RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

RULES

Part C Hull Construction and Equipment

2020 AMENDMENT NO.1

Rule No.47 30 June 2020

Resolved by Technical Committee on 22 January 2020

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

Rule No.47 30 June 2020
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 20 HATCHWAYS, MACHINERY SPACE OPENINGS AND OTHER DECK OPENINGS

20.2 Hatchways

20.2.1 Application

Sub-paragraphs -2 and -3 have been amended as follows.

2 Notwithstanding the provisions in this paragraph, the construction and means for closing of cargo and other hatchways of bulk carriers defined in **1.3.1(13), Part B** (excluding those affixed with the notation "*CSR*") and ships intended to be registered as "bulk carriers" in accordance with **C31.1.1-1, Part C of the Guidance** are to comply with the relevant requirements in **Part CSR-B&T** or **Part CSR-B**.
3 When the requirements for hatchways in **Part CSR-B&T** or **Part CSR-B** apply to the hatchways of ships ~~which are not subject to the application of **Part CSR-B&T**~~ in accordance with **2**, the corrosion additions for hatch coamings, hatch coaming stays and stiffeners may be taken as 1.5 *mm*.

EFFECTIVE DATE AND APPLICATION (Amendment 1-1)

1. The effective date of the amendments is 30 June 2020.
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.
3. Notwithstanding the provision of preceding **2.**, the amendments to the Rules may apply to ships for which the date of contract for construction is before the effective date upon request of the applicant.

Amendment 1-2

Chapter 23 BULLWARKS, GUARDRAILS, FREEING ARRANGEMENTS, CARGO PORTS AND OTHER SIMILAR OPENINGS, SIDE SCUTTLES, RECTANGULAR WINDOWS, VENTILATORS AND GANGWAYS

23.4 Side Shell Doors and Stern Doors

23.4.2 Arrangement of Doors*

Sub-paragraph -3 has been amended as follows.

3 Notwithstanding the requirements in **-2**, the lower edges of the doors are not to be below a line drawn parallel to the freeboard deck at side, which has at its lowest point at least 230*mm* above ~~the deepest subdivision draught specified in **4.1.2(3)**~~the upper edge of the uppermost load line, unless additional measures for ensuring watertightness such as the following **(1)** to **(4)** are implemented. However, notwithstanding the additional measures in **(1)** to **(4)**, in no case are such doors to be fitted so as to have their lowest point below the deepest subdivision draught specified in **4.1.2(3)**.
((1) to (4) are omitted.)

EFFECTIVE DATE AND APPLICATION (Amendment 1-2)

1. The effective date of the amendments is 30 June 2020.
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.

Amendment 1-3

Chapter 1 GENERAL

1.1 General

1.1.3 Ships of Unusual Form or Proportion, or Intended for Carriage of Special Cargoes*

Sub-paragraph -6 has been added as follows.

1 In ships of unusual form or proportion, or intended for carriage of special cargoes, the requirements concerning hull construction, equipment, arrangement and scantlings will be decided individually based upon the general principle of the Rules instead of the requirements in this Part.
2 For ships intended for the carriage of lumber cargoes in cargo spaces and/or on decks, notwithstanding being marked with the load lines corresponding to timber freeboard assigned in accordance with the provisions of **Part V**, hull structural members are to be protected to a degree deemed appropriate by the Society. In addition, for ships intended for the carriage of lumber cargoes in decks, special considerations are to be taken related to stowage and securing of cargoes.
3 Deck structures for the loading of vehicles are to comply with the provisions of **10.9** and **17.3.5**.
4 Reinforcement of the ship for loading containers is to be done in accordance with the provisions of **32.4.1**. Cell guide constructions, where provided, are to be in accordance with the provisions of **32.11**.
5 The hull structural members of ships intended for the carriage of cargoes having moisture contents which exceed transportable moisture limit are to be in accordance with the requirements provided in this Part. In addition, the special considerations deemed necessary by the Society are to be taken into account.
6 Among the requirements applicable to bulk carriers defined in **1.3.1(13)** of **Part B**, those requirements in **18.4**, **31.6** and **34.2** are to be applied to the self-unloading ships defined in **1.3.1(19)** of **Part B**.

1.1.11 Application of Steels*

Sub-paragraph -2 has been amended as follows.

2 Within 0.4*L* amidships, the widths of single strakes of sheer strakes to the strength deck, stringer plates in the strength deck, bilge strakes (excluding ships of less than 150*m* in length L_1 having double bottom structures), deck plates adjoined to longitudinal bulkheads and other members of grade *KE*, *KE*32, *KE*36, *KE*40, *KF*32, *KF*36 and *KF*40 are to be not less than the value given by the following formula (maximum being 1,800*mm*). The widths of single strakes on rounded gunwales are to be determined by the Society.

$5L_1 + 800 \ (mm)$

L_1: ~~Length (*m*) of ship specified in **2.1.2, Part A** or 0.97 times the length (*m*) of ship on the load line, whichever is smaller~~ Distance (*m*) measured on the waterline at the scantling draught d_S from the forward side of the stem to the centre of the rudder stock. L_1 is to be not less than 96% and need not exceed 97% of the extreme length on the waterline at the scantling draught d_S. In ships without rudder stocks (e.g. ships fitted with azimuth thrusters), the Rule length L_1 is to be taken equal to 97% of the extreme length on the

waterline at the scantling draught d_S.

d_S: Scantling draught (*m*) at which the strength requirements for the scantlings of the ship are met and represents the full load condition. d_S is to be not less than that corresponding to the assigned freeboard.

Note of Table C1.1 has been amended as follows.

Table C1.1 Application of Mild Steels for Various Structural Members

Structural member	Application		Thickness of plate : t (*mm*)					
			$t \leq 15$	$15 < t \leq 20$	$20 < t \leq 25$	$25 < t \leq 30$	$30 < t \leq 40$	$40 < t \leq 50$
Shell Plating								
Sheer strake at strength deck	within 0.4*L* amidship	$L_1 \leq 250$	A^{*1*4}	*B*	*D*		*E*	
		$L_1 > 250$	*E*					
	within 0.6*L* amidship excluding the above		A^{*1*4}		*B*	*D*		*E*
	other than those mentioned above		A^{*1*4}				*B*	*D*
Side plating	within 0.4*L* amidship	within 0.1*D* downward from the lower surface of strength deck	A^{*1*4}		*B*	*D*		*E*
		other than those mentioned above	A^{*1*4}				*B*	*D*
Bilge strake	within 0.4*L* amidship	$L_1 > 250$	*D*				*E*	
		ships of $150 \leq L_1 \leq 250$, having double bottom structures and ships having single bottom structures	A^{*1*4}	*B*	*D*		*E*	
	within 0.6*L* amidship excluding the above		A^{*1*4}		*B*	*D*		*E*
	other than those mentioned above		A^{*1*4}				*B*	*D*
Bottom plating including keel plate	within 0.4*L* amidship		*A*		*B*	*D*		*E*
Deck Plating								
Stringer plate in strength deck	within 0.4*L* amidship	$L_1 \leq 250$	A^{*2*5}	*B*	*D*		*E*	
		$L_1 > 250$	*E*					
	within 0.6*L* amidship excluding the above		*A*		*B*	*D*		*E*
	other than those mentioned above		*A*				*B*	*D*
Strength deck strake adjoining to longitudinal bulkhead	within 0.4*L* amidship		A^{*2*5}	*B*	*D*		*E*	
	within 0.6*L* amidship excluding the above		*A*		*B*	*D*		*E*
	other than those mentioned above		*A*				*B*	*D*
Strength deck other than mentioned above	within 0.4*L* amidship		A^{*2*5}		*B*	*D*		*E*
Strength deck at cargo hatch corner	container carriers and other ships with similar hatch openings configuration		A^{*2}	*B*	*D*		*E*	
	bulk carriers, ore carriers, combination carriers and other ships with similar hatch openings configuration	within 0.6*L* amidship	A^{*2}	*B*	*D*		*E*	
		cargo region excluding the above	*A*		*B*	*D*		*E*
	other than those mentioned above within 0.4*L* amidship		A^{*2}		*B*	*D*		*E*
Deck plating exposed to weather, in general	within 0.4*L* amidship		*A*				*B*	*D*
Longitudinal bulkhead plate								
Upper strake in longitudinal bulkhead adjoining to strength deck	within 0.4*L* amidship		*A*		*B*	*D*		*E*
Other than those mentioned above	within 0.4*L* amidship		*A*				*B*	*D*

Table C1.1 Application of Mild Steels for Various Structural Members (Continued)

Structural member	Application		Thickness of plate : t (*mm*)					
			$t \leq 15$	$15 < t \leq 20$	$20 < t \leq 25$	$25 < t \leq 30$	$30 < t \leq 40$	$40 < t \leq 50$
Longitudinals								
Upper strake in sloping plate of topside tank adjoining to strength deck	within 0.4*L* amidship		*A*		*B*	*D*		*E*
Longitudinal plating members above strength deck	corners of dome openings on trunk deck and inner deck plating above strength deck in ships with membrane tanks carrying liquefied gases in bulk	within 0.6*L* amidship	*A*[*5]	*B*	*D*		*E*	
		cargo region excluding the above	*A*		*B*	*D*		*E*
	longitudinal girders including end brackets and face plates	within 0.4*L* amidship	*A*[*3*5]		*B*	*D*		*E*
	longitudinal plating members other than those mentioned above	within 0.4*L* amidship	*A*[*3*5]		*B*	*D*		*E*
Cargo Hatch								
Cargo hatch coaming longitudinally extended on the strength deck	longitudinal members over 0.15*L* (including face plate and its flange, but excluding other stiffeners. See **Fig. C1.1**) and end brackets and deck house transition	within 0.4*L* amidship	*D*				*E*	
		within 0.6*L* amidship excluding the above	*D*					*E*
		other than those mentioned above	*D*					
Hatch cover	top plates, bottom plates and primary supporting members		*A*				*B*	*D*
Stern								
Stern frame, rudder horn, rudder trunk, shaft bracket	—		*A*		*B*	*D*		*E*
Rudder								
Rudder plate	—		*A*		*B*	*D*		*E*
Other								
Other members than those mentioned above (including stiffeners)			*A*[*1*4]					

Remarks:

1. For ships with length of L_1 exceeding 150*m* and single strength deck, single side strakes for ships without inner continuous longitudinal bulkhead(s) between bottom and the strength deck within cargo region are not to be less than grade *KB* as defined in **Part K of the Rules**.
2. For ships with length of L_1 exceeding 150*m* and single strength deck, longitudinal strength members of strength deck plating within 0.4*L* amidship are not to be less than grade *KB* as defined in **Part K of the Rules**.
3. For ships with length of L_1 exceeding 150*m* and single strength deck, continuous longitudinal plating of strength members above strength deck within 0.4*L* amidship are not to be less than grade *KB* as defined in **Part K of the Rules**.
4. For ships with ice strengthening conforming to **Chapter 8**, **Part I of the Rules**, shell strakes in way of ice strengthening area for plates are not to be less than grade *KB* as defined in **Part K of the Rules**.

