RUSSIAN MARITIME REGISTER OF SHIPPING

URGENT RULE CHANGE NOTICE No. 311-05-2029 dated 27.08.2024

Entry-into-force date:
From the date of publication

Re: amendments to the Rules for the Classification and Construction of Sea-Going Ships, ND No. 2-020101-174-E (Part III "Equipment, Arrangements and Outfit").

The amendments have been introduced resulting from the entry into force of IACS Unified Requirement S21 (Rev.5 May 2023) concerning evaluation of scantlings of hatch covers, hatch coamings and closing arrangements of cargo holds of ships.

Instructions on application:

Apply the provisions of this notice during review and approval of the technical documentation on ships contracted for construction or conversion on or after 01.07.2024, in the absence of a contract, on ships, during review and approval of the technical documentation on ships, requested for review on or after 01.07.2024.

Director General Sergey A. Kulikov

Person in charge: Dmitry V. Kalinkin 311 +7(812) 312-11-00

AMENDMENTS
TO THE RULES FOR THE CLASSIFICATION AMD CONSTRUCTION OF SEA-GOING SHIPS

REVISION HISTORY

PART III. EQUIPMENT, ARRANGEMENTS AND OUTFIT (01.07.2024)

Item	Applied to	Description	Remarks
Chapter 7.10	Ships Hatchways of dry cargo holds	Chapter has been amended in accordance with the effective revision of the IACS unified requirement	IACS UR S21 (Rev.5 May 2023) **Entry-into-force date: 27.08.2024**
Chapter 7.13 (deleted)	Bulk carriers, ore carriers and combination carriers Cargo hatch covers	Requirements transferred to Chapter 7.10 in accordance with the effective revision of the IACS unified requirement have been deleted. Existing Chapters 7.14 and 7.15 have been renumbered 7.13 and 7.14 accordingly	IACS UR S21 (Rev.5 May 2023) **Entry-into-force date: 27.08.2024**

PART III. EQUIPMENT, ARRANGEMENTS AND OUTFIT

7 OPENINGS IN HULL, SUPERSTRUCTURES AND DECKHOUSES AND THEIR CLOSING APPLIANCES

7.10 HATCHWAYS OF DRY CARGO HOLDS

Chapter 7.10 is replaced by the following text:

"**7.10.1 General.**

The deck openings through which cargoes or ship's stores are loaded and unloaded shall be protected by strong hatchways. If these hatchways are situated in positions 1 and 2, the hatchway covers shall be weathertight. The tightness shall be provided by one of the following two methods:

.1 by portable covers and tarpaulins as well as battening devices;

.2 by weathertight covers made of steel or other equivalent material fitted with rubber or other suitable gaskets and clamping devices.

The requirements of this Chapter are applicable to all cargo hatch covers and coamings on exposed decks depending on the specific ship types as categorized below:

Type-1 ships, including all ships except bulk carriers, self-unloading bulk carriers, ore carriers and combination carriers;

Type-2 ships, including all bulk carriers, self-unloading bulk carriers, ore carriers and combination carriers.

The requirements of this Chapter do not apply to bulk carriers of 90 m in length and above, contracted for construction on or after 1 July 2015. The requirements for design of cargo hatch covers are regulated by the Common Structural Rules.

The requirements of this Chapter do not apply to portable covers secured weathertight by tarpaulins and battening devices, as defined in 3.2.4 of the Guidelines on Application of Provisions of the International Convention on Load Lines (LL-66/88).

The requirements of this Chapter do not apply to sea coastal ships in restricted areas **RN(SCI)** and **RN(SCII)**. The requirements for design of cargo hatch covers are regulated in 26.2.2.6 of Part XVII "Distinguishing Marks and Descriptive Notations in the Class Notation Specifying Structural and Operational Particulars of Ships".

7.10.2.1 The height of hatchway coamings in positions 1 and 2 shall be at least 600 mm and 450 mm, respectively.

If the length of the ship is less than 24 m, the height of the coamings may be reduced down to 380 mm for ships of restricted area of navigation **R2**, **R2-RSN**, **R2-RSN(4,5)** and **R3-RSN** and down to 300 mm for ships of restricted area of navigation **R3**.

In ships of restricted area of navigation **R3** having the length of 24 m and over (except passenger ships) the specified height of cargo hatchway coamings may be reduced from 600 mm down to 450 mm and from 450 mm down to 380 mm, respectively.

In fishing vessels, the height of cargo hatchway coamings in position 2 may be reduced down to 300 mm.

7.10.2.2 The height of hatchway coamings specified in 7.10.1.2 may be reduced as compared to that required by 7.10.2.1or the coamings may be omitted entirely provided that the cover tightness and securing means are found efficient and the following is submitted:

for hatches that are closed at sea — technical background containing operational limitations considering designation and nature of hatch application;

for hatches that may be open at sea — technical background containing assessment of seaworthiness and deck flooding as well as confirmation that the safety of the ship is provided at any sea condition in accordance with the designated area of navigation.

7.10.3 Materials.

7.10.3.1 For steel of top plate, bottom plate and primary supporting members (PSM), refer to 1.6.

7.10.3.2 The wood of hatchway covers shall be of good quality and of the type and grade which proved to be satisfactory for this purpose. Wedges shall be of hard wood.

