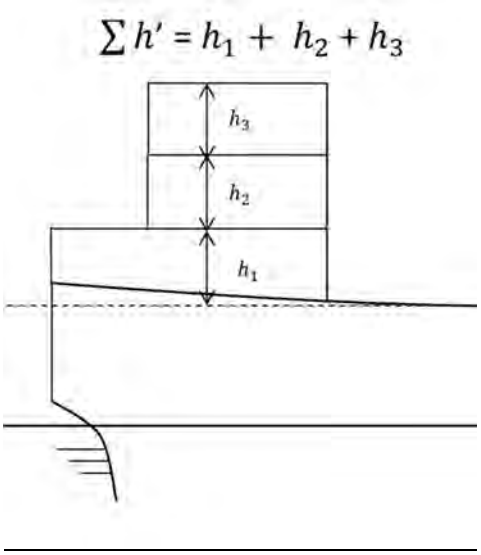


Fig. C27.1.2-~~6~~5

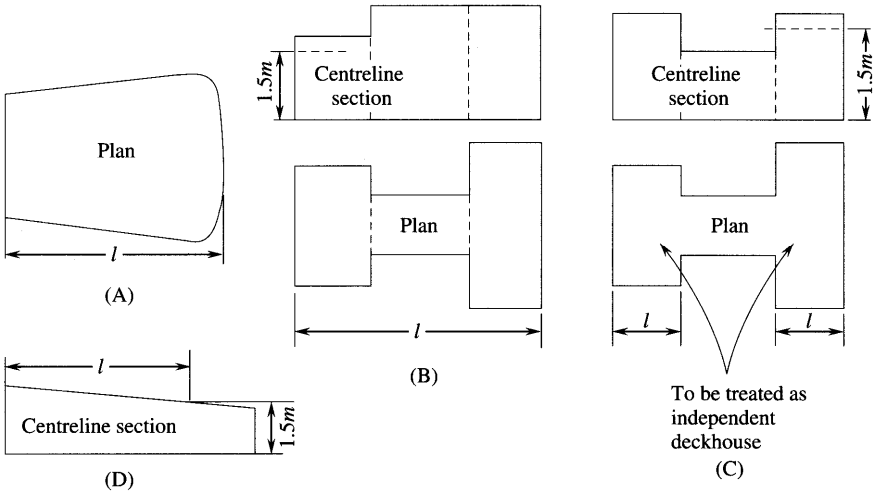

Plan
l
(A)
1.5m
Centreline section
Plan
l
(B)
Centreline section
1.5m
Plan
l
l
To be treated as independent deckhouse
(C)
l
Centreline section
1.5m
(D)

Fig. C27.1.2-7 has been deleted.

~~Fig. C27.1.2-7~~

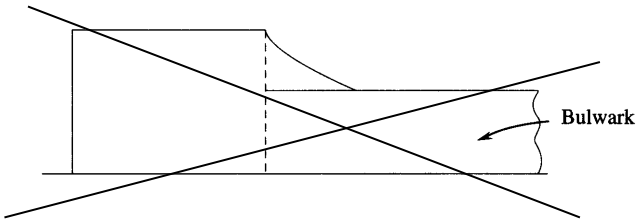


Fig. C27.1.2-8 has been deleted.

~~Fig. C27.1.2-8~~

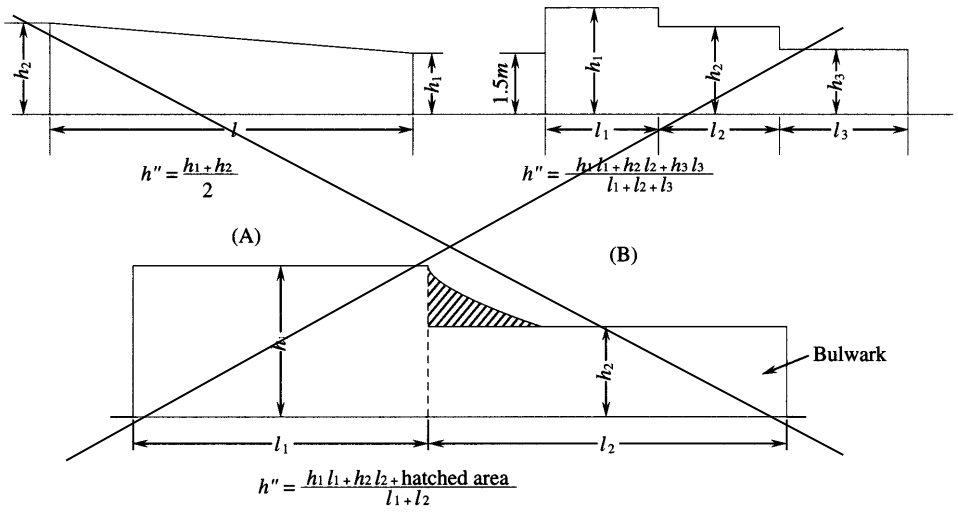
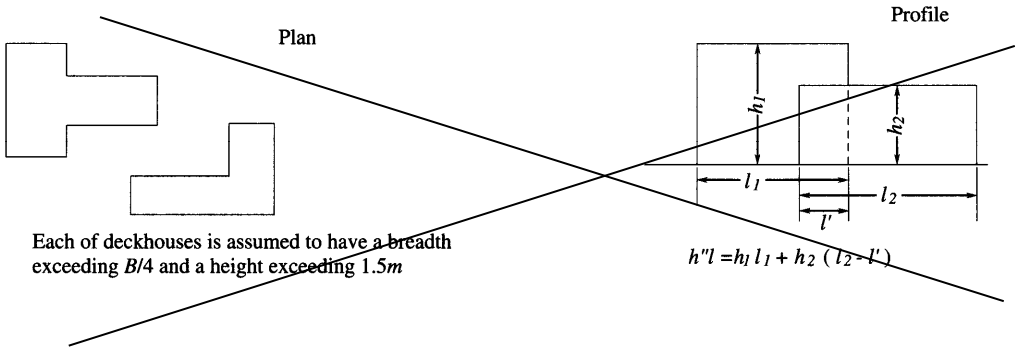