5. For ships with membrane tanks carrying liquefied gases in bulk with length of L_1 exceeding 150*m* having deck structure comprising trunk deck and inner deck (see **Fig. C1.2**), the following structural members within 0.4*L* amidship are not to be less than grade *KB* as defined in **Part K of the Rules**.
   (1) Strength deck
   (2) Inner deck above strength deck
   (3) Longitudinal strength member plating between trunk deck and inner deck above strength deck

   The above structural members for ships having similar deck structure are not to be less than grade *KB* where deemed necessary by the Society.

Notes:

1. *A*, *B*, *D*, *E* refer to the following grades of steel.
   A: *KA*, *B*: *KB*, *D*: *KD*, *E*: *KE*
2. L_1 is ~~the length (*m*) of ship specified in **2.1.2 Part A** or 0.97 times the length (*m*) of the ship on the load line, whichever is smaller.~~ the distance (*m*) measured on the waterline at the scantling draught d_S from the forward side of the stem to the centre of the rudder stock. L_1 is to be not less than 96% and need not exceed 97% of the extreme length on the waterline at the scantling draught d_S. In ships without rudder stocks (e.g. ships fitted with azimuth thrusters), the Rule length L_1 is to be taken equal to 97% of the extreme length on the waterline at the scantling draught d_S.
3. Where the strength deck strake adjoined to the inner skin bulkhead of double hull ships is not a deck stringer plate, the deck strake may be treated as an ordinary strength deck strake.
4. Applicable areas of bilge strakes is as follows.
   (1) If the point where the bottom flat line stops being parallel to the centre line of the ship is within 0.6*L* amidships, the applicable part is to be taken as 0.6 *L* amidships.
   (2) If the point where the bottom flat line stops being parallel to the centre line of the ship is outside 0.6*L* amidships, the applicable part is to be taken as is.
5. The type of steel used in way of lower pintle for type D and type E rudders specified in **Chapter 3** and in way of upper part of type C rudder specified in **Chapter 3** is to be approved by the Society.
6. Continuous longitudinal plating of strength members above strength deck (including trunk deck, inner deck and longitudinal strength member plating between trunk deck and inner deck) are to be treated as longitudinal plating members above strength deck.

Note of Table C1.2 has been amended as follows.

Table C1.2 Application of High Tensile Steels for Various Structural Members

Structural member	Application		Thickness of plate : t (*mm*)					
			$t \leq 15$	$15 < t \leq 20$	$20 < t \leq 25$	$25 < t \leq 30$	$30 < t \leq 40$	$40 < t \leq 50$
Shell plating								
Sheer strake at strength deck	within0.4*L* amidship	$L_1 \leq 250$	*AH*		*DH*		*EH*	
		$L_1 > 250$	*EH*					
	within 0.6*L* amidship excluding the above		*AH*			*DH*		*EH*
	other than those mentioned above		*AH*					*DH*
Side plating	within 0.4*L* amidship	within 0.1*D* downward from the lower surface of strength deck	*AH*			*DH*		*EH*
		other than those mentioned above	*AH*					*DH*
Bilge strake	within 0.4*L* amidship	$L_1 > 250$	*DH*				*EH*	
		ships of $150 \leq L_1 \leq 250$, having double bottom structures and ships having single bottom structures	*AH*		*DH*		*EH*	
	within 0.6*L* amidship excluding the above		*AH*			*DH*		*EH*
	other than those mentioned above		*AH*					*DH*
Bottom plating including keel plate	within 0.4*L* amidship		*AH*			*DH*		*EH*
Deck plating								
Stringer plate in strength deck	within 0.4*L* amidship	$L_1 \leq 250$	*AH*		*DH*		*EH*	
		$L_1 > 250$	*EH*					
	within 0.6*L* amidship excluding the above		*AH*			*DH*		*EH*
	other than those mentioned above		*AH*					*DH*
Strength deck strake adjoining to longitudinal bulkhead	within 0.4*L* amidship		*AH*		*DH*		*EH*	
	within 0.6*L* amidship excluding the above		*AH*			*DH*		*EH*
	other than those mentioned above		*AH*					*DH*
Strength deck other than mentioned above	within 0.4*L* amidship		*AH*			*DH*		*EH*
Strength deck at cargo hatch corner	container carriers and other ships with similar hatch openings configuration		*AH*		*DH*		*EH*	
	bulk carriers, ore carriers, combination carriers and other ships with similar hatch openings configuration	within 0.6*L* amidship	*AH*		*DH*		*EH*	
		cargo region excluding the above	*AH*			*DH*		*EH*
	other than those mentioned above within 0.4*L* amidship		*AH*			*DH*		*EH*
Deck plating exposed to weather, in general	within 0.4*L* amidship		*AH*					*DH*
Longitudinal bulkhead plate								
Upper strake in longitudinal bulkhead adjoining to strength deck	within 0.4*L* amidship		*AH*			*DH*		*EH*
Other than those mentioned above	within 0.4*L* amidship		*AH*					*DH*

Table C1.2 Application of High Tensile Steels for Various Structural Members (Continued)

Structural member	Application		Thickness of plate : t (*mm*)					
			$t \leq 15$	$15 < t \leq 20$	$20 < t \leq 25$	$25 < t \leq 30$	$30 < t \leq 40$	$40 < t \leq 50$
Longitudinals								
Upper strake in sloping plate of topside tank adjoining to strength deck	within 0.4*L* amidship		*AH*			*DH*		*EH*
Longitudinal plating members above strength deck	corners of dome openings on trunk deck and inner deck plating above strength deck in ships with membrane tanks carrying liquefied gases in bulk	within 0.6*L* amidship	*AH*		*DH*		*EH*	
		cargo region excluding the above	*AH*			*DH*		*EH*
	longitudinal girders including end brackets and face plates	within 0.4*L* amidship	*AH*			*DH*		*EH*
	longitudinal plating members other than those mentioned above	within 0.4*L* amidship	*AH*			*DH*		*EH*
Cargo Hatch								
Cargo hatch coaming longitudinally extended on the strength deck	longitudinal members over 0.15*L* (including face plate and its flange, but excluding other stiffeners) and end brackets and deck house transition	within 0.4*L* amidship	*DH*				*EH*	
		within 0.6*L* amidship excluding the above	*DH*					*EH*
		other than those mentioned above	*DH*					
Hatch cover	top plates, bottom plates and primary supporting members		*AH*					*DH*
Stern								
Stern frame, rudder horn, rudder trunk, shaft bracket	—		*AH*			*DH*		*EH*
Rudder								
Rudder plate	—		*AH*			*DH*		*EH*
Other								
Other members than those mentioned above (including stiffeners)			*AH*					

Notes:

1. *AH*, *DH*, *EH* refer to the following grades of steel.
   AH: *KA*32, *KA*36 and *KA*40; *DH*: *KD*32, *KD*36 and *KD*40; *EH*: *KE*32, *KE*36 and *KE*40
2. L_1 is ~~the length (*m*) of ship specified in **2.1.2 Part A** or 0.97 times the length (*m*) of the ship on the load line, whichever is smaller.~~ the distance (*m*) measured on the waterline at the scantling draught d_S from the forward side of the stem to the centre of the rudder stock. L_1 is to be not less than 96% and need not exceed 97% of the extreme length on the waterline at the scantling draught d_S. In ships without rudder stocks (e.g. ships fitted with azimuth thrusters), the Rule length L_1 is to be taken equal to 97% of the extreme length on the waterline at the scantling draught d_S.
3. Where the strength deck strake adjoined to the inner skin bulkhead of double hull ships is not a deck stringer plate, the deck strake may be treated as an ordinary strength deck strake.
4. Applicable areas of bilge strakes is as follows.
   (1) If the point where the bottom flat line stops being parallel to the centre line of the ship is within 0.6*L* amidships, the

applicable part is to be taken as 0.6*L* amidships.

(2) If the point where the bottom flat line stops being parallel to the centre line of the ship is outside 0.6*L* amidships, the applicable part is to be taken as is.

5. The type of steel used in way of lower pintle for type D and type E rudders specified in **Chapter 3** and in way of upper part of type C rudder specified in **Chapter 3** is to be approved by the Society.

Chapter 2 STEMS AND STERN FRAMES

2.2 Stern Frames

2.2.5 Rudder Horns*

Sub-paragraph -4 has been amended as follows.

4 The thickness of the rudder horn side plating is not to be less than:

$2.4\sqrt{L_1 K_{rh}}$ (mm)

L_1: ~~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.~~ Distance (m) measured on the waterline at the scantling draught d_S from the forward side of the stem to the centre of the rudder stock. L_1 is to be not less than 96% and need not exceed 97% of the extreme length on the waterline at the scantling draught d_S. In ships without rudder stocks (e.g. ships fitted with azimuth thrusters), the Rule length L_1 is to be taken equal to 97% of the extreme length on the waterline at the scantling draught d_S.

d_S: Scantling draught (*m*) at which the strength requirements for the scantlings of the ship are met and represents the full load condition. d_S is to be not less than that corresponding to the assigned freeboard.

K_{rh}: As specified in **-1(1)**

Chapter 15 LONGITUDINAL STRENGTH

15.2 Bending Strength

15.2.1 Bending Strength at the Midship Part*

Sub-paragraph -1 has been amended as follows.

1 The section moduli of the transverse sections of the hull at the midship part under consideration are not to be less than the values of Z_σ obtained from the following two formulae for all conceivable loading and ballasting conditions.

$Z_\sigma = 5.72|M_s + M_w(+)|$ (cm^3)

$Z_\sigma = 5.72|M_s + M_w(-)|$ (cm^3)

M_s: Longitudinal bending moment in still water (*kN-m*) at the transverse section under consideration along the length of the hull, which is calculated by the method deemed

appropriate by the Society

The positive value of M_s, however, is to be defined as a positive value which is obtained assuming that downward loads are taken as positive values and are integrated in the forward direction from the aft end of the ship. (*See* **Fig. C15.1**)

M_w (+) and M_w (-): Wave induced longitudinal bending moments (*kN-m*) at the transverse section under consideration along the length of the hull, which are obtained from the following formulae:

$M_w(+) = +0.19C_1C_2L_1^2BC_b'$ (*kN-m*)

$M_w(-) = -0.11C_1C_2L_1^2B(C_b' + 0.7)$ (*kN-m*)

C_1:As given by the following formulae:

$10.75 - \left(\frac{300-L_1}{100}\right)^{1.5}$ for $L_1 \leq 300m$

10.75 for $300m < L_1 \leq 350m$

$10.75 - \left(\frac{L_1-350}{150}\right)^{1.5}$ for $350m < L_1$

L_1: ~~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_1 is the perpendicular to the designed maximum load draught at the forward side of the stem, and the aft end of L_1 is the perpendicular to the designed maximum load draught at a distance L_1 aft of the fore end of L_1.~~ Distance (*m*) measured on the waterline at the scantling draught d_S from the forward side of the stem to the centre of the rudder stock. L_1 is to be not less than 96% and need not exceed 97% of the extreme length on the waterline at the scantling draught d_S. In ships without rudder stocks (e.g. ships fitted with azimuth thrusters), the Rule length L_1 is to be taken equal to 97% of the extreme length on the waterline at the scantling draught d_S.

d_S: Scantling draught (*m*) at which the strength requirements for the scantlings of the ship are met and represents the full load condition. d_S is to be not less than that corresponding to the assigned freeboard.