7.10.3.3 Canvas used for making tarpaulins shall be impregnated to make them moisture-resistant and shall not contain jute thread. Mass of 1 m^2 of canvas before impregnation shall be not less than 0,55 kg. Breaking stress of impregnated canvas band 200×50 mm in size shall be at least 3 kN and 2 kN in longitudinal and transverse directions, respectively. When tested for watertightness, the impregnated canvas shall not get wet under water head of 0,15 m acting for 24 h.

7.10.3.4 The rubber for packing gaskets of hatchway covers shall be elastic, strong, and resistant to atmospheric changes. The rubber shall be of sufficient hardness.

7.10.3.5 All internal and external surfaces of steel hatch covers in bulk carriers (except inaccessible spaces in box type covers) shall have effective epoxy or other equivalent protective coating applied in accordance with the recommendations of the manufacturer (refer to 1.1.4.7 and 3.3.5.1 of Part II "Hull").

7.10.4 Design loads.

Hatchway covers shall be designed to sustain deck cargoes which are intended to be carried on these covers. Where operation of the cargo handling cars on hatchways covers is anticipated in the course of the ship's service, during cargo handling operations, the loads induced by such cars shall be taken into consideration. For hatchway covers in positions 1 and 2 the design load shall be calculated in accordance with 3.2.5.2 of the Guidelines on Application of Provisions of the International Convention on Load Lines (LL-66/88) or 3.2.5.2 of the Load Line Rules for Sea-Going Ships; design of hatch covers shall comply with the requirements of 3.2.5.3 — 3.2.5.5 of the above-stated documents, as applicable.

For ships of less than 24 m in length of restricted area of navigation engaged on international voyages and for all ships of restricted area of navigation not engaged on international voyages the load intensity reduced by the following values may be used instead of load intensity specified in 3.2.5.2 of the Load Line Rules for Sea-Going Ships:

15 % for ships of restricted areas of navigation **R2**, **R2-RSN**, **R2-RSN(4,5)** and **R3-RSN**;

30 % for ships of restricted areas of navigation **R3**.

7.10.5 Design of hatch covers specified in 7.10.1.1.

7.10.5.1 Design of these hatch covers shall meet the requirements of 3.2.4 of the Guidelines on Application of Provisions of the International Convention on Load Lines (LL-66/88) or 3.2.4 of the Load Line Rules for Sea-Going Ships.

7.10.6 Structure of hatch covers indicated in 7.10.1.2.

7.10.6.1 Structure of these covers shall meet the requirements of 3.2.5 of the Guidelines on Application of Provisions of the International Convention on Load Lines (LL-66/88) or 3.2.5 of the Load Line Rules for Sea-Going Ships.

7.10.6.2 Primary supporting members and stiffeners of hatch covers shall be continuous over the breadth and length of hatch covers, as far as practical. When this is impractical, sniped end connections shall not be used and appropriate arrangements shall be adopted to provide sufficient load carrying capacity.

7.10.6.3 The spacing of primary supporting members parallel to the direction of stiffeners shall not exceed 1/3 of the span of primary supporting members. If sufficient strength based on finite element (FE) analysis can be verified, this requirement may be waived.

Stiffeners of hatch coamings shall be continuous over the breadth and length of hatch coamings.

7.10.6.4 Unless otherwise quoted, the thickness t of the following sections is the net thickness.

Net thickness is the member thickness necessary to obtain the minimum net scantlings. The required gross thicknesses are obtained by adding corrosion additions t_s given in Table 7.10.6.44. Strength calculations using FEM shall be performed with net scantlings.

7.10.6.5 Structural assessment of hatch covers and hatch coamings shall be carried out using the design loads, defined in this Chapter and the following definitions shall be used:

L — length of ship, in m, as defined in 1.1.3 of Part II "Hull";

L_{LL} — length of ship, in m, as defined in this Part;

x — longitudinal coordinate of midpoint of assessed structural member measured from aft end of length L or L_{LL}, as applicable;

$D_{\min}$ — the least moulded depth, in m, as defined in 1.2.1 of the Load Line Rules for Sea-Going Ships;

h_N — standard superstructure height, in m,

$h_N = 1{,}05 + 0{,}01L_{LL}$, and $1{,}8 \leq h_N \leq 2{,}3$.

7.10.6.6 The pressure P_{HC}, in kN/m^2, on the hatch cover panels is given in Table 7.10.6.6. The vertical weather design load needs not to be combined with cargo loads. In Fig. 7.10.6.6 positions 1 and 2 are illustrated for an example ship.

Table 7.10.6.6

Design load P_{HC} of weather deck hatches

Position	Design load P_{HC}, in kN/m^2	
	$x/L_{LL} \leq 0{,}75$	$0{,}75 < x/L_{LL} \leq 1{,}0$
1	for 24 m $\leq L_{LL} \leq$100 m	
	$\frac{9{,}81}{76}(1{,}5L_{LL} + 116)$	on freeboard deck: $\frac{9{,}81}{76}\left[(4{,}28L_{LL} + 28)\frac{x}{L_{LL}} - 1{,}71L_{LL} + 95\right]$ upon exposed superstructure decks located at least one superstructure standard height above the freeboard deck: $\frac{9{,}81}{76}(1{,}5L_{LL} + 116)$
	for $L_{LL} >$ 100 m	
	9,81 × 3,5	on freeboard deck for type B ships according to LL-66/88: $9{,}81\left[(0{,}0296L_1 + 3{,}04)\frac{x}{L_{LL}} - 0{,}0222L_1 + 1{,}22\right]$ on freeboard deck for ships with less freeboard than type B according to LL-66/88: $9{,}81\left[(0{,}1452L_1 + 8{,}52)\frac{x}{L_{LL}} - 0{,}1089L_1 + 9{,}89\right]$ $L_1 = L_{LL}$ but not more than 340 m upon exposed superstructure decks located at least on superstructure standard height above the freeboard deck: 9,81 × 3,5
2	for 24 m $\leq L_{LL} \leq$ 100 m	
	$\frac{9{,}81}{76}(1{,}1L_{LL} + 87{,}6)$	
	for $L_{LL} >$ 100 m	
	9,81 × 2,6 upon exposed superstructure decks located at least one superstructure standard height above the lowest position 2 deck: 9,81 × 2,1	