Fig. C27.1.2-9 has been deleted.

~~Fig. C27.1.2-9~~



Paragraph C27.1.4 has been deleted.

C27.1.4 Chain Cables

Wire ropes may be used in place of chain cables on ships with less than 40 *m* in length as long as the following **(1)** to **(3)** are satisfied.

(1) The length of the wire rope is to be equal to 1.5 times the corresponding tabular length of chain cable specified in **Table C27.1, Part C of the Rules** and its strength is to be equal to that of a Grade 1 chain cable as specified in **Table L3.5, Part L of the Rules.**

(2) A short length of chain cable is to be fitted between the wire rope and anchor having a length of 12.5 *m* or the distance between anchor in its stowed position and the winch, whichever is less.

(3) All surfaces coming into contact with the wire rope need to be rounded with a radius of not less than 10 times the wire rope diameter (including stem).

Paragraph C27.1.5 has been deleted.

C27.1.5 Mooring Lines

1 With respect to the provisions of **27.1.5-2, Part C of the Rules**, deck cargo as given by the Loading Manual is to be included for the determination of side-projected area A_L.

2 Fibre ropes used for tow lines or mooring lines are to be not less than 20 *mm* in diameter. The minimum breaking strength specified in **27.1.5, Part C of the Rules** is to be increased by 20% for polyamide ropes and by 10% for other synthetic ropes to account for any strength loss due to aging and wear, etc.

3 For synthetic fibre ropes, it is recommended to use lines which have a reduced risk of recoil (snap-back) to mitigate the risk of injuries or fatalities in the cases where the lines may break.

4 "Breast line", "head line", "stern line" and "spring line" referred to in **27.1.5, Part C of the Rules** are defined as follows.

(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 the longitudinal and transverse directions, restraining the ship in the off-berth and in the fore or aft directions. The amount of restraint in the fore or aft and off-berth directions depends on the line angle relative to these directions.

5 "The ship is intended to be regularly moored to jetty-type piers" referred to in **27.1.5-5(2), Part C of the Rules** means oil tankers, chemical tankers or gas carriers which are assumed to be moored to jetty-type piers.

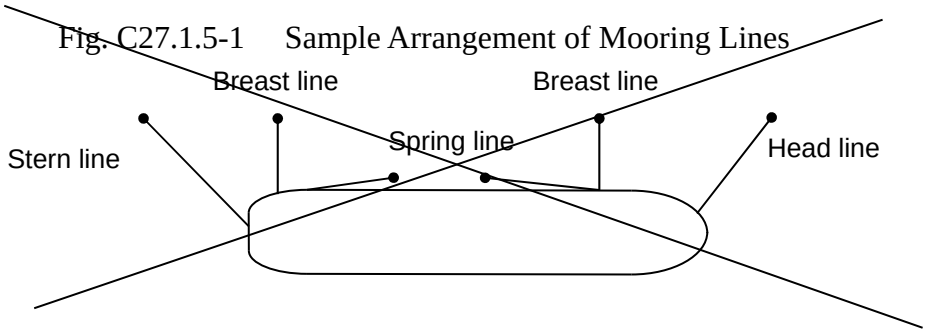
6 Maximum wind speed, acceptable wind speed and maximum current speed referred to in **27.1.5, Part C of the Rules** are based on the following **(1)** to **(2)**.

(1) 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.

(2) 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 currents.

Fig.C27.1.5-1 has been deleted.

Fig. C27.1.5-1 Sample Arrangement of Mooring Lines



Paragraph C27.1.7 has been renumbered to Paragraph C27.1.5, and has been amended as follows.

C27.1.~~7~~5 Chain Lockers

The wording "the access cover and its securing arrangements to the satisfaction of the Society" in **27.1.~~7~~5-5, Part C of the Rules** means those which are in accordance with *JIS* F 2304, *JIS* F 2329, or *ISO* 5894:1999 or their equivalent.

C27.2 Towing and Mooring Fittings

Paragraph C27.2.1 has been amended as follows.