C_b': Volume of displacement corresponding to ~~the designed maximum load line~~ the scantling draught d_S divided by ~~L_1Bd~~ $L_1B_Sd_S$

However, the value is to be taken as 0.6, where it is less than 0.6.

B_S: Breadth (*m*) measured amidships at the scantling draught d_S.

C_2: Coefficient specified along the length at positions where the transverse section of the hull is under consideration, as given in **Fig. C15.2**

Chapter 20 HATCHWAYS, MACHINERY SPACE OPENINGS AND OTHER DECK OPENINGS

20.2 Hatchways

20.2.1 Application

Sub-paragraph -2 has been amended as follows.

2 Notwithstanding the provisions in this paragraph, the construction and means for closing of cargo and other hatchways of bulk carriers defined in **1.3.1(13)**~~,~~ of **Part B**, self-unloading ships defined in **1.3.1(19)** of **Part B** and ships intended to be registered as "bulk carriers" in accordance with **C31.1.1-1**~~,~~ of **Part C of the Guidance** are to comply with ~~the~~ relevant requirements in **Part CSR-B&T**.

20.2.4 Design Loads*

Sub-paragraph (2) has been amended as follows.

The design loads for steel hatchway covers, steel pontoon covers, steel weathertight covers, portable beams and hatchway coamings applying the requirements in **20.2** are specified in following **(1)** to **(5)**:

((1) is omitted.)

(2) Design horizontal wave load P_H (kN/m^2) is not to be less than that obtained from the following formulae. However, P_H is not to be taken less than the minimum values given in **Table C20.3**. P_H need not be included in the direct strength calculation of the hatch cover, expect where structures supporting stoppers are assessed.

$P_H = ac(bC_1 - y)$

a: As given by the following:

$20 + \frac{L'}{12}$ for unprotected front coamings and hatch cover skirt plates

$10 + \frac{L'}{12}$ for unprotected front coamings and hatch cover skirt plates, where the distance from the actual freeboard deck to the summer load line exceeds the minimum non-corrected tabular freeboard according to the ILCC by at least one superstructure standard height

$5 + \frac{L'}{15}$ for side and protected front coamings and hatch cover skirt plates

$7 + \frac{L'}{100} - 8\frac{x}{L_1}$ for aft ends of coamings and aft hatch cover skirt plates abaft amidships

$5 + \frac{L'}{100} - 4\frac{x}{L_1}$ for aft ends of coamings and aft hatch cover skirt plates forward of amidships

L': Length of ship L_1 (m). However, where L_1 exceeds 300m, L' is to be taken as 300m.

L_1: ~~Length of ship specified in **2.1.2, Part A** (m). However, L_1 need not to be greater than 97% of the total length on the summer load waterline.~~ Distance (m) measured on the waterline at the scantling draught d_S from the forward side of the stem to the centre of the rudder stock. L_1 is to be not less than 96% and need not exceed 97% of the extreme

length on the waterline at the scantling draught d_S. In ships without rudder stocks (e.g. ships fitted with azimuth thrusters), the Rule length L_1 is to be taken equal to 97% of the extreme length on the waterline at the scantling draught d_S.

d_S: Scantling draught (m) at which the strength requirements for the scantlings of the ship are met and represents the full load condition. d_S is to be not less than that corresponding to the assigned freeboard.

C_1: As given by the following formulae:

$$10.75 - \left(\frac{300 - L_1}{100}\right)^{1.5} \quad \text{for } L_1 \leq 300m$$

$$10.75 \quad \text{for } 300 < L_1 \leq 350m$$

$$10.75 - \left(\frac{L_1 - 350}{150}\right)^{1.5} \quad \text{for } 350 < L_1$$

c_L: Coefficient to be taken as 1.0

b: As given by the following formulae:

$$1.0 + \left(\frac{0.45 - \frac{x}{L_1}}{C_{b1} + 0.2}\right)^2 \quad \text{for } \frac{x}{L_1} < 0.45$$

$$1.0 + 1.5\left(\frac{\frac{x}{L_1} - 0.45}{C_{b1} + 0.2}\right)^2 \quad \text{for } \frac{x}{L_1} \geq 0.45$$

x: Distance (m) from the hatchway coamings or hatch cover skirt plates to after perpendicular, or distance from the mid-point of the side hatchway coaming or hatch cover skirt plates to after perpendicular. However, where the length of the side hatchway coaming or hatch cover skirt plates exceeds $0.15L_1$, the side hatchway coaming or hatch cover skirt plates are to be equally subdivided into spans not exceeding $0.15L_1$ and the distance from the mid-point of the subdivisions to the after perpendicular is to be taken.

C_{b1}: Block coefficient. However, where C_b is 0.6 or under, C_{b1} is to be taken as 0.6 and where C_b is 0.8 and over, C_{b1} is to be taken as 0.8. When determining scantlings of the aft ends of coamings and aft hatch cover skirt plates forward of amidships, C_{b1} does not need to be taken as less than 0.8.

c: As given by the following formula. However, where $\frac{b'}{B'}$ is less than 0.25, $\frac{b'}{B'}$ is to be taken as 0.25.

$$0.3 + 0.7\frac{b'}{B'}$$

b': Breadth (m) of hatchway coamings at the position under consideration

B': Breadth (m) of ship on the exposed weather deck at the position under consideration

y: Vertical distance (m) from the designed maximum load line to the mid-point of the span of stiffeners when determining the scantlings of stiffeners and to the mid-point of the plating when determining the thickness of plating

Table C20.3 Minimum Value of P_H (kN/m^2)

	Unprotected front coamings and hatch cover skirt plates	others
$L \leq 250$	$25 + \frac{L_1}{10}$	$12.5 + \frac{L_1}{20}$
$L > 250$	50	25

((3) to (5) are omitted.)

20.2.11 Hatch Cover Supports, Stoppers and Supporting Structures

Sub-paragraph (3) has been amended as follows.

Hatch cover supports, stoppers and supporting structures subject to the provisions of **20.2** are to comply with the following **(1)** to **(3)**:
((1) to (2) are omitted.)
(3) The details of hatch cover supporting structures are to be in accordance with the following **(a)** to **(g)**:
(a) The nominal surface pressure (N/mm^2) of a hatch cover supports is not to be greater than that obtained from the following formula:
$p_{n\max} = dp_n$ in general
$p_{n\max} = 3p_n$ for metallic supporting surface not subjected to relative displacements
d : As given by the following formula. Where d exceeds 3, d is to be taken as 3.
$d = 3.75 - 0.015L_1$
$d_{\min} = 1.0$ in general
$d_{\min} = 2.0$ for partial loading conditions
L_1 : ~~Length of ship specified in **2.1.2, Part A** (m). However, L_1 need not to be greater than 97% of the total length at the summer load waterline.~~ Distance (m) measured on the waterline at the scantling draught d_S from the forward side of the stem to the centre of the rudder stock. L_1 is to be not less than 96% and need not exceed 97% of the extreme length on the waterline at the scantling draught d_S. In ships without rudder stocks (e.g. ships fitted with azimuth thrusters), the Rule length L_1 is to be taken equal to 97% of the extreme length on the waterline at the scantling draught d_S.
d_S: Scantling draught (m) at which the strength requirements for the scantlings of the ship are met and represents the full load condition. d_S is to be not less than that corresponding to the assigned freeboard.
p_n : As obtained from **Table C20.10**

Table C20.10 Permissible Nominal Surface Pressure p_n

Material	p_n when loaded by	
	Vertical force	Horizontal force
Hull structure steel	25	40
Hardened steel	35	50
Lower friction materials	50	-

((b) to (g) are omitted.)

Paragraph 20.2.13 has been amended as follows.

20.2.13 Additional Requirement for Small Hatches Fitted on Exposed Fore Deck*

Small hatches located on exposed decks forward of $0.25L_1$ are to be of sufficient strength and weathertightness to resist green sea force if the height of the exposed deck in way of those hatches is less than $0.1L_1$ or 22 *m* above the designed maximum load line, whichever is smaller. The length L_1 is ~~specified in **15.2.1-1.**~~ the distance (*m*) measured on the waterline at the scantling draught d_S from the forward side of the stem to the centre of the rudder stock. L_1 is to be not less than 96% and need not exceed 97% of the extreme length on the waterline at the scantling draught d_S.

In ships without rudder stocks (e.g. ships fitted with azimuth thrusters), the Rule length L_1 is to be taken equal to 97% of the extreme length on the waterline at the scantling draught d_S.

d_S is the scantling draught (*m*) at which the strength requirements for the scantlings of the ship are met and represents the full load condition; it is to be not less than that corresponding to the assigned freeboard.

Chapter 23 BULWARKS, GUARDRAILS, FREEING ARRANGEMENTS, CARGO PORTS AND OTHER SIMILAR OPENINGS, SIDE SCUTTLES, RECTANGULAR WINDOWS, VENTILATORS AND GANGWAYS

23.6 Ventilators

23.6.8 Additional Requirement for Ventilators Fitted on Exposed Fore Deck*

Sub-paragraph -1 has been amended as follows.

1 The ventilators located on the exposed deck forward of $0.25L_1$ are to be of sufficient strength to resist green sea force if the height of the exposed deck in way of those ventilators is less than $0.1L_1$ or $22m$ above the designed maximum load line, whichever is smaller. The length L_1 is ~~specified in **15.2.1-1.**~~ the distance (*m*) measured on the waterline at the scantling draught d_S from the forward side of the stem to the centre of the rudder stock. L_1 is to be not less than 96% and need not exceed 97% of the extreme length on the waterline at the scantling draught d_S. In ships without rudder stocks (e.g. ships fitted with azimuth thrusters), the Rule length L_1 is to be taken equal to 97% of the extreme length on the waterline at the scantling draught d_S. d_S is the scantling draught (*m*) at which the strength requirements for the scantlings of the ship are met and represents the full load condition; it is to be not less than that corresponding to the assigned freeboard.

Chapter 27 EQUIPMENT

27.1 Anchors, Cables and Mooring Ropes

27.1.2 Equipment Numbers*

Sub-paragraph -1(2) has been amended as follows.

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) is omitted.)

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

f ~~L_1~~ $L_2 + \sum h''l$

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

~~L_1: Length (m) of ship specified in **15.2.1-1**~~

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_1~~ L_2 and also have a breadth greater than $B/4$ and a height greater than $1.5m$

((3) is omitted.)