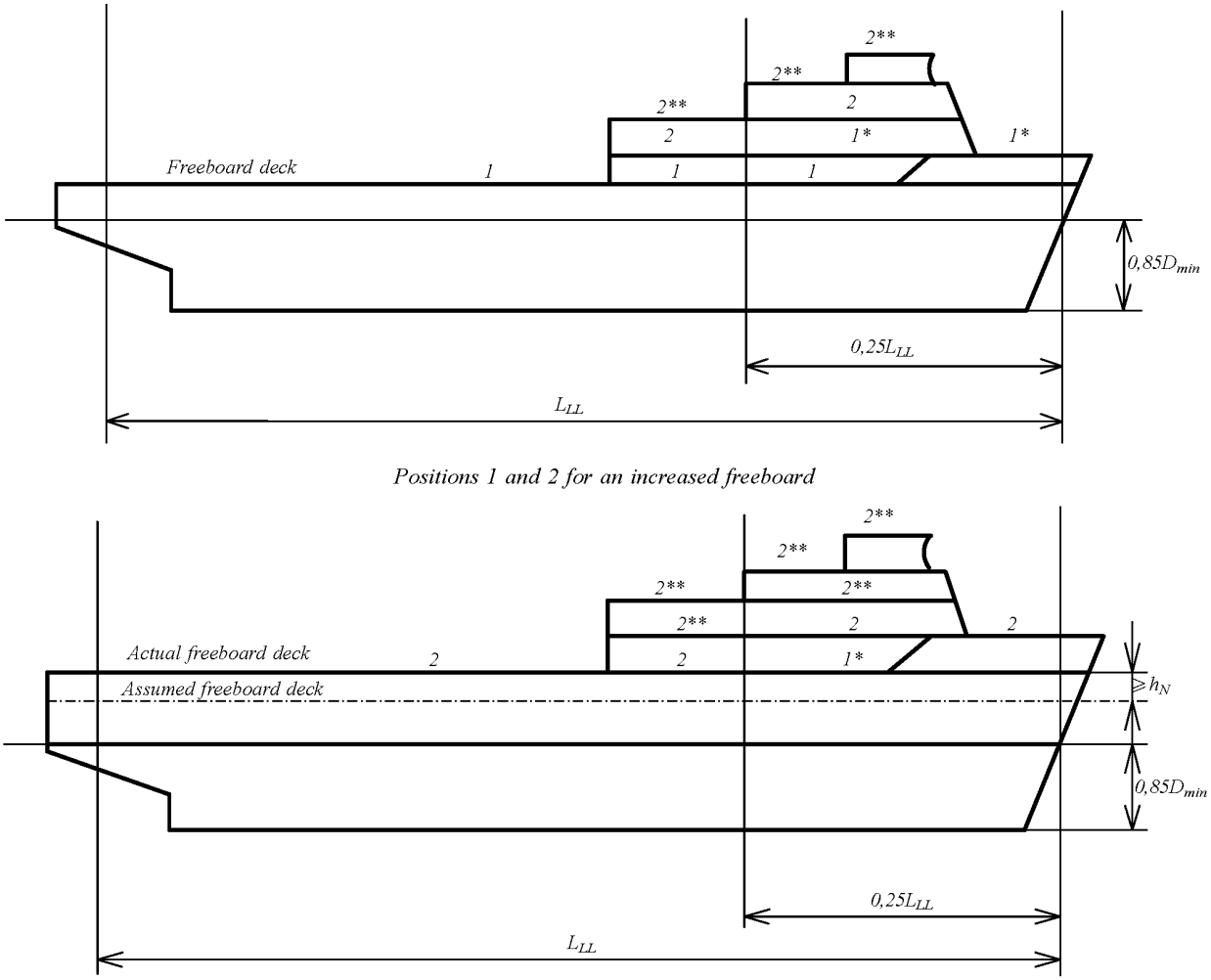


Fig. 7.10.6.6

*Reduced load upon exposed superstructure decks located at least one superstructure standard height above the freeboard deck.

**Reduced load upon exposed superstructure decks of ships with L_{LL} > 100 m located at least one superstructure standard height above the lowest position 2 deck.

7.10.6.7 Where an increased freeboard is assigned, the design load for hatch covers according to Table 7.10.6.6 on the actual freeboard deck may be as required for a superstructure deck, provided the summer freeboard is such that the resulting draught will not be greater than that corresponding to the minimum freeboard calculated from an assumed freeboard deck situated at a distance at least equal to the standard superstructure height h_N below the actual freeboard deck (refer to Fig. 7.10.6.6).