C27.2.1 General

~~**1** "Shipboard fittings" referred to in **27.2.1-1, Part C of the Rules** mean bollards, bitts, fairleads, stand rollers, chocks used for normal mooring of the ship and other similar components used for normal or other towing of the ship. Other components such as capstans, winches, etc. are not included. Any weld, bolt or equivalent device connecting a shipboard fitting to its supporting structure is to be considered to be part of the shipboard fitting if selected in accordance with an industry standard deemed appropriate by the Society.~~

~~**2** "Supporting hull structures" referred to in **27.2.1-1, Part C of the Rules** means the parts of the ship structure on/in which the shipboard fitting is placed and which is directly subjected to the forces exerted on the shipboard fitting. The supporting hull structures of capstans, winches, etc. used for normal or other towing and mooring operations mentioned above is included.~~

~~**3** **27.2.1-1, Part C of the Rules** is not applicable to the design and construction of shipboard fittings and supporting hull structures used for the following types of special towing service:~~

~~(1) Escort towing: Towing service, in particular, for laden oil tankers or LNG carriers, required in specific estuaries. Its main purpose is to control the ship in case of failures of propulsion or steering systems.~~

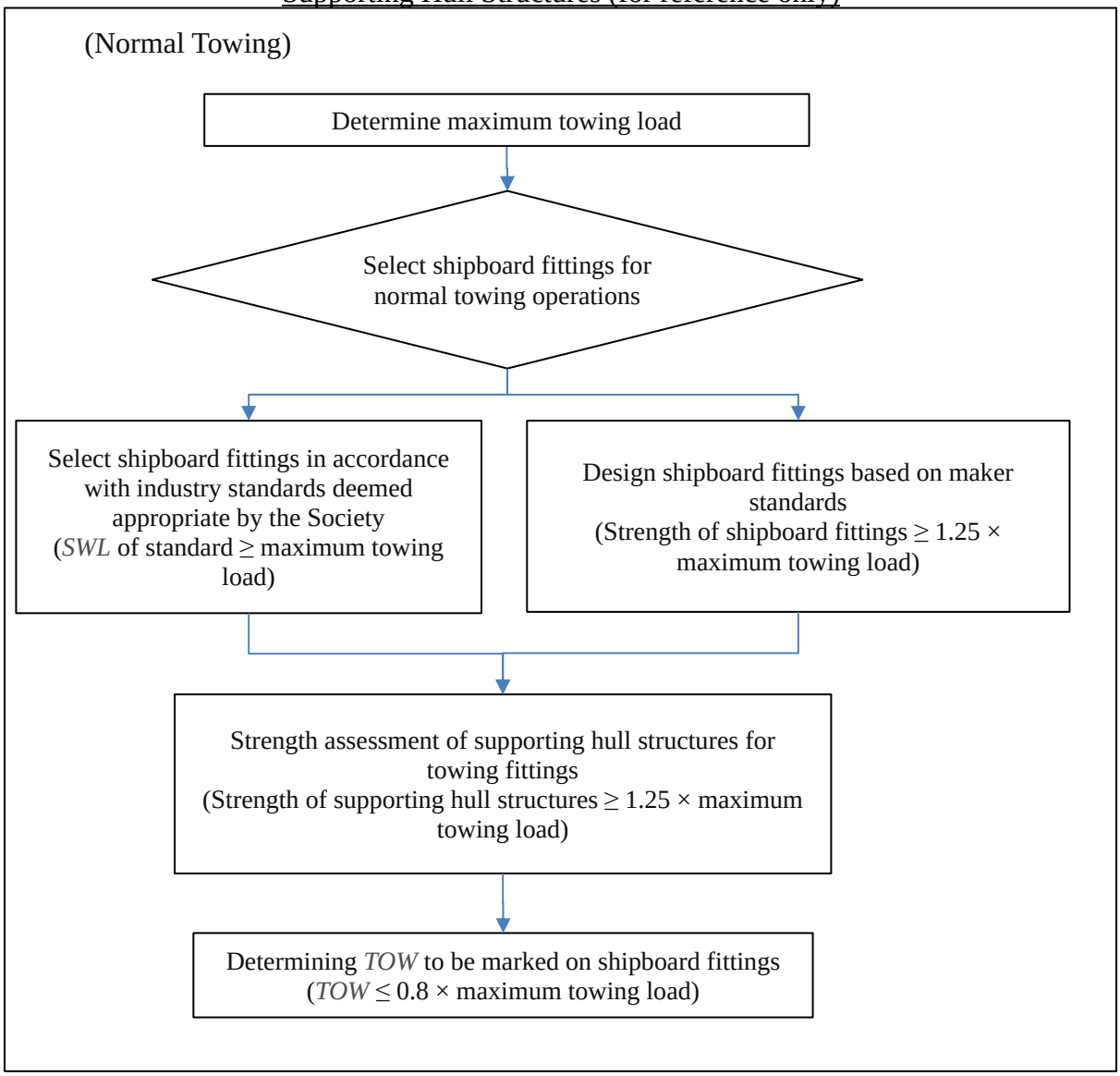
~~(2) Canal transit towing: Towing service for ships transiting canals~~

~~(3) Emergency towing for tankers: Towing service to assist tankers in the cases of emergency referred to in **27.3, Part C of the Rules**.~~

~~**4** "Sheltered waters" referred to in **27.2.1-1, Part C of the Rules** means water area specified in **3.5.2**, **Section 4, Chapter 1, Part 1 of Part CSR-B&T**.~~

With respect to the provisions of **27.2, Part C of the Rules**, the flow charts shown in **Fig. C27.2.1-1** and **Fig. C27.2.1-2** are standard methods for the design processes of tow lines, mooring lines, shipboard fittings and their supporting hull structures.