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

Table C27.1 Anchors, Chain Cables and Ropes

Equipment Letter	Equipment number		Anchor		Chain cable for anchor (Stud anchor for chain)				Tow line	
			Number	Mass per anchor (stock-less anchor)	Total length	Diameter			Length	Breaking load
						Grade 1	Grade 2	Grade 3		
	Over	Up to		*kg*	*m*	*mm*	*mm*	*mm*	*m*	*kN*
A1	50	70	2	180	220	14	12.5		180	98
*A*2	70	90	2	240	220	16	14		180	98
*A*3	90	110	2	300	247.5	17.5	16		180	98
*A*4	110	130	2	360	247.5	19	17.5		180	98
*A*5	130	150	2	420	275	20.5	17.5		180	98
*B*1	150	175	2	480	275	22	19		180	98
*B*2	175	205	2	570	302.5	24	20.5		180	112
*B*3	205	240	2	660	302.5	26	22	20.5	180	129
*B*4	240	280	2	780	330	28	24	22	180	150
*B*5	280	320	2	900	357.5	30	26	24	180	174
*C*1	320	360	2	1020	357.5	32	28	24	180	207
*C*2	360	400	2	1140	385	34	30	26	180	224
*C*3	400	450	2	1290	385	36	32	28	180	250
*C*4	450	500	2	1440	412.5	38	34	30	180	277
*C*5	500	550	2	1590	412.5	40	34	30	190	306
*D*1	550	600	2	1740	440	42	36	32	190	338
*D*2	600	660	2	1920	440	44	38	34	190	370
*D*3	660	720	2	2100	440	46	40	36	190	406
*D*4	720	780	2	2280	467.5	48	42	36	190	441
*D*5	780	840	2	2460	467.5	50	44	38	190	479
*E*1	840	910	2	2640	467.5	52	46	40	190	518
*E*2	910	980	2	2850	495	54	48	42	190	559
*E*3	980	1060	2	3060	495	56	50	44	200	603
*E*4	1060	1140	2	3300	495	58	50	46	200	647
*E*5	1140	1220	2	3540	522.5	60	52	46	200	691
*F*1	1220	1300	2	3780	522.5	62	54	48	200	738
*F*2	1300	1390	2	4050	522.5	64	56	50	200	786
*F*3	1390	1480	2	4320	550	66	58	50	200	836
*F*4	1480	1570	2	4590	550	68	60	52	220	888
*F*5	1570	1670	2	4890	550	70	62	54	220	941
*G*1	1670	1790	2	5250	577.5	73	64	56	220	1024
*G*2	1790	1930	2	5610	577.5	76	66	58	220	1109
*G*3	1930	2080	2	6000	577.5	78	68	60	220	1168
*G*4	2080	2230	2	6450	605	81	70	62	240	1259
*G*5	2230	2380	2	6900	605	84	73	64	240	1356

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

Equipment Letter	Equipment number		Anchor		Chain cable for anchor (Stud anchor for chain)				Tow line	
			Number	Mass per anchor (stock-less anchor)	Total length	Diameter			Length	Breaking load
						Grade 1	Grade 2	Grade 3		
	Over	Up to		*kg*	*m*	*mm*	*mm*	*mm*	*m*	*kN*
*H*1	2380	2530	2	7350	605	87	76	66	240	1453
*H*2	2530	2700	2	7800	632.5	90	78	68	260	1471
*H*3	2700	2870	2	8300	632.5	92	81	70	260	1471
*H*4	2870	3040	2	8700	632.5	95	84	73	260	1471
*H*5	3040	3210	2	9300	660	97	84	76	280	1471
*J*1	3210	3400	2	9900	660	100	87	78	280	1471
*J*2	3400	3600	2	10500	660	102	90	78	280	1471
*J*3	3600	3800	2	11100	687.5	105	92	81	300	1471
*J*4	3800	4000	2	11700	687.5	107	95	84	300	1471
*J*5	4000	4200	2	12300	687.5	111	97	87	300	1471
*K*1	4200	4400	2	12900	715	114	100	87	300	1471
*K*2	4400	4600	2	13500	715	117	102	90	300	1471
*K*3	4600	4800	2	14100	715	120	105	92	300	1471
*K*4	4800	5000	2	14700	742.5	122	107	95	300	1471
*K*5	5000	5200	2	15400	742.5	124	111	97	300	1471
*L*1	5200	5500	2	16100	742.5	127	111	97	300	1471
*L*2	5500	5800	2	16900	742.5	130	114	100	300	1471
*L*3	5800	6100	2	17800	742.5	132	117	102	300	1471
*L*4	6100	6500	2	18800	742.5		120	107	300	1471
*L*5	6500	6900	2	20000	770		124	111	300	1471
*M*1	6900	7400	2	21500	770		127	114	300	1471
*M*2	7400	7900	2	23000	770		132	117	300	1471
*M*3	7900	8400	2	24500	770		137	122	300	1471
*M*4	8400	8900	2	26000	770		142	127	300	1471
*M*5	8900	9400	2	27500	770		147	132	300	1471
*N*1	9400	10000	2	29000	770		152	132	300	1471
*N*2	10000	10700	2	31000	770			137	300	1471
*N*3	10700	11500	2	33000	770			142	300	1471
*N*4	11500	12400	2	35500	770			147	300	1471
*N*5	12400	13400	2	38500	770			152	300	1471
*O*1	13400	14600	2	42000	770			157	300	1471
*O*2	14600	16000	2	46000	770			162	300	1471

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**)

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_1, as defined in **2.1.1 of Part A**~~, $\underline{L_2}$, 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*.

Chapter 31 BULK CARRIERS

31.1 General

31.1.2 Ship Types and Applicable Requirements*

Sub-paragraph -1 has been amended as follows.

1 Ships with a length L_1 of not less than 150 *m* are to be categorized into one of the following types and comply with the requirements of this Chapter. L_1 is ~~the length of ship (*m*) specified in **2.1.2, Part A** or 0.97 *times* the length of ship (*m*) on the designed maximum load line, whichever is smaller.~~ the distance (*m*) measured on the waterline at the scantling draught d_S from the forward side of the stem to the centre of the rudder stock. L_1 is to be not less than 96% and need not exceed 97% of the extreme length on the waterline at the scantling draught d_S. In ships without rudder stocks (e.g. ships fitted with azimuth thrusters), the Rule length L_1 is to be taken equal to 97% of the extreme length on the waterline at the scantling draught d_S. d_S is the scantling draught (*m*) at which the strength requirements for the scantlings of the ship are met and represents the full load condition; it is to be not less than that corresponding to the assigned freeboard.

(1) BC-A: Bulk carriers designed to carry bulk cargoes with a bulk cargo density (defined in **31A.1.2-1(6)**) of 1.0 t/m^3 and above with specified holds empty at designed maximum load draught (hereinafter referred to as "alternately loaded condition") and with all ballast tanks empty.

(2) BC-B: Bulk carriers designed to carry bulk cargoes with a bulk cargo density of 1.0 t/m^3 and above in a homogeneously loaded condition at designed maximum load draught with all ballast tanks empty.

(3) BC-C: Bulk carriers designed to carry bulk cargoes with a bulk cargo density of less than 1.0 t/m^3 in a homogeneously loaded condition at designed maximum load draught with all ballast tanks empty.

31.1.6 Minimum Thickness*

Sub-paragraph -2 has been amended as follows.

2 The thickness of webs and upper brackets of hold frames is not to be less than that obtained from the following formula. The thickness of lower brackets of hold frames is not to be less than 2.0 *mm* greater than that obtained from the following formula:

$C(0.03L_0 + 7.0)$ (mm)

L_0: ~~Length 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~~ Distance (*m*) measured on the waterline at the scantling draught d_S from the forward side of the stem to the centre of the rudder stock. L_1 is to be not less than 96% and need not exceed 97% of the extreme length on the waterline at the scantling draught d_S.
However, where the value exceeds 200 *m*, L_0 is to be taken as 200 *m*.

d_S: Scantling draught (*m*) at which the strength requirements for the scantlings of the ship are met and represents the full load condition. d_S is to be not less than that corresponding to the assigned freeboard.

C: Coefficient given by the following:
1.15: for the webs of hold frames in way of the foremost hold
1.00: for the webs of hold frames in way of other holds

Sub-paragraph -3 has been amended as follows.

3 For single side skin bulk carriers, the thickness of side shell plating located between top side tanks and bilge hopper tanks is not to be less than that obtained from the following formula:

$\sqrt{L_1}$ (mm)

L_1: ~~Length 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~~ Distance (m) measured on the waterline at the scantling draught d_S from the forward side of the stem to the centre of the rudder stock. L_1 is to be not less than 96% and need not exceed 97% of the extreme length on the waterline at the scantling draught d_S.

d_S: Scantling draught (m) at which the strength requirements for the scantlings of the ship are met and represents the full load condition. d_S is to be not less than that corresponding to the assigned freeboard.

31.6 Hold Frames

31.6.1 Hold Frames*

Sub-paragraph -4 has been amended as follows.

4 In ships less than 190 m in length L_1, mild steel hold frames may be asymmetric. ~~In this sub-paragraph, length of ship means L_1 (m) as specified in **31.1.6-3.**~~ L_1 is the distance (m) measured on the waterline at the scantling draught d_S from the forward side of the stem to the centre of the rudder stock. L_1 is to be not less than 96% and need not exceed 97% of the extreme length on the waterline at the scantling draught d_S. In ships without rudder stocks (e.g. ships fitted with azimuth thrusters), the Rule length L_1 is to be taken equal to 97% of the extreme length on the waterline at the scantling draught d_S. d_S is the scantling draught (m) at which the strength requirements for the scantlings of the ship are met and represents the full load condition; it is to be not less than that corresponding to the assigned freeboard.

31.6.2 Upper and Lower End Connections of Hold Frames*

Sub-paragraph -4 has been amended as follows.

4 In ships not less than 190 m in length L_1, hold frames are to be fabricated with integral upper and lower brackets. ~~In this sub-paragraph, length of ship means L_1 (m) specified in **31.1.4-3.**~~ L_1 is the distance (m) measured on the waterline at the scantling draught d_S from the forward side of the stem to the centre of the rudder stock. L_1 is to be not less than 96% and need not exceed 97% of the extreme length on the waterline at the scantling draught d_S. In ships without rudder stocks (e.g. ships fitted with azimuth thrusters), the Rule length L_1 is to be taken equal to 97% of the extreme length on the waterline at the scantling draught d_S. d_S is the scantling draught (m) at which the strength requirements for the scantlings of the ship are met and represents the full load condition; it is to be not less than that corresponding to the assigned freeboard.

Chapter 31A ADDITIONAL REQUIREMENTS FOR NEW BULK CARRIERS

31A.3 Transverse Watertight Bulkheads in Cargo Holds

31A.3.1 General

Sub-paragraph -7 has been amended as follows.

7 For ships of not less than 190 *m* of length L_1, bulkheads are to be fitted with a lower stool and generally with a upper stool. For ships other than the above, corrugations may extend from the inner bottom to the deck. L_1 is ~~the length 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 distance (*m*) measured on the waterline at the scantling draught d_S from the forward side of the stem to the centre of the rudder stock. L_1 is to be not less than 96% and need not exceed 97% of the extreme length on the waterline at the scantling draught d_S. In ships without rudder stocks (e.g. ships fitted with azimuth thrusters), the Rule length L_1 is to be taken equal to 97% of the extreme length on the waterline at the scantling draught d_S. d_S is the scantling draught (*m*) at which the strength requirements for the scantlings of the ship are met and represents the full load condition; it is to be not less than that corresponding to the assigned freeboard.

Sub-paragraph -8 has been added as follows.

8 Notwithstanding the requirements in this section, for self-unloading ships with unloading systems that do not maintain watertightness, the combination loads acting on the bulkheads in the flooded conditions are to be considered using the extent to which the flooding may occur.

31A.5 Longitudinal Strength in Flooded Condition

31A.5.1 General*

Sub-paragraph -3 has been added as follows.

1 The requirements in this section apply to bulk carriers, coming under the following **(1)** or **(2)**, of not less than 150 *m* in length L_f, designed to carry solid bulk cargoes having a density of not less than 1.0 *ton/m*^{3}.