7.10.6.8 The horizontal weather design load P_A, in kN/m^2, for determining the scantlings of outer edge girders (skirt plates) of weather deck hatch covers and of hatch coamings shall be determined by the formula

$$P_A = f_n f_c (f_b c_L C_w - z) \qquad (7.10.6.8)$$

where

$C_w = L/25 + 4{,}1$ for $L < 90$ m;

$C_w = 10{,}75 - \left(\frac{300-L}{100}\right)^{1,5}$ for 90 m $\leq L <$ 300 m;

$C_w = 10{,}75$ for 300 m $\leq L <$ 350 m;

$C_w = 10{,}75 - \left(\frac{L-350}{150}\right)^{1,5}$ for 350 m $\leq L \leq$ 500 m;

$c_L = \sqrt{L/90}$ for $L < 90$ m;

$c_L = 1$ for $L \geq 90$ m;

$f_n = 20 + L_1/12$ for unprotected front coamings and hatch cover skirt plates;

$f_n = 10 + L_1/12$ 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 LL-66/88 by at least one standard superstructure height h_N;

$f_n = 5 + L_1/15$ for side and protected front coamings and hatch cover skirt plates;

$f_n = 7 + L_1/100 - 8x'/L$ for aft ends of coamings and aft hatch cover skirt plates abaft amidships;

$f_n = 5 + L_1/100 - 4x'/L$ for aft ends of coamings and aft hatch cover skirt plates forward of amidships;

$L_1 = L$, need not be taken greater than 300 m;

$f_b = 1{,}0 + \left(\frac{x'/L - 0.45}{C_B + 0{,}2}\right)^2$ for $x'/L < 0{,}45$;

$f_b = 1{,}0 + 1{,}5\left(\frac{x'/L - 0.45}{C_B + 0{,}2}\right)^2$ for $x'/L \geq 0{,}45$

where $0{,}6 \leq C_B \leq 0{,}8$ when determining scantlings of aft ends of coamings and aft hatch cover skirt plates forward of amidships; C_B need not be taken less than 0,8;

x' = distance, in m, between the transverse coaming or hatch cover skirt plate considered and aft end of the length L. When determining side coamings or side hatch cover skirt plates, the side shall be subdivided into parts of approximately equal length, not exceeding $0{,}15L$ each, and x' shall be taken as the distance between aft end of the length L and the centre of each part considered;

z = vertical distance, in m, from the summer load line to the midpoint of stiffener span, or to the middle of the plate field;

$$f_c = 0{,}3 + 0{,}7\frac{b'}{B'}$$

where b' = breadth of coaming, in m, at the position considered;

B' = actual maximum breadth of ship, in m, on the exposed weather deck at the position considered;

b'/B' shall not be taken less than 0,25.

The design load P_A shall not be taken less than the minimum values given in Table 7.10.6.8.

Table 7.10.6.8

Minimum design load $P_{A\,\min}$

L	$P_{A\,\min}$, in kN/m², for	
	unprotected fronts	elsewhere
≤ 50	30	15
> 50	$25 + \frac{L}{10}$	$12{,}5 + \frac{L}{20}$
< 250		
≥ 250	50	25

7.10.6.9 Horizontal weather design load applicable to coamings of Type-2 ships is taken as stated below.

The pressure P_{Coam}, in kN/m², on the No. 1 forward transverse hatch coaming is given by:

$P_{Coam} = 220$, when a forecastle is fitted in accordance with 3.3.5.4 of Part II "Hull" and the current version[1] of IACS UR S28;

$P_{Coam} = 290$ in the other cases.

The pressure P_{Coam}, in kN/m², on the other coamings is given by:

$P_{Coam} = 220$.

Note. The horizontal weather design loads P_A and P_{Coam}need not be included in the direct strength calculation of the hatch cover, unless it is utilized for the design of substructures of horizontal support according to 7.10.6.51.

[1] That is effective on the date of this version of the Rules.

7.10.6.10 The load on hatch covers due to distributed cargo loads P_L, in kN/m^2, resulting from heave and pitch (i.e. ship in upright condition) shall be determined according to the following formula:

$$P_L = P_{Cargo}(1 + a_V) \qquad (7.10.6.10)$$

where P_{Cargo} = uniform cargo hold, in kN/m^2;
a_V = vertical acceleration addition as follows:

$$a_V = F \cdot m$$

where $F = 0{,}11\frac{v_0}{\sqrt{L}}$;

$m = m_0 - 5(m_0 - 1)\frac{x}{L}$ for $0 \le x/L \le 0{,}2$;

$m = 1$ for $0{,}2 < x/L \le 0{,}7$;

$m = 1 + \frac{m_0+1}{0{,}3}\left(\frac{x}{L} - 0{,}7\right)$ for $0{,}7 < x/L \le 1{,}0$

where $m_0 = 1{,}5 + F$;
v_0 = maximum speed at summer load line draught;
v_0 shall not be taken less than $\sqrt{L}$, in knots.

7.10.6.11 The load P, in kN, due to a concentrated force P_S, in kN, except for container load, resulting from heave and pitch (i.e. ship in upright condition) shall be determined as follows:

$$P = P_S(1 + a_V). \qquad (7.10.6.11)$$

7.10.6.12 The loads defined in 7.10.6.12.1 shall be applied where containers are stowed on the hatch cover.

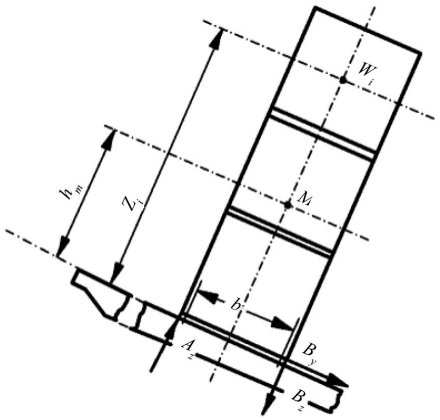


Fig. 7.10.6.12
Forces due to container loads

7.10.6.12.1 The load P, in kN, applied at each corner of a container stack, and resulting from heave and pitch (i.e. ship in upright condition) shall be determined as follows:

$$P = 9{,}81\frac{M}{4}(1 + a_V) \qquad (7.10.6.12.1)$$

where a_V = vertical acceleration addition according to 7.10.6.10;
M = maximum designed mass of container stack, in t.