Fig. C27.2.1-1 Standard Design and Selection Process for Tow Lines, Towing Arrangements and Supporting Hull Structures (for reference only)



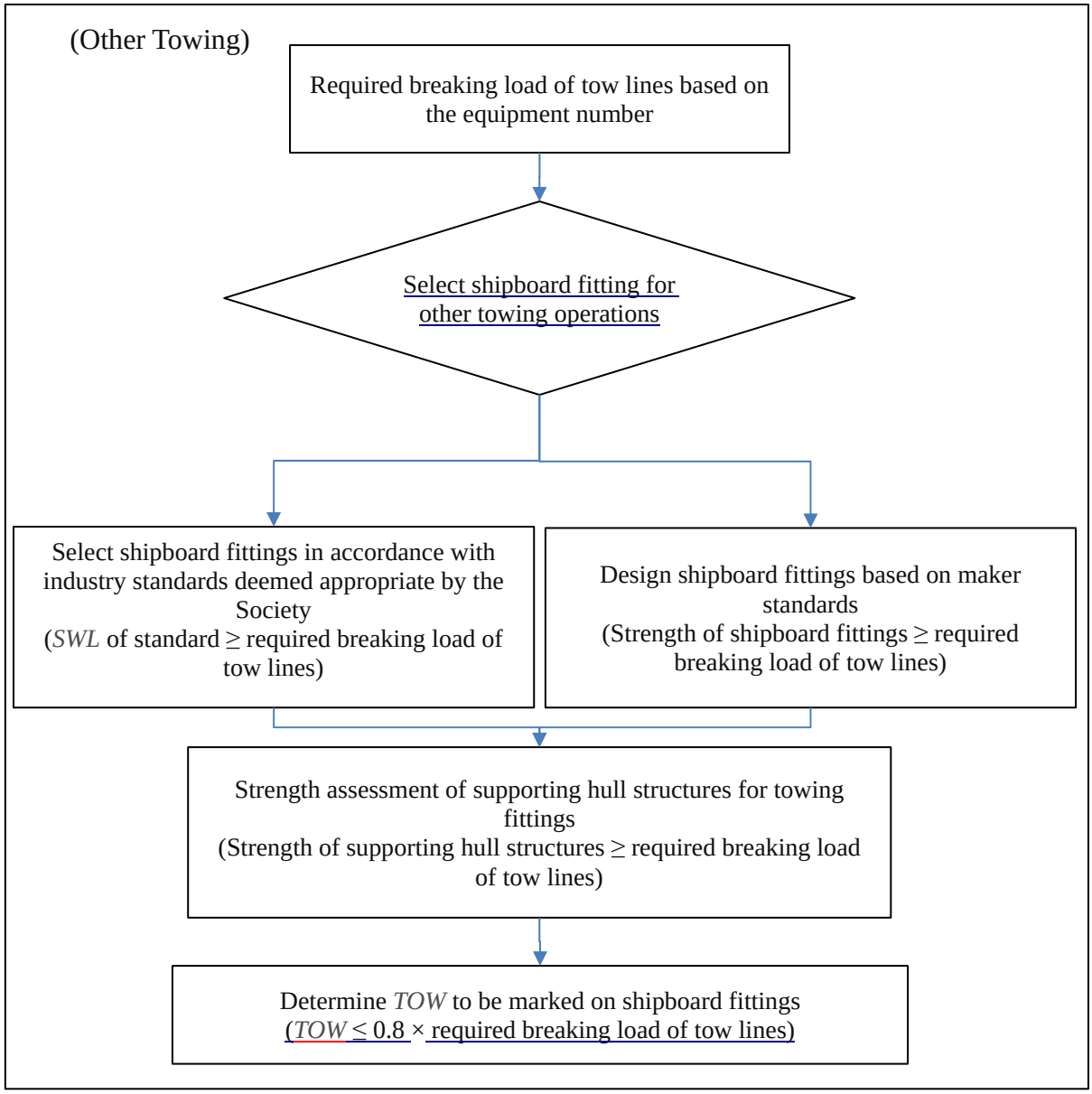
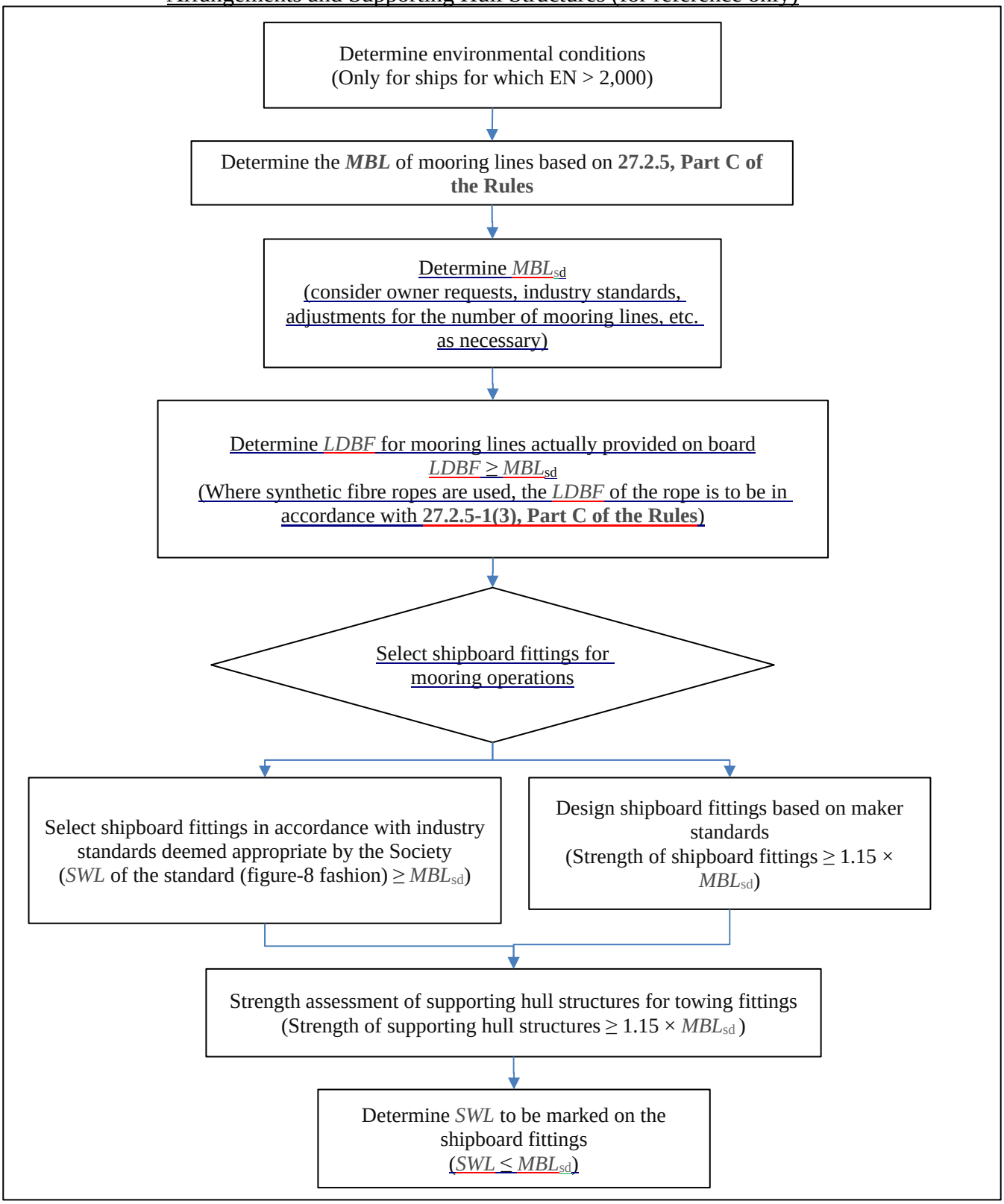