(1) Bulk carriers of single-side skin construction

(2) Bulk carriers of double-side skin construction in which any part of a longitudinal bulkhead is located within *B*/5 or 11.5 *m*, whichever is less, inboard from the ship's side at right angles to the centreline at the assigned summer load line

2 Ships are to have sufficient longitudinal hull girder strength to withstand flooding of any one cargo hold in the following conditions. The loads in flooded holds are to be in accordance with **31A.5.2** and the evaluation of longitudinal strength is to be in accordance with **31A.5.3.**

(1) Ballast condition (at departure and arrival)

(2) Homogeneous loading condition (at departure and arrival)

(3) All specific non-homogeneous loading conditions (at departure and arrival)

(4) Other loading conditions deemed necessary by the Society

3 Notwithstanding the requirements in this section, for self-unloading ships with unloading systems that do not maintain watertightness, the longitudinal strength in the flooded conditions are to be considered using the extent to which the flooding may occur.

Chapter 31B ADDITIONAL REQUIREMENTS FOR EXISTING BULK CARRIERS

31B.5 Hold Frames

31B.5.2 Steel Renewal Criteria and Reinforcing Measures*

1 Steel renewal of the webs of side shell frames and brackets is to be done when $t_M \leq t_{REN}$, where t_M is the measured thickness, in *mm*, and t_{REN} is the renewal thickness, in *mm*, defined as the maximum value of the following **(1)** through **(4)**.

(1) $t_{REN} = t_{COAT} - t_C$

t_{COAT}: $0.75t_{S12}$ (*mm*)

t_C: The value (*mm*) specified in **Table C31B.5.2**

t_{S12}:Web of hold frame and web of bracket thickness (*mm*) required according to **31.1.6-2** and **31.6.2-5**

Table C31B.5.2 has been amended as follows.

Table C31B.5.2 t_C values (*mm*)

Ship's length L_1 (*m*)	Holds other than No. 1		Hold No. 1	
	Span and upper brackets	Lower brackets	Span and upper brackets	Lower brackets
≤ 100	2.0	2.5	2.0	3.0
150	2.0	3.0	3.0	3.5
≥ 200	2.0	3.0	3.0	4.0

~~Note:~~ Notes:

1: L_1 is the distance (*m*) measured on the waterline at the scantling draught d_S from the forward side of the stem to the centre of the rudder stock. L_1 is to be not less than 96% and need not exceed 97% of the extreme length on the waterline at the scantling draught d_S. In ships without rudder stocks (e.g. ships fitted with azimuth thrusters), the Rule length L_1 is to be taken equal to 97% of the extreme length on the waterline at the scantling draught d_S. d_S is the scantling draught (*m*) at which the strength requirements for the scantlings of the ship are met and represents the full load condition; it is to be not less than that corresponding to the assigned freeboard.

2: For intermediate ship lengths, t_C is obtained by linear interpolation between the above values.

((2) to (4) are omitted.)

31B.5.3 Strength Check Criteria

Sub-paragraph -2 has been amended as follows.

2 Load model

The forces $P_{fr,a}$ and $P_{fr,b}$, in *kN*, to be considered for the strength checks at sections *a*) and *b*) of side frames specified in **Fig. C31B.5.2** (in the case of separate lower brackets, section b) is at the top of the lower bracket) are given by:

$$P_{fr,a} = P_S + \max(P_1, P_2)$$

$$P_{fr,b} = P_{fr,a} \cdot \frac{h - 2h_B}{h}$$

P_S : Still water force, in *kN*, obtained from the following **(1)** or **(2)**.

(1) When the upper end of the side frame span *h* (see **Fig. C31B.5.1**) is below the load water line

$$s\,h\,\left(\frac{p_{S,U}+p_{S,L}}{2}\right)$$

(2) When the upper end of the side frame span *h* (see **Fig. C31B.5.1**) is at or above the load water line

$$s\,h'\,\left(\frac{p_{S,L}}{2}\right)$$

P_1: Wave force, in *kN*, in head sea

$$s\,h\,\left(\frac{p_{1,U}+p_{1,L}}{2}\right)$$

P_2: Wave force, in *kN*, in beam sea

$$s\,h\,\left(\frac{p_{2,U}+p_{2,L}}{2}\right)$$

h, h_B: Side frame span and lower bracket length, in *m*, defined in **Fig.C31B.5.1** and **Fig.C31B.5.2**, respectively

h': Distance, in *m*, between the lower end of side frame and the load water line

s: Frame spacing, in *m*

$p_{S,U}$, $p_{S,L}$: Still water pressure, in *kN/m*^{2}, at the upper and lower end of the side frame span *h* (see **Fig.C31B.5.1**), respectively

$p_{1,U}$, $p_{1,L}$: Wave pressure, in *kN/m*^{2}, as defined in **(1)** below for the upper and lower end of the side frame span *h*, respectively

$p_{2,U}$, $p_{2,L}$: Wave pressure, in *kN/m*^{2}, as defined in **(2)** below for the upper and lower end of the side frame span *h*, respectively

(1) Wave pressure p_1

(a) The wave pressure p_1, in *kN/m*^{2}, at and below the waterline is given by:

$$p_1 = 1.5\left[p_{11} + 135\,\frac{B}{2\,(B+75)} - 1.2\,(d-z)\right]$$

$$p_{11} = 3\,k_S\,C + k_f$$

(b) The wave pressure p_1, in *kN/m*^{2}, above the water line is given by:

$$p_1 = p_{1wl} - 7.5(z-d)$$

(2) Wave pressure p_2

(a) The wave pressure p_2, in *kN/m*^{2}, at and below the waterline is given by:

$$p_2 = 13\left[0.5\,B\,\frac{50\,c_r}{2\,(B+75)} + C_B\,\frac{0.5\,B+k_f}{14}\,\left(0.7+2\frac{z}{d}\right)\right]$$

(b) The wave pressure p_2, in *kN/m*^{2}, above the water line is given by:

$$p_2 = p_{2wl} - 5(z-d)$$

p_{1wl}: p_1 wave sea pressure at the waterline

p_{2wl}: p_2 wave sea pressure at the waterline

~~L_1: Length of ship, in *m*, specified in **15.2.1-1, Part C**~~

B: Breadth of ship, in *m*, specified in **2.1.4, Part A**

C_B: ~~Block coefficient C_B specified in **15.2.1-1, Part C**~~ Volume of displacement corresponding to the scantling draught d_S divided by $L_1B_Sd_S$; this value, however, is to be taken as 0.6, when less than 0.6.

B_S: Breadth (*m*) measured amidships at the scantling draught d_S.

d: Designed maximum load draught, in *m*, specified in **2.1.12, Part A**

L_1: Distance (*m*) measured on the waterline at the scantling draught d_S from the forward side of the stem to the centre of the rudder stock. L_1 is to be not less than 96% and need not exceed 97% of the extreme length on the waterline at the scantling draught d_S. In ships without rudder stocks (e.g. ships fitted with azimuth thrusters), the Rule length L_1 is to be taken equal to 97% of the extreme length on the waterline at the scantling draught d_S.

d_S: Scantling draught (*m*) at which the strength requirements for the scantlings of the ship are met and represents the full load condition. d_S is to be not less than that corresponding to the assigned freeboard.

C: Coefficient defined as follows:

$10.75 - \left(\frac{300-L_1}{100}\right)^{1.5}$ for $90 \le L_1 \le 300$ *m*

10.75 for $L_1 > 300$ *m*

c_r: $\left(1.25 - 0.025\frac{2\ k_r}{\sqrt{GM}}\right)k$

$k = 1.2$ for ships without bilge keel

$k = 1.0$ for ships with bilge keel

k_r: Roll radius of gyration. If the actual value of k_r is not available, the following value of **(1)** or **(2)** is to be used.

(1) 0.39*B* for ships with even distribution of mass in transverse section (*e.g.* alternate heavy cargo loading or homogeneous light cargo loading)

(2) 0.25*B* for ships with uneven distribution of mass in transverse section (*e.g.* homogeneous heavy cargo distribution)

GM: 0.12*B* if the actual value of *GM* is not available

z: Vertical distance, in *m*, from the baseline to the load point

k_s: $C_B + \frac{0.83}{\sqrt{C_B}}$ at aft end of L_1

C_B between 0.2 L_1 and 0.6 L_1 from aft end of L_1

$C_B + \frac{1.33}{C_B}$ at forward end of L_1

Between the specified points above, k_s is to be interpolated linearly.

$k_f = 0.8C$

31B.6 Steel Weathertight Hatch Covers

Paragraph 31B.6.1 has been amended as follows.

31B.6.1 Implementation Schedule

For ships constructed or converted with a single deck, top-side tanks and hopper side tanks in cargo area and intended primarily to carry dry cargoes in bulk, which are contracted for construction prior to 1 January 2004, steel weathertight hatch covers for cargo hold hatchways which are located wholly or partially within $0.25L_1$ of the fore end of L_1 are to comply with the requirements of **31B.6.2** and **31B.6.3** in accordance with the schedule shown in **Table C31B.5.1**. Notwithstanding the provisions above, hatch covers other than those for the foremost and second cargo holds need not apply to these requirements. The length L_1 is ~~a length specified in **15.2.1-1.**~~ the distance (*m*) measured on the waterline at the scantling draught d_S from the forward side of the stem to the centre of the rudder stock. L_1 is to be not less than 96% and need not exceed 97% of the extreme length on the waterline at the scantling draught d_S. In ships without rudder stocks (e.g.

ships fitted with azimuth thrusters), the Rule length L_1 is to be taken equal to 97% of the extreme length on the waterline at the scantling draught d_S. d_S is the scantling draught (m) at which the strength requirements for the scantlings of the ship are met and represents the full load condition; it is to be not less than that corresponding to the assigned freeboard.

Chapter 32 CONTAINER CARRIERS

32.1 General

32.1.2 Definitions

Sub-paragraph -1 has been amended as follows.

1 The definitions of L_1, d_S, *FE* (fore end of L_1) and *AE* (aft end of L_1) are given in **Table C32.1** and **Fig. C32.1**.

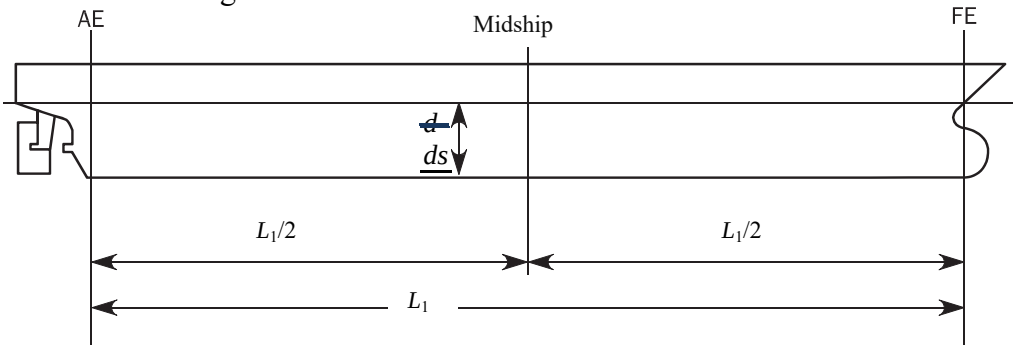
Table C32.1 has been amended as follows.