7.10.6.12.2 The loads, in kN, applied at each corner of a container stack, and resulting from heave, pitch, and the ship's rolling motion (i.e. ship in heel condition) shall be determined as follows (refer also to Fig. 7.10.6.12):

$$A_z = 9{,}81\frac{M}{2}(1 + a_V)\left(0{,}45 - 0{,}42\frac{h_m}{b}\right); \qquad (7.10.6.12.2\text{-}1)$$

$$B_z = 9{,}81\frac{M}{2}(1 + a_V)\left(0{,}45 + 0{,}42\frac{h_m}{b}\right); \qquad (7.10.6.12.2\text{-}2)$$

$$B_y = 2{,}4M \qquad (7.10.6.12.2\text{-}3)$$

where a_V = vertical acceleration addition according to 7.10.6.10;
M = maximum designed mass of container stack, in t;
h_m = designed height of centre of gravity of stack above hatch cover top, in m, may be calculated as weighted mean value of the stack, where the centre of gravity of each tier is assumed to be located at the centre of each container,
$h_m = \Sigma(z_i \cdot W_i)/M$;
z_i = distance from hatch cover top to the centre of i-th container, in m;
W_i = weight of i-th container, in t;
b = distance between midpoints of foot points, in m, refer to Fig. 7.10.6.12;
A_z, B_z = support forces in z-direction at the forward and aft stack corners;
B_y = support force in y-direction at the forward and aft stack corners.

Values of A_z and B_z applied for the assessment of hatch cover strength shall be shown in the drawings of the hatch covers.

N o t e . It is recommended that container loads as calculated above are considered as limit for foot point loads of container stacks in the calculations of cargo securing (container lashing).

7.10.6.13 The load cases defined in 7.10.6.12.1 and 7.10.6.12.2 shall also be considered for partial non homogeneous loading which may occur in practice, e.g. where specified container stack places are empty. For each hatch cover, the heel directions, as shown in Table 7.10.6.13.

The load case partial loading of container hatch covers can be evaluated using a simplified approach, where the hatch cover is loaded without the outermost stacks that are located completely on the hatch cover. If there are additional stacks that are supported partially by the hatch cover and partially by container stanchions then the loads from these stacks shall also be neglected, refer to Table 7.10.6.13.

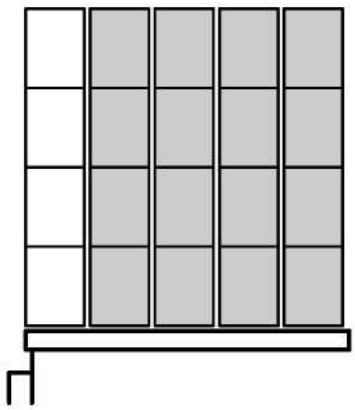
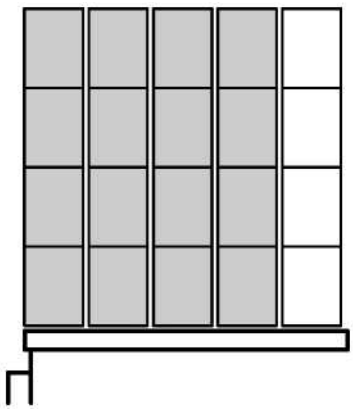
In addition, the case where only the stack places supported partially by the hatch cover and partially by container stanchions are left empty shall be assessed in order to consider the maximum loads in the vertical hatch cover supports.

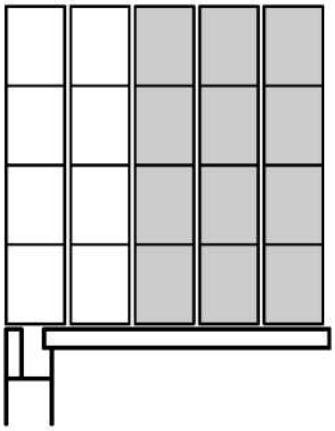
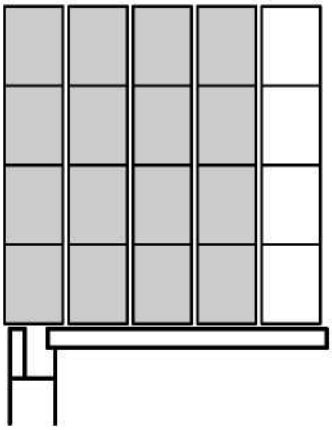
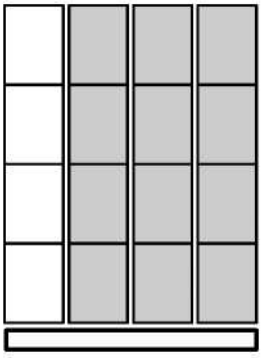
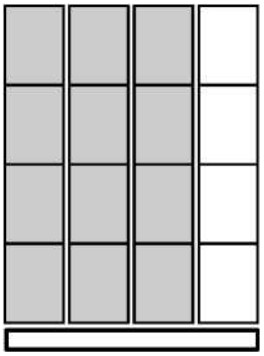
It may be necessary also to consider partial load cases where more or different container stack places are left empty.