(Other Towing)
Required breaking load of tow lines based on the equipment number
Select shipboard fitting for other towing operations
Select shipboard fittings in accordance with industry standards deemed appropriate by the Society
(*SWL* of standard ≥ required breaking load of tow lines)
Design shipboard fittings based on maker standards
(Strength of shipboard fittings ≥ required breaking load of tow lines)
Strength assessment of supporting hull structures for towing fittings
(Strength of supporting hull structures ≥ required breaking load of tow lines)
Determine *TOW* to be marked on shipboard fittings
(*TOW* ≤ 0.8 × required breaking load of tow lines)

Fig. C27.2.1-2 Standard Design and Selection Process for Mooring Lines, Mooring Arrangements and Supporting Hull Structures (for reference only)



Paragraph C27.2.2 has been renumbered to Paragraph C27.2.3, and has been amended as follows.

C27.2.~~2~~3 Towing Fittings

~~**1** With respect to the provisions of **27.2.2, Part C of the Rules**, the increase of the minimum breaking strengths of fibre ropes according to **C27.1.5-2** need not to be taken into account for loads applied to shipboard fittings and supporting hull structures.~~

~~**2** With respect to the provisions of **27.2.2-1, Part C of the Rules**, the arrangements of towing fittings and their supporting hull structures refer to **Fig C27.2.2-1**~~

~~**3**~~**1** "Industry standards deemed appropriate by the Society" as prescribed in **27.2.~~2~~3-~~2~~3(1), Part C of the Rules**, means international standards or national standards such as *ISO*, *JIS F*, etc.