Table C32.1 Definitions of L_1, d_S, *FE* and *AE*

	Definition
L_1	~~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.~~ Distance (m) measured on the waterline at the scantling draught d_S from the forward side of the stem to the centre of the rudder stock. L_1 is to be not less than 96% and need not exceed 97% of the extreme length on the waterline at the scantling draught d_S. In ships without rudder stocks (e.g. ships fitted with azimuth thrusters), the Rule length L_1 is to be taken equal to 97% of the extreme length on the waterline at the scantling draught d_S.
d_S	Scantling draught (m) at which the strength requirements for the scantlings of the ship are met and represents the full load condition; it is to be not less than that corresponding to the assigned freeboard.
FE	The fore end of L_1, defined as the perpendicular to ~~the designed maximum load draught~~ the scantling draught d_S at the forward side of the stem.
AE	The aft end of L_1, defined as the perpendicular to ~~the designed maximum load draught~~ the scantling draught d_S at a distance L_1 aft of the fore end (*FE*).

Fig. C32.1 has been amended as follows.

Fig. C32.1 Definitions of the *FE* and *AE*



32.2 Longitudinal Bending Strength

32.2.1 General

Sub-paragraph -1 has been amended as follows.

1 The wave induced load requirements specified in this Chapter apply to ships meeting the criteria in the following **(1)** to **(3)**:

(1) Length of ship L_1: $90m \leq L_1 \leq 500m$

(2) Proportion: $5 \leq L_1/B \leq 9,\ 2 \leq B/~~d~~\ \underline{d_S} \leq 6$

(3) Block coefficient at ~~the designed maximum load line~~ the scantling draught $\underline{d_S}$: $0.55 \leq C_b' \leq 0.9$

~~C_b' is the volume of displacement corresponding to the designed maximum load line divided by $L_1 B d$~~

$\underline{C_b'}$: Volume of displacement corresponding to the scantling draught $\underline{d_S}$ divided by $\underline{L_1 B_S d_S}$

$\underline{B_S}$: The breadth (m) measured amidships at the scantling draught $\underline{d_S}$.

32.2.3 Loads*

Sub-paragraph -6 has been amended as follows.

6 The distribution of the vertical wave induced bending moments, $M_W(kN\text{-}m)$, along the ship length is given in **Fig. C32.6**. $M_{W-Hog-Mid}$ and $M_{W-Sag-Mid}$ are to be obtained using the following formulae.

$$M_{W-Hog-Mid} = +1.5 f_R {L_1}^3 C C_W \left(\frac{B}{L_1}\right)^{0.8} f_{NL-Hog}$$

$$M_{W-Sag-Mid} = -1.5 f_R {L_1}^3 C C_W \left(\frac{B}{L_1}\right)^{0.8} f_{NL-Sag}$$

f_R: Factor, to be taken as 0.85

C: Wave parameter, to be taken as:

$$C = 1 - 1.50\left(1 - \sqrt{\frac{L_1}{L_{ref}}}\right)^{2.2} \quad \text{for } L_1 \leq L_{ref}$$

$$C = 1 - 0.45\left(\sqrt{\frac{L_1}{L_{ref}}} - 1\right)^{1.7} \quad \text{for } L_1 > L_{ref}$$

L_{ref}: Reference length (m), to be taken as:

$$L_{ref} = 315 {C_W}^{-1.3}$$

C_W: Waterplane coefficient at ~~the designed maximum load draught~~ the scantling draught $\underline{d_S}$, to be taken as:

$$C_W = \frac{A_W}{L_1 B}$$

A_W: Waterplane area at ~~the designed maximum load draught~~ the scantling draught $\underline{d_S}$ (m^2)

f_{NL-Hog}: Non-linear correction factor for hogging, to be taken as:

$f_{NL-Hog} = 0.3 \frac{C_b'}{C_W} ~~\sqrt{d}~~ \underline{\sqrt{d_S}}$, not to be taken greater than 1.1

f_{NL-Sag}: Non-linear correction factor for sagging, to be taken as:

$$f_{NL-Sag} = 4.5\frac{1+0.2f_{Bow}}{C_W\sqrt{C_b'L_1}}, \text{ not to be taken less than } 1.0$$

f_{Bow}: Bow flare shape coefficient, to be taken as:

$$f_{Bow} = \frac{A_{DK} - A_{WL}}{0.2L_1Z_f}$$

A_{DK}: Projected area in horizontal plane of uppermost deck (m^2) including the forecastle deck, if any, extending from $0.8L_1$ (see **Fig. C32.7**). Any other structures, e.g. plated bulwark, are to be excluded.

A_{WL}: Waterplane area (m^2) at ~~the designed maximum load draught~~ the scantling draught d_S, extending from $0.8L_1$ forward

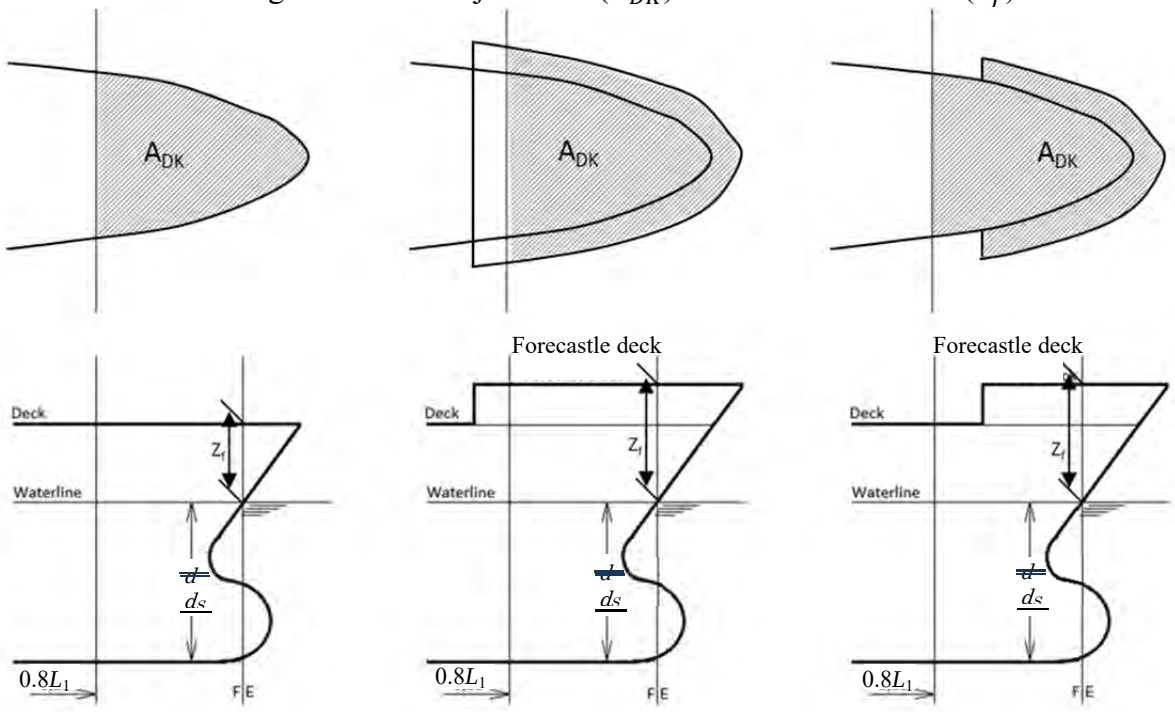
Z_f: Vertical distance (m) from the waterline at ~~the designed maximum load draught~~ the scantling draught d_S to the uppermost deck (or forecastle deck), measured at FE (see **Fig. C32.7**). Any other structures, e.g. plated bulwark, are to be excluded.

C_b': Volume of displacement corresponding to ~~the designed maximum load line~~ the scantling draught d_S divided by ~~L_1Bd~~ $L_1B_Sd_S$

B_S: The breadth (m) measured amidships at the scantling draught d_S.

Fig. C32.7 has been amended as follows.

Fig. C32.7 Project Area (A_{DK}) and Vertical Distance (Z_f)



32.2.4 Minimum Section Modulus

Sub-paragraph -1 has been amended as follows.

1 The gross section modulus of the transverse section of the hull at the mid-point of L is not to be less than the value of $W_{gr\_min}(cm^3)$ obtained from the following formula:

$W_{gr\_min} = C_1 {L_1}^2 B(C_b' + 0.7)$

C_1: As given by the following formulae:

$10.75 - \left(\frac{300 - L_1}{100}\right)^{1.5}$ for $L_1 \leq 300m$

10.75 for $300m < L_1 \leq 350m$

$10.75 - \left(\frac{L_1 - 350}{150}\right)^{1.5}$ for $350m < L_1$

C_b': Volume of displacement corresponding to ~~the designed maximum load line~~ the scantling draught d_S divided by ~~L_1Bd~~ $L_1 B_S d_S$.
However, the value is to be taken as 0.6, where it is less than 0.6.

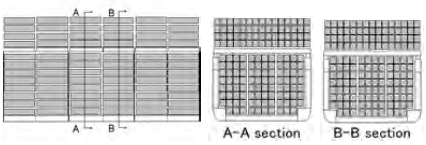
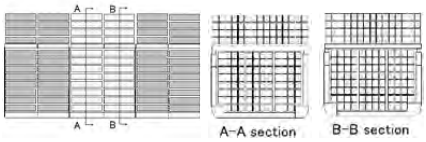
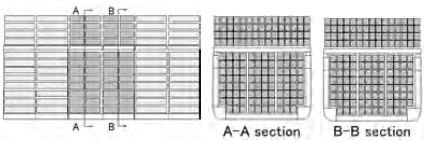
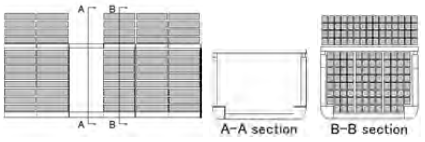
B_S: The breadth (m) measured amidships at the scantling draught d_S.

32.9.4 Loading Conditions

The minimum set of loading conditions for yielding strength assessment and buckling strength assessment is specified in **Table C32.16**. In addition, loading conditions specified in the loading manual are to be considered where deemed necessary.

Table C32.16 has been amended as follows.

Table C32.16 Loading Conditions

Loading condition	Loading patterns	Draught	Container weight of cargo hold to be evaluated	Ballast and fuel oil tanks	Vertical still water bending moment M_S
40' containers loading condition *FH*4		~~*d*~~ d_S	40' containers weight(1)	Empty	$M_{S\,max}$
Light 40' containers loading condition *FL*4(4)		~~*d*~~ d_S	Light 40' containers weight (2), (3)	Empty	$M_{S\,max}$
20' containers loading condition *RH*2(5)		0.9~~*d*~~ d_S	20' containers weight(1)	Empty	$M_{S\,min}$
One bay empty condition *OH*4(6)		~~*d*~~ d_S	40' containers weight(1)	Empty	$M_{S\,max}$

Notes:

$M_{S\,max}$: Permissible maximum vertical still water bending moment in seagoing condition (*kN-m*) at the cross section under consideration.

$M_{S\,min}$: Permissible minimum vertical still water bending moment in seagoing condition (*kN-m*) at the cross section under consideration.

(1): Container unit weight is to be calculated as the permissible stacking weight divided by the maximum number of tiers planned.

(2): Light container unit weight in hold is to be taken as 50% of its related container unit weight.