In the case of mixed stowage (20' + 40' container combined stack), the foot point forces at the fore and aft end of the hatch cover shall not be higher than resulting from the design stack weight for 40' containers, and the foot point forces at the middle of the cover shall not be higher than resulting from the design stack weight for 20' containers.

T a b l e 7.10.6.13

Partial loading of container hatch covers

Heel direction	←	→
Hatch covers supported by the longitudinal hatch coaming with all container stacks located completely on the hatch cover		

Heel direction	←	→
Hatch covers supported by the longitudinal hatch coaming with the outermost container stack supported partially by the hatch cover and partially by container stanchions		
Hatch covers not supported by the longitudinal hatch coaming (center hatch covers)		

7.10.6.14 Hatch covers, which in addition to the loads according to 7.10.6.6, 7.10.6.7 and 7.10.6.12 are loaded in the ship's transverse direction by forces due to elastic deformations of the ship's hull, shall be designed such that the sum of stresses does not exceed the permissible values given in 7.10.6.15.

7.10.6.15 Yield strength of all hatch cover structural members shall comply with the following formulae:

$\sigma_{vm} \leq \sigma_a$ for shell elements in general;

$\sigma_{axial} \leq \sigma_a$ for rod or beam elements in general

where σ_a = allowable stress as defined in Table 7.10.6.15;
R_{eH} = specified minimum yield stress, in N/mm², of the material;

σ_{vm} = Von Mises stress, in N/mm², to be taken as follows:

$$\sigma_{vm} = \sqrt{\sigma_x^2 - \sigma_x \cdot \sigma_y + \sigma_y^2 + 3\tau_{xy}^2}, \text{ in N/mm}^2 \qquad (7.10.6.15)$$

where σ_x = normal stress, in N/mm², in x-direction;
σ_y = normal stress, in N/mm², in y plane;
τ_{xy} = shear stress, in N/mm², in the x-y plane;
σ_{axial} = axial stress in rod or beam elements, in N/mm²;
Indices x and y are coordinates of a two-dimensional Cartesian system in the plane of the considered structural element.

In case of FEM calculations using shell (or plate) strain elements, the stresses shall be read from the centre of the individual element. It shall be observed that, in particular, at flanges of unsymmetrical girders, the evaluation of stress from element centre may lead to non-conservative results. Thus, a sufficiently fine mesh shall be applied in these cases or, the stress at the element

edges shall not exceed the allowable stress. Where shell elements are used, the stresses shall be evaluated at the mid plane of the element.

For steels with a minimum yield stress of more than 355 N/mm^2, the value of R_{eH} shall be taken in accordance with 3.13.7 of Part III "Materials".

Table 7.10.6.15

Allowable stresses

Members of	Subject to	σ_a, in N/mm^2
Hatch cover structure	External pressure, as defined in 7.10.6.6	$0{,}80\ R_{eH}$
	Other loads, as defined in 7.10.6.8 —7.10.6.14	$0{,}90\ R_{eH}$ for static + dynamic load case $0{,}72\ R_{eH}$ for static load case

7.10.6.16 The vertical deflection of primary supporting members due to the vertical weather design load according to 7.10.6.6 and 7.10.6.7 shall not be more than $0{,}0056 l_g$ where l_g — is the greatest span of primary supporting members.

Note. Where hatch covers are arranged for carrying containers and mixed stowage is allowed, i.e. a 40' container stowed on top of two 20' containers, particular attention shall be paid to the deflections of hatch covers. Further the possible contact of deflected hatch covers within hold cargo shall be observed.

7.10.6.17 The local net plate thickness t, in mm, of the hatch cover top plating shall not be less than:

$$t = 0{,}0158\ F_p s \sqrt{\frac{P}{0{,}95 R_{eH}}} \qquad (7.10.6.17)$$

and shall not be less than 1 % of the spacing of the stiffener or 6 mm if that be greater

where F_p = 1,5 in general;
F_p = 1,9 σ/σ_a, for $\sigma/\sigma_a \geq 0{,}8$ for the attached plate flange of primary supporting members;
s = stiffener spacing, in mm;
P = pressure P_{HC} and P_L, in kN/m^2, as defined in 7.10.6.6 and 7.10.6.10;
σ = maximum normal stress, in N/mm^2, of hatch cover top plating, determined according to Fig. 7.10.6.17;
σ_a = as defined in Table 7.10.6.15.

For flange plates under compression sufficient buckling strength according to 7.10.6.25 shall be demonstrated.