~~**4** With respect to the provisions of **27.2.2-2(1)(b), Part C of the Rules**, side projected area including that of deck cargoes as given by the Loading Manual is to be taken into account for the calculation of equipment numbers.~~

~~**5** With respect to the provisions of **27.2.2-2(2), Part C of the Rules**, strength assessments using finite element analysis are to be in accordance with **C27.2.2-8.**~~

~~**6** "Normal stress" referred to in **27.2.2-4(1), Part C of the Rules** is the sum of bending stress and axial stress with the corresponding shearing stress acting perpendicular to the normal stress.~~

~~**7** With respect to the provisions of **27.2.2-4(1), Part C of the Rules**, stress concentration factors need not be taken into account for strength assessments using beam theory or grillage analysis.~~

~~**8** With respect to the provisions of **27.2.2-4(2), Part C of the Rules**, strength assessments using finite element analysis are to be in accordance with the following **(1)** to **(10)**.~~

~~(1) The geometry is to be idealized as realistically as possible.~~

~~(2) The ratio of element length to width is not to exceed 3.~~

~~(3) Girders are to be modelled using shell or plane stress elements.~~

~~(4) Symmetric girder flanges may be modelled by beam or truss elements.~~

~~(5) The element height of girder webs is not to exceed one-third of the web height.~~

~~(6) In way of small openings in girder webs the web thickness is to be reduced to a mean thickness over the web height.~~

~~(7) Large openings are to be modelled.~~

~~(8) Stiffeners may be modelled by using shell, plane stress, or beam elements.~~

~~(9) Stresses are to be read from the centre of the individual element.~~

~~(10) For shell elements the stresses are to be evaluated at the mid-plane of the element.~~

~~**9**~~**2** The provisions for the *TOW* specified in **27.2.~~2~~3-~~5~~6, Part C of the Rules** are applied for the use ~~with~~ of no more than one line. If not otherwise ~~chosen, for towing bitts (double bollards),~~ specified the *TOW* for towing bitts (double bollards) is the load limit for ~~a~~ tow line~~s~~ attached with eye splice~~s~~.

~~**10**~~**3** Towing arrangements are recommended as follows.

(1) Tow lines are to be led through a closed chock. The use of open fairleads with rollers or closed roller fairleads is to be avoided.

(2) It is recommended to provide at least one chock close to centreline of the ship forward and aft. It is beneficial to provide additional chocks on the port and starboard side~~s~~ at the transom and at the bow.

(3) Tow lines are to have a straight lead from the towing bitt or bollard to the chock. Bitts or bollards serving chocks are to be located slightly offset and at a distance of at least 2 *m* away from the chock. (~~Refer to~~ See **Fig. C27.2.~~2~~3-~~2~~1**)

(4) Warping drums are to be positioned not more than 20 *m* away from chocks ~~as far as practicable,~~ measured along the path of the line as far as practicable.

(5) Attention is to be given to the arrangement of the equipment for towing and mooring operations in order to prevent interference of mooring and tow lines as far as practicable.

Fig. C27.2.2-1 has been deleted, Fig. C27.2.2-2 has been renumbered to Fig. C27.2.3-1.

~~Fig. C27.2.2-1 Sample Arrangement of Shipboard Fittings and Supporting Hull Structures~~

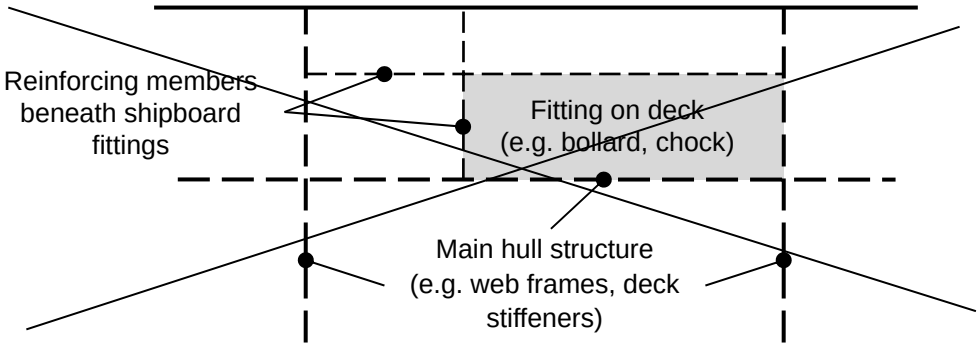
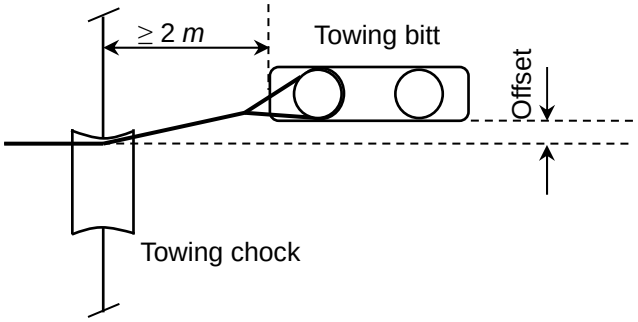


Fig. C27.2.~~2~~3-~~2~~1 Sample Arrangement of Towing Fittings



Paragraph C27.2.3 has been renumbered to Paragraph C27.2.6, and has been amended as follows.