(3): Light container unit weight on deck is to be taken as 50% of its related container unit weight or 17 metric tons, whichever is the lesser.

(4): For loading condition *FL*4, 40' containers are assumed to be loaded in the cargo holds not being evaluated.

(5): For loading condition *RH*2, light 40' containers are assumed to be loaded in the cargo holds not being evaluated.

(6): For one bay empty condition, if the cargo hold consists of two or more bays, then each bay is to be considered entirely empty in hold and on deck (other bays full) in turn as separate load cases.

32.9.6 Loads

1 Ship motion and acceleration are to be in accordance with the following **(1)** to **(3)**:

(1) The pitch angle, θ, and roll angle, ϕ, are to be as given in **Table C32.18**.

Table C32.18 has been amended as follows.

Table C32.18 Ship Motion

Pitch angle	$\theta = \frac{5.4}{L_1{}^{1.2}\sqrt{C_b'}} H_{L-180}(rad.)$
Roll angle	$\phi = \frac{4}{T_R\sqrt{B}} H_R(rad.)$

Notes:

C_b': As specified in **32.2.4-1**.

H_{L-180}: As given by the following formula:

$$H_{L-180} = 1.1C_1C_2\sqrt{\frac{L_1 + \lambda_{L-180} - 25}{L_1}}$$

H_R: As given by the following formula:

$$H_R = 0.64C_1C_2\sqrt{\frac{L_1 + \lambda_R - 25}{L_1}}$$

C_1: Coefficient to be taken as follows:

$C_1 = 10.75 - \left(\frac{300 - L_1}{100}\right)^{1.5}$ for $L_1 \leq 300\ m$

$C_1 = 10.75$ for $300\ m < L_1 \leq 350\ m$

$C_1 = 10.75 - \left(\frac{L_1 - 350}{150}\right)^{1.5}$ for $350\ m < L_1$

C_2: Coefficient to be taken as follows:

$C_2 = 0.85$

λ_{L-180}: As given by the following formula:

$$\lambda_{L-180} = 0.5\left(1 + \frac{d_i}{d_S}\right)L_1\ (m)$$

λ_R: As given by the following formula:

$$\lambda_R = \frac{g}{2\pi}{T_R}^2\ (m)$$

d_i: Draught amidships for the relevant loading condition (m).

g: Gravity acceleration, taken as 9.81 (m/s^2).

T_R: As given by the following formula:

$$T_R = C\frac{2K_{xx}}{\sqrt{GM}}\ (s)$$

C: Coefficient, taken as 1.1

K_{xx}: Roll radius of gyration (m). If K_{xx} is not available, K_{xx} may be calculated as $K_{xx} = 0.35B$

GM: Metacentric height (m); If GM is not available, GM may be calculated from the following formulae, but is not to be taken as $0.06B$ or below.

$GM = 0.52B - 0.55D_S - 5.26$ for loading condition *FH*4, *FL*4, *OH*4

$GM = 0.52B - 0.53D_S - 4.84$ for loading condition *RH*2

(2) The acceleration at the centre of gravity of the ship due to pitch motion a_{pitch}, roll motion a_{roll}, and heave motion a_{heave} are to be as given in **Table C32.19**.

Table C32.19 has been amended as follows.

Table C32.19 Acceleration of the Centre of Gravity of the Ship

Acceleration at the centre of gravity of the ship due to pitch motion	$a_{pitch} = \theta \cdot \frac{2\pi \cdot g}{\lambda_{L-180}}$ $(rad./s^2)$
Acceleration at the centre of gravity of the ship due to roll motion	$a_{roll} = \phi \cdot GM \left(\frac{\pi}{C \cdot K_{xx}}\right)^2$ $(rad./s^2)$
Acceleration at the centre of gravity of the ship due to heave motion	$a_{heave} = \frac{5.4g}{(B \cdot L_1)^{0.6}\sqrt{C_b}} H_P$ (m/s^2)

Notes:

$C_b', \theta, \phi, \lambda_{L-180}$, GM, K_{xx}: As specified in **Table C32.18**.

g: Acceleration due to gravity, taken as 9.81 (m/s^2).

C: Coefficient, taken as 1.1

H_P: As given by the following formula:

$$H_P = 0.93 C_1 C_2 \sqrt{\frac{L_1 + \lambda_P - 25}{L_1}}$$

C_1 and C_2: As specified in **Table C32.18**.

λ_P: As given by the following formula:

$$\lambda_P = \left(0.2 + 0.15 \frac{d_i}{d_S}\right) L_1 \ (m)$$

d_i: Draught amidships for the relevant loading condition (m).

Table C32.22 has been amended as follows.

Table C32.22 Hydrodynamic Pressure Corresponding to Wave Load Conditions *L*-180 and *L*-0

Wave load condition		Hydrodynamic pressure (kN/m^2)		
		$z \le d_i$	$d_i < z \le d_i + h_w$	$z > d_i + h_w$
L-180	*L*-180-1	$P = \max(P_{D,L-180}, \rho g(z - d_i))$	$P = P_{WL} - \rho g(z - d_i)$	$P = 0$
	L-180-2	$P = \max(-P_{D,L-180}, \rho g(z - d_i))$		
L-0	*L*-0-1	$P = \max(P_{D,L-0}, \rho g(z - d_i))$		
	L-0-2	$P = \max(-P_{D,L-0}, \rho g(z - d_i))$		

Notes:

$P_{D,L-180}$: As given by the following formula:

$$P_{D,L-180} = 2.3C_3\left(\frac{z}{d_i} + \frac{|2y|}{B} + 1\right)H_{L-180}$$

$P_{D,L-0}$: As given by the following formula:

$$P_{D,L-0} = 2.3C_3C_{L-0}\left(\frac{z}{d_i} + \frac{|2y|}{B} + 1\right)H_{L-0}$$

C_3: Coefficient to be taken as :
$C_3 = 0.5$ for wave load condition *L*-180
$C_3 = 1$ for wave load condition *L*-0

C_{L-0}: Coefficient to be taken as :
$C_{L-0} = 0.8$

d_i: Draught amidships for the relevant loading condition (*m*).

y: *Y* coordinate, in *m*, at the position considered.

z: *Z* coordinate, in *m*, at the position considered.

H_{L-180}: As specified in **Table C32.18**.

H_{L-0}: As given by the following formula:

$$H_{L-0} = 1.1C_1C_2\sqrt{\frac{L_1 + \lambda_{L-0} - 25}{L_1}}$$

C_1 and C_2: As specified in **Table C32.18**.

λ_{L-0}: As given by the following formula:

$$\lambda_{L-0} = 0.5\left(1 + \frac{2}{3}\frac{d_i}{d_S}\right)L_1 \ (m)$$

P_{WL}: Wave pressure at the waterline (kN/m^2) for the considered wave load condition, to be taken as *P* for $z = d_i$

h_W: Water head equivalent to the pressure at waterline, in *metres*, to be taken as follows:

$$h_W = \frac{P_{WL}}{\rho g}$$

ρ: Density of sea water, taken as 1.025 (m/s^2) .

g: Acceleration due to gravity, taken as 9.81 (m/s^2) .

Table C32.26 has been amended as follows.

Table C32.26 Superimposition Ratio of Vertical Wave Induced Bending Moment and Horizontal Wave Induced Bending Moment

Wave load condition		C_4	M_W	C_5	M_H
L-180	*L*-180-1	1.0	Hogging M_{W-Hog}	–	–
	L-180-2		Sagging M_{W-Sag}		
L-0	*L*-0-1	0.8	Hogging M_{W-Hog}	–	–
	L-0-2		Sagging M_{W-Sag}		
R	*R*-*P*1	$0.75\frac{d_i}{~~d~~d_s}-0.55$	Sagging M_{W-Sag}	$1.2-\frac{d_i}{~~d~~d_s}$	Port side (Compression) $M_H(+)$
	R-*P*2		Hogging M_{W-Hog}		Port side (Tension) $M_H(-)$
	R-*S*1		Sagging M_{W-Sag}		Starboard side (Compression) $M_H(-)$
	R-*S*2		Hogging M_{W-Hog}		Starboard side (Tension) $M_H(+)$
P	*P*-*P*1	$\frac{d_i}{~~d~~d_s}-0.55$	Sagging M_{W-Sag}	$0.7-0.6\frac{d_i}{~~d~~d_s}$	Port side (Compression) $M_H(+)$
	P-*P*2		Hogging M_{W-Hog}		Port side (Tension) $M_H(-)$
	P-*S*1		Sagging M_{W-Sag}		Starboard side (Compression) $M_H(-)$
	P-*S*2		Hogging M_{W-Hog}		Starboard side (Tension) $M_H(+)$

Notes:
d_i: Draught amidships for the relevant loading condition (m) .
M_{W-Hog}: Vertical wave induced bending moment in hogging at the cross section under consideration. (See **Fig. C32.6**).
M_{W-Sag}: Vertical wave induced bending moment in sagging at the cross section under consideration. (See **Fig. C32.6**).

Chapter 34 LOADING MANUAL AND LOADING COMPUTER

34.2 Additional Requirements for Newly-built Bulk Carriers

34.2.1 General

Sub-paragraph -2 has 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), 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

2 Notwithstanding the provisions of **-1**, the bulk carriers defined in **31A.1.2(1)** ~~but not coming under the definition of~~ (excluding those bulk carriers ~~as~~ 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 1-3)

1. The effective date of the amendments is 1 July 2020.

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

2020 AMENDMENT NO.1

Notice No.26 30 June 2020

Resolved by Technical Committee on 22 January 2020

Notice No.26 30 June 2020
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

C4 SUBDIVISIONS

C4.1 General

Paragraph C4.1.2 has been amended as follows.

C4.1.2 Definitions

1 "Light service draught" stated in **4.1.2(4)**, **Part C** of the Rules corresponds, in general, to the ballast arrival condition with 10 % consumables.

~~**1**~~**2** "Deck or decks limiting the vertical extent of flooding" stated in **4.1.2(6)**, **Part C** of the Rules refers to the weather deck. However, when the ship has multiple decks above d_s + 12.5 (m) at the deepest subdivision draught, the deck just above d_s + 12.5 (m) is implied.

~~**2**~~**3** The wording "specifically accepted by the Society" stated in **4.1.2(13)**, **Part C** of the Rules means the carriage of timber and wood chip in cargo holds. Figures specified in **Table C4.1.2** may be used as the permeability of compartment.

~~**3**~~**4** With respect to the provisions of **4.1.2(13), Part C** of the Rules, the volume of spaces under consideration is to be taken as the moulded volume.

C4.2 Subdivision Index

Paragraph C4.2.1 has been amended as follows.

C4.2.1 Subdivision Index

1 If pipes, ducts or tunnels are provided within an assumed damaged compartment or group of compartments, they are to be arranged in such a way as to prevent flooding progressing to other compartments, or they are to be fitted with devices which can easily control the progress of flooding to other compartments. However, where the attained subdivision index takes into account flooding to other compartment through the pipes, ducts or tunnels, and satisfies the requirements in **4.2, Part C** of the Rules, these requirements need not apply.