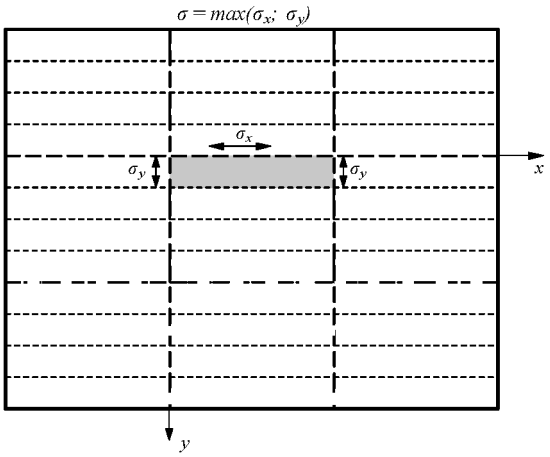


Fig. 7.10.6.17

7.10.6.18 The thickness of lower plating of double skin hatch covers and box girders shall fulfill the strength requirements and shall be obtained from the calculation according to 7.10.6.22 under consideration of permissible stresses according to 7.10.6.15. When the lower plating is taken into account as a strength member of the hatch cover, the net thickness, in mm, of lower plating shall be taken not less than 5 mm. When project cargo is intended to be carried on a hatch cover, the net thickness shall not be less than:

$$t = 6{,}5s \times 10^{-3}, \text{ in mm} \qquad (7.10.6.18)$$

where s = stiffener spacing, in mm.

N o t e . Project cargo means especially large or bulky cargo lashed to the hatch cover. Examples are parts of cranes or wind power stations, turbines, etc. Cargoes that can be considered as uniformly distributed over the hatch cover, e.g. timber, pipes or steel coils need not to be considered as project cargo.

7.10.6.19 The net section modulus Z and net shear area A_{shr} of uniformly loaded hatch cover stiffeners constraints at both ends shall not be less than:

$$Z = \frac{Psl^2}{f_{bc}\sigma_a}, \text{ in cm}^3, \qquad (7.10.6.19\text{-}1)$$

$$A_{shr} = \frac{8{,}7Psl}{\sigma_a}, \text{ in cm}^2 \qquad (7.10.6.19\text{-}2)$$

where l = stiffener span, in m, to be taken as the spacing, in m, of primary supporting members or the distance between a primary supporting member and the edge support, as applicable. When brackets are fitted at both ends of all stiffener spans, the secondary stiffener span may be reduced by an amount equal to 2/3 of the minimum brackets arm length, but not greater than 10 % of the unsupported span, for each bracket;

s = stiffener spacing, in mm;

P = pressure P_{HC} and P_L, in kN/m^2, as defined in 7.10.6.6 and 7.10.6.10;

f_{bc} = boundary coefficient of stiffener, taken equal to:

$f_{bc} = 8$, in the case of stiffener simply supported at both ends or simply supported at one end and clamped at the other end;

$f_{bc} = 12$, in the case of stiffener clamped at both ends;

σ_a = allowable stress as defined in Table 7.10.6.15.

For stiffeners of lower plating of double skin hatch covers, requirements mentioned above are not applied due to the absence of lateral loads.

The net thickness, in mm, of the stiffener (except U-type/trapeze stiffeners) web shall be taken not less than 4 mm.

The net section modulus of the stiffeners shall be determined based on and attached plate width assumed equal to the stiffener spacing.

Stiffeners parallel to primary supporting members shall be continuous at crossing primary supporting member and may be regarded for calculating the cross-sectional properties of primary supporting members. It shall be verified that the combined stress of those stiffeners induced by the bending of primary supporting members and lateral pressures does not exceed the permissible stresses according to 7.10.6.15. These requirements are not applied to stiffeners of lower plating of double skin hatch covers if the lower plating is not considered as strength member.

For hatch cover stiffeners under compression sufficient safety against lateral and torsional buckling according to 7.10.6.24.3 shall be verified.

For hatch covers subject to wheel loading or point loads stiffener scantlings shall be determined under consideration of the permissible stresses according to 7.10.6.15.

7.10.6.20 Scantlings of primary supporting members are obtained from calculations according to 7.10.6.23 and 7.10.6.24 under consideration of permissible stresses according to 7.10.6.15.

For all components of primary supporting members sufficient safety against buckling shall be verified according to 7.10.6.24.3.

The net thickness, in mm, of webs of primary supporting members shall not be less than:

$t = 6{,}5\ s \times 10^{-3}$, in mm; (7.10.6.20)

$t_{\min} = 5$ mm

where s = stiffener spacing, in mm.

7.10.6.21 Scantlings of edge girders are obtained from the calculations according to 7.10.6.23 and 7.10.6.24 under consideration of permissible stresses according to 7.10.6.15.

The net thickness, in mm, of the outer edge girders exposed to wash of sea shall not be less than the largest of the following values:

$$t = 0{,}0158s\sqrt{\frac{P_A}{0{,}95R_{eH}}}; \quad (7.10.6.21\text{-}1)$$

$t = 8{,}5\ s \times 10^{-3}$, in mm;

$t_{\min} = 5$ mm

where P_A = horizontal pressure as defined in 7.10.6.8;
s = stiffener spacing, in mm.

The moment of inertia I, in cm^4, of edge girders shall not be less than:

$I = 6qS_{SD}^4$, in cm^4 (7.10.6.21-2)

where q = packing line pressure, in N/mm, minimum 5 N/mm;
S_{SD} = spacing of securing devices, in m, not to be taken less than 2 m.

7.10.6.22 The stresses in hatch covers are to be determined by FE analysis.

The stress calculation model in 7.10.6.23 shall be used for both yielding and buckling strength assessments in accordance with 7.10.6.15 and 7.10.6.24, respectively.

The net scantlings as defined in 7.10.6.4 shall be used.

7.10.6.23 General requirements for calculations by means of finite element method (FEM calculations).

For the strength assessments of hatch covers by means of FE analysis, the hatch cover geometry shall be idealized as realistically as possible. In no case shall element width be larger than stiffener spacing. In way of force transfer points and cutouts the mesh shall be refined where applicable. The ratio of element length to width shall not exceed 3.