C27.2.~~3~~6 Mooring Fittings

~~**1** With respect to the provisions of **27.2.3, Part C of the Rules**, the increase of minimum breaking strength for fibre ropes according to **C27.1.5-2** needs not to be taken into account for the loads applied to shipboard fittings and supporting hull structures.~~

~~**2** With respect to the provisions of **27.2.3-1, Part C of the Rules**, the arrangements of mooring fittings, capstans, winches and their supporting structures refers to **Fig C27.2.2-1**.~~

~~**3**~~**1** The requirements in **27.2, Part C of the Rules** ~~are to~~ also apply to additional mooring fittings ~~and~~ as well as their supporting hull structures. However, ~~"minimum breaking strength of mooring line"~~ MBL_{sd} specified in **27.2.~~3~~6-~~2~~3(1), Part C of the Rules** and ~~"minimum design load"~~MBL_{sd} specified in **27.2.~~3~~6-~~3~~4, Part C of the Rules** may be read as assumed values in consideration of the intended use. This information is to be incorporated into the ~~T~~towing and ~~M~~mooring ~~Fitting A~~arrangement ~~P~~plan specified in **27.2.~~6~~9, Part C of the Rules.**

~~**4**~~**2** The "~~I~~industry standards deemed appropriate by the Society" referred to in **27.2.~~3~~6-2(1), Part C of the Rules** means international standards or national standards such as *ISO*, *JIS F*, etc.

~~**5** With respect to the provisions of **27.2.3-2(2), Part C of the Rules**, strength assessments using finite element analysis are to be in accordance with **C27.2.2-8.**~~

~~**6** "Normal stress" referred to in **27.2.3-4(1), Part C of the Rules** is the sum of bending stress and axial stress with the corresponding shearing stress acting perpendicular to the normal stress.~~

~~**7** With respect to the provisions of **27.2.3-4(1), Part C of the Rules**, stress concentration~~

~~factors need not be taken into account for strength assessments using beam theory or grillage analysis.~~

~~8~~3 The provisions for *SWL* specified in **27.2.~~3~~6-~~5~~6, Part C of the Rules** ~~are to be~~apply~~ied~~ only in cases where no more than one line is used.

~~9~~4 Mooring arrangements are recommended to be as follows.

(1) As far as possible, a sufficient number of mooring winches is to be fitted to allow for all mooring lines to be belayed on winches. If the mooring arrangement is designed such that mooring lines are partly belayed on bitts or bollards, it is to be considered that these lines may not be as effective as the mooring lines belayed on winches. Mooring lines are to have as straight a lead as is practicable from the mooring drum to the fairlead.

(2) At points of changes in direction, sufficiently large radii of the contact surface of a rope on a fitting is to be provided to minimize the wear experienced by mooring lines and as recommended by the rope manufacturer for the rope type intended to be used.

(3) Attention is to be given to the arrangement of the equipment for mooring operations in order to prevent interference of the mooring lines as far as practicable.

Paragraph C27.2.6 has been renumbered to Paragraph C27.2.9, and has been amended as follows.

C27.2.~~6~~9 Towing and Mooring ~~Fitting~~ Arrangements Plan

1 It is recommended that the information related to safe towing and mooring operation in the ~~T~~towing and ~~M~~mooring ~~FittingA~~arrangement ~~P~~plan specified in **27.2.~~6~~9, Part C of the Rules** is incorporated into the pilot card in order to provide ~~the~~pilots ~~proper~~ with relevant information on harbour ~~/~~ or escort~~ing~~ operations.

2 With respect to the provisions ~~of~~ specified in **27.2.~~6~~9-2(6), Part C of the Rules**, the design condition related to **27.~~1~~2.5-~~5~~3(2), Part C of the Rules** is to be described in this plan as a note.

EFFECTIVE DATE AND APPLICATION (Amendment 1-2)

1. The effective date of the amendments is 1 January 2022.

2. Notwithstanding the amendments to the Guidance, the current requirements apply to ships for which the date of contract for construction* is before the effective date.

* "contract for construction" is defined in the latest version of IACS Procedural Requirement (PR) No.29.

IACS PR No.29 (Rev.0, July 2009)

1. The date of "contract for construction" of a vessel is the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. This date and the construction numbers (i.e. hull numbers) of all the vessels included in the contract are to be declared to the classification society by the party applying for the assignment of class to a newbuilding.

2. The date of "contract for construction" of a series of vessels, including specified optional vessels for which the option is ultimately exercised, is the date on which the contract to build the series is signed between the prospective owner and the shipbuilder.

For the purpose of this Procedural Requirement, vessels built under a single contract for construction are considered a "series of vessels" if they are built to the same approved plans for classification purposes. However, vessels within a series may have design alterations from the original design provided:

(1) such alterations do not affect matters related to classification, or

(2) If the alterations are subject to classification requirements, these alterations are to comply with the classification requirements in effect on the date on which the alterations are contracted between the prospective owner and the shipbuilder or, in the absence of the alteration contract, comply with the classification requirements in effect on the date on which the alterations are submitted to the Society for approval.