2 Notwithstanding the provisions of **-1** above, minor progressive flooding may be permitted if it is demonstrated that the effects of progressive flooding of other compartments through these pipes, ducts or tunnels can be easily controlled and the safety of the ship is not impaired. However, for ships up to L_f = 150 m the provision for allowing "minor progressive flooding" is to be limited to pipes penetrating a watertight subdivision with a total cross-sectional area of not more than 710 mm^2 between any two watertight compartments. For ships of L_f = 150 m and upwards the total cross-sectional area of pipes is not to exceed the cross-sectional area of one pipe with a diameter of L_f/5000 m.

~~**2**~~**3** Where penetrations for piping, ventilation, electrical cables, etc. are provided in bulkheads, decks and shells forming a compartment, the watertight integrity of the penetrations are to be at

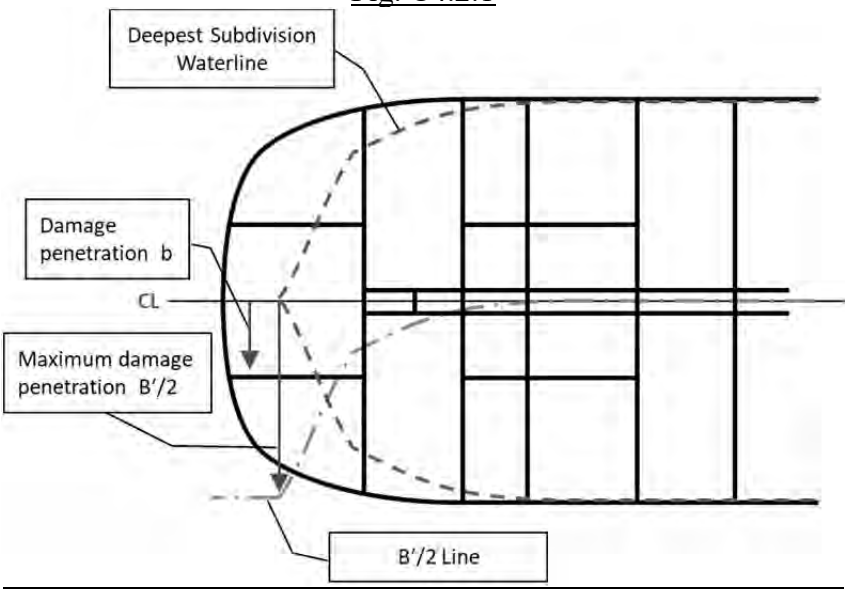
least equivalent to the parts they penetrate.

4 With the same intent as wing tanks, the summation of the attained index *A* is to reflect effects caused by all watertight bulkheads and flooding boundaries within the damaged zone. It is not correct to assume damage only to one half of the ship's breadth (*B*′) and ignore changes in subdivision that would reflect lesser contributions.

~~**3**~~**5** In the forward and aft ends of the ship where the sectional breadth is less than the ship's breadth (*B*′) specified in **4.1.2(11)**, **Part C** of the Rules, transverse damage penetration may extend beyond the centreline bulkhead.

6 Where, at the extreme ends of the ship, the subdivision exceeds the waterline at the deepest subdivision draught, the damage penetration b or *B*′/2 is to be taken from centreline. **Fig. C4.2.1** illustrates the shape of the *B*′/2 line.

Fig. C4.2.1



~~**4**~~**7** ~~Where corrugated bulkheads are fitted, they may be treated as ordinary stiffened bulkheads as long as the corrugation is of the same order as the stiffening structure. Pipes and valves directly adjacent to the bulkhead may be considered to be a part of the bulkhead. The same applies for small recesses, drain wells, etc.~~ Where longitudinal corrugated bulkheads are fitted in wing compartments or on the centreline, they may be treated as equivalent plane bulkheads provided the corrugation depth is of the same order as the stiffening structure. The same principle may also be applied to transverse corrugated bulkheads.

8 Pipes and valves directly adjacent or situated as close as practicable to a bulkhead or to a deck can be considered to be part of the bulkhead or deck, provided the separation distance on either side of the bulkhead or deck is of the same order as the bulkhead or deck stiffening structure. The same applies for small recesses, drain wells, etc.

~~**5**~~**9** In setting the trim and G_0M used to calculate the subdivision index, reference is also to be made to **1.3.10-11** and **-12**, **Annex U1.2.1 "GUIDANCE FOR STABILITY INFORMATION FOR MASTER", Part U of the Guidance**.

C4.2.3 Probability of Survival (s_i)

Sub-paragraph -6 has been added as follows.

6 If the final waterline immerses the lower edge of any opening through which progressive

flooding takes place, the factor "s" may be recalculated taking such flooding into account. However, in this case the *s* value is also to be calculated without taking into account progressive flooding and corresponding opening. The smallest *s* value is to be retained for the contribution to the attained index.

EFFECTIVE DATE AND APPLICATION (Amendment 1-1)

1. The effective date of the amendments is 30 June 2020.

2. Notwithstanding the amendments to the Guidance, the current requirements apply to ships other than ships that fall under the following:

(1) for which the contract for construction is placed on or after 1 January 2020; or

(2) in the absence of a contract for construction, the keels of which are laid or which are at *a similar stage of construction* on or after 1 July 2020; or

(3) the delivery of which is on or after 1 January 2024.

(Note) The term "a similar stage of construction" means the stage at which the construction identifiable with a specific ship begins and the assembly of that ship has commenced comprising at least 50 *tonnes* or 1% of the estimated mass of all structural material, whichever is the less.

Amendment 1-2

C4 SUBDIVISIONS

C4.2 Subdivision Index

C4.2.3 Probability of Survival (s_i)

Sub-paragraph -2 has been amended as follows.

2 In applying θ_v specified in **4.2.3-1, Part C of the Rules**, an "opening incapable of being closed weathertight" includes ventilators provided with weathertight closing appliances in accordance with the requirements of **23.6.5-2, Part C of the Rules** that for operational reasons have to remain open to supply air to the engine room ~~or~~, emergency generator room or closed ro-ro and vehicle spaces (if the same is considered buoyant in the stability calculation or protecting openings leading below) for the effective operation of the ship. Where it is not technically feasible to treat some closed ro-ro and vehicle space ventilators as unprotected openings, an alternative arrangement that provides an equivalent level of safety may be used provided that it is deemed appropriate by the Administration.

EFFECTIVE DATE AND APPLICATION (Amendment 1-2)

1. The effective date of the amendments is 30 December 2020.

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.

Amendment 1-3

C1 GENERAL

C1.1 General

C1.1.1 Application

Sub-paragraph -1 has been amended as follows.

1 For reduction of scantlings of structural members of ships to be classed for restricted service, the provisions in **1.1.1-2, Part CS of the Rules** are to apply except for those specially prescribed in this Part. In cases where the draught is defined as d_S in the **Part C of the Rules**, this requirement does not apply.

C1.1.23 Structural Details

Sub-paragraph -1(1) has been amended as follows.

1 In applying the requirements in **1.1.23-4**, **Part C of the Rules**, fatigue strength assessment of longitudinals in the midship part for tankers, ore carriers, bulk carriers, container carriers, ships carrying liquefied gases in bulk and ships carrying dangerous chemicals in bulk is to be in accordance with the following items **(1)** to **(3)**.

(1) For ships not less than 150 *m* in length L_1, the fatigue strength assessment of longitudinals that do not penetrate structural members which constrain athwartship or vertical displacements of longitudinals (such as transverse bulkheads, swash bulkheads or floors) is to be carried out in accordance with **Annex C1.1.23-1** "**GUIDANCE FOR THE FATIGUE STRENGTH ASSESSMENT OF LONGITUDINALS**". L_1 is ~~the ship length specified in **15.2.1-1 Part C of the Rules.**~~ the distance (*m*) measured on the waterline at the scantling draught d_S from the forward side of the stem to the centre of the rudder stock. L_1 is to be not less than 96% and need not exceed 97% of the extreme length on the waterline at the scantling draught d_S. In ships without rudder stocks (e.g. ships fitted with azimuth thrusters), the Rule length L_1 is to be taken equal to 97% of the extreme length on the waterline at the scantling draught d_S. d_S is the scantling draught (*m*) at which the strength requirements for the scantlings of the ship are met and represents the full load condition; it is to be not less than that corresponding to the assigned freeboard.

((2) to (3) are omitted.)

C27 EQUIPMENT

C27.1 Anchors, Chain Cables and Mooring Ropes

C27.1.1 General

Sub-paragraph -1(1) has been amended as follows.

1 "Special consideration" referred to in **27.1.1-1**, **Part C of the Rules** means the evaluation of the design effectiveness of anchors, chain cables and windlasses. For ships for which ~~the L_1 specified in **15.2.1-1, Part C of the Rules**~~ 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) Anchors and chain cables are to be in accordance with **Table C27.1.1-1** and based on the Equipment number EN_1 obtained from the following formula:

$$EN_1 = 0.628\left[a\left(\frac{EN}{0.628}\right)^{1/2.3} + b(1-a)\right]^{2.3}$$

a: As obtained from the following formula:

$$a = 1.83 \times 10^{-9}\cancel{L_1^3}\ L_2^3 + 2.09 \times 10^{-6}\cancel{L_1^2}\ L_2^2 - 6.21 \times 10^{-4}\cancel{L_1}\ L_2 + 0.0866$$

b: As obtained from the following formula:

$$b = 0.156\cancel{L_1}\ L_2 + 8.372$$

~~L_1: Ship length specified in **15.2.1-1, Part C of the Rules**~~

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.

EN: Equipment number specified in **27.1.2**, **Part C of the Rules**

((2) to (4) are omitted.)

C27.1.2 Equipment Numbers

Sub-paragraph -1(3) has been amended as follows.

1 Significant figures are to be taken as follows:
((1) to (2) are omitted.)
(3) Terms in the formula ($W^{2/3}$, $2.0hB$, $0.1A$) are to be rounded to the nearest whole number.

Example

~~L~~ L_2 = 313.00 *m* (Designed)
~~L~~ L_2 = 313.06 *m* (Scantling)
B = 48.20 *m*
D = 25.50 *m*
d = 19.00 *m* (Designed)
d_s = 19.8 *m* (Scantling)
W = 253,800 *t* (Scantling)
f = 25.50 − 19.80 = 5.70
h' = 2.70 × 4 + 2.80 × 1 = 13.60
h = 5.70 + 13.60 = 19.30
$f \times$ ~~L~~ L_2 = 5.70 × 313.06 = 1,784.4
(figures below 1st place of decimals omitted)

($h'' \times l$)
Upper deck house = 2.70 × 40.85 = 110.2
(figures below 1st place of decimal omitted)
A deckhouse = 2.70 × 40.85 = 110.2 (〃)
B deckhouse = 2.70 × 34.85 = 94.0 (〃)
+) *C* deckhouse = 2.70 × 34.85 = 94.0 (〃)
$\sum(h'' \times l)$ = 408.4

A = 1,784.4 + 408.4 = 2,192 (fraction omitted)
$W^{2/3} = 253{,}800^{2/3}$ = 4,009
(whole number rounded to nearest)

$2.0hB$ = 2.0 × 19.30 × 48.20 = 1,861 (〃)
+) $0.1A$ = 0.1 × 2,192 = 219 (〃)
Equipment number = 6,089

EFFECTIVE DATE AND APPLICATION (Amendment 1-3)

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

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

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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:

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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.

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Note:
This Procedural Requirement applies from 1 July 2009.