The optional vessels will be considered part of the same series of vessels if the option is exercised not later than 1 year after the contract to build the series was signed.

3. If a contract for construction is later amended to include additional vessels or additional options, the date of "contract for construction" for such vessels is the date on which the amendment to the contract, is signed between the prospective owner and the shipbuilder. The amendment to the contract is to be considered as a "new contract" to which **1.** and **2.** above apply.

4. If a contract for construction is amended to change the ship type, the date of "contract for construction" of this modified vessel, or vessels, is the date on which revised contract or new contract is signed between the Owner, or Owners, and the shipbuilder.

Note:
This Procedural Requirement applies from 1 July 2009.

Amendment 1-3

C4 SUBDIVISIONS

C4.2 Subdivision Index

C4.2.3 Probability of Survival (s_i)

Sub-paragraph -3 has been amended as follows.

3 The calculation of the probability of survival (s_i) in **4.2.3-10, Part C of the Rules** is to be treated as follows.

(1) Where ~~timber deck cargo is stowed to the standard height of one superstructure or more,~~ the buoyancy of the timber deck cargo ~~may be~~ is taken into account~~,~~ ~~provided that~~ the cargo is to be in compliance with ~~the provisions of **Chapter 3** and **Chapter 4** of the *CODE OF SAFE PRACTICE FOR SHIPS CARRYING TIMBER DECK CARGOES, 1991* (resolution A.715(17)).~~ the following **(a)** to **(e)**:

(a) The timber deck cargo is to be stowed in accordance with the requirements of **Section 2.9**, **Part A** of the *Code of Safe Practice for Ships Carrying Timber Deck Cargoes, 2011* (*IMO* resolution *A*.1048(27)).

(b) The timber deck cargo is to be secured by lashings, uprights or both.

(c) Lashings are to comply with the requirements of **Section 2.10**, **Part A** of the *Code of Safe Practice for Ships Carrying Timber Deck Cargoes, 2011* (*IMO* resolution *A*.1048(27)).

(d) Uprights are to be as follows:

i) be made of steel or other suitable material of adequate strength, taking into account the breadth of the deck cargo;

ii) be spaced at intervals not exceeding 3 *m*;

iii) be fixed to the deck by angles, metal sockets or equally efficient means; and

iv) if deemed necessary, be further secured by a metal bracket to a strengthened point (e.g. bulwark, hatch coaming).

(e) The height and extent of the timber deck cargo is to be in accordance with **Section 3.3.2** of **Chapter 3**, **Part A** of the *International Code on Intact Stability, 2008 (2008 IS Code)* and is to be at least stowed to the standard height of one superstructure.

(2) ~~Only one standard superstructure height of timber deck cargo may be taken into account when calculating its buoyancy, and it is assumed to have a permeability of not less than 25%.~~ The permeability of the timber deck cargo is not to be less than 25 % of the volume occupied by the cargo up to one standard superstructure height.

((3) is omitted.)

EFFECTIVE DATE AND APPLICATION (Amendment 1-3)

1. The effective date of the amendments is 1 July 2022.

2. Notwithstanding the amendments to the Guidance, the current requirements apply to ships for which the date of contract for construction* is before the effective date.

* "contract for construction" is defined in the latest version of IACS Procedural Requirement (PR) No.29.

IACS PR No.29 (Rev.0, July 2009)

1. The date of "contract for construction" of a vessel is the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. This date and the construction numbers (i.e. hull numbers) of all the vessels included in the contract are to be declared to the classification society by the party applying for the assignment of class to a newbuilding.

2. The date of "contract for construction" of a series of vessels, including specified optional vessels for which the option is ultimately exercised, is the date on which the contract to build the series is signed between the prospective owner and the shipbuilder.

For the purpose of this Procedural Requirement, vessels built under a single contract for construction are considered a "series of vessels" if they are built to the same approved plans for classification purposes. However, vessels within a series may have design alterations from the original design provided:

(1) such alterations do not affect matters related to classification, or

(2) If the alterations are subject to classification requirements, these alterations are to comply with the classification requirements in effect on the date on which the alterations are contracted between the prospective owner and the shipbuilder or, in the absence of the alteration contract, comply with the classification requirements in effect on the date on which the alterations are submitted to the Society for approval.

The optional vessels will be considered part of the same series of vessels if the option is exercised not later than 1 year after the contract to build the series was signed.

3. If a contract for construction is later amended to include additional vessels or additional options, the date of "contract for construction" for such vessels is the date on which the amendment to the contract, is signed between the prospective owner and the shipbuilder. The amendment to the contract is to be considered as a "new contract" to which **1.** and **2.** above apply.

4. If a contract for construction is amended to change the ship type, the date of "contract for construction" of this modified vessel, or vessels, is the date on which revised contract or new contract is signed between the Owner, or Owners, and the shipbuilder.

Note:
This Procedural Requirement applies from 1 July 2009.