The element size along the height of webs of primary supporting member shall not exceed one-third of the web height. Stiffeners, which support plates subjected to lateral pressure loads, shall be included in the FE model idealization. Stiffeners may be modelled by using beam elements, or shell/plate elements. Buckling stiffeners may be disregarded for the stress calculation.

Hatch covers fitted with U-type stiffeners as shown in Fig. 7.10.6.23 shall be assessed by means of FE analysis. The geometry of the U-type stiffeners shall be accurately modelled using shell/plate elements. Nodal points shall be properly placed on the intersections between the webs of a U-type stiffener and the hatch cover plate, and between the webs and flange of the U-type stiffener.

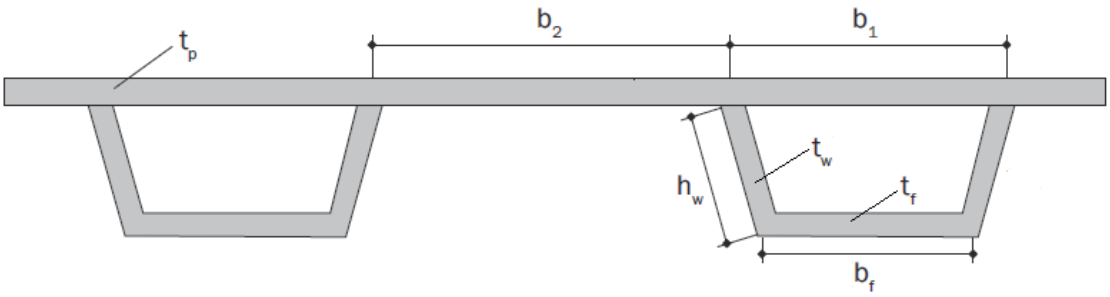


Fig. 7.10.6.23
Example of hatch cover fitted with U-type stiffeners

Wherever applicable the following boundary conditions shall be applied to the FE model:

boundary nodes in way of a bearing pad on the hatch coamings shall be fixed against displacement in the direction perpendicular to the pad;

lifting stoppers shall be fixed against displacements in the direction determined by the stoppers;

for a folding type hatch cover, the FE nodes connected through a hinge shall have the same translational displacement in the direction perpendicular to the hatch cover top plating.

7.10.6.24 Buckling strength of hatch cover structures.

7.10.6.24.1 General.

Buckling strength of all hatch cover structures shall be checked. Buckling assessments shall be performed in compliance with the requirements in IACS UR S35 for the conditions specified in 7.10.6.24.2 and 7.10.6.24.3.

The net scantlings as defined in 7.10.6.4 shall be used for buckling check.

7.10.6.24.2 Slenderness requirements.

The slenderness requirements shall be in accordance with those specified in Section 2 of IACS UR S35.

The slenderness requirements need not be applied to the lower boundary of double skin hatch covers unless the cargo hold is designed for carriage of ballast or liquid cargo.

The breadth of the primary supporting member flange shall be not less than 40 % of its depth for laterally unsupported spans greater than 3,0 m. Tripping brackets attached to the flange may be considered as a lateral support for primary supporting members.

7.10.6.24.3 Buckling requirements.

7.10.6.24.3.1 These requirements apply to the buckling assessment of hatch cover structures subjected to compressive and shear stresses and lateral pressures. The buckling assessment shall be performed for the following structural elements:

stiffened and unstiffened panels, including curved panels and panels stiffened with U-type stiffeners;

web panels of primary supporting members in way of openings.

The panel types and assessment methods, the applied lateral pressure and stresses, safety factors and buckling check criteria are defined in 7.10.6.24.3.2 — 7.10.6.24.3.5, respectively. The procedure and detailed requirements for buckling assessment are given in Section 4 of IACS UR S35.

7.10.6.24.3.2 Panel types and assessment methods.

The plate panel of a hatch cover structure shall be modelled as stiffened panel (SP) or unstiffened panel (UP) as defined in Section 4 of IACS UR S35. Assessment Method A (-A) and Method B (-B) as defined in Section 1 of IACS UR S35, shall be used in accordance with Table 7.10.6.24.3.2, Figs. 7.10.6.24.3.2-1 and 7.10.6.24.3.2-2. For a web panel with opening, the procedure for opening should be used for its buckling assessment.

For a hatch cover fitted with U-type stiffeners, the additional buckling assessment requirements specific for panels with U-type stiffeners in Section 5 of IACS UR S35 shall also be followed.

Table 7.10.6.24.3.2

Structural members and assessment methods

Structural elements	Assessment method[1, 2]	Normal panel definition
Hatch cover top/bottom plating structures, refer to Fig. 7.10.6.24.3.2-1		
Hatch cover top/bottom plating	SP-A	Length: between transverse girders Width: between longitudinal girders
Irregularly stiffened panels	UP-B	Plate between local stiffeners/PSM
Hatch cover web panels of primary supporting members, refer to Fig. 7.10.6.24.3.2-2		
Web of transverse/longitudinal girder (single skin type)	UP-B	Plate between local stiffeners/face plate/PSM
Web of transverse/longitudinal girder (double skin type)	SP-B[3]	Length: between PSM Width: full web depth
Web panel with opening	Procedure for opening	Plate between local stiffeners/face plate /PSM
Irregularly stiffened panels	UP-B	Plate between local stiffeners/face plate /PSM

[1]SP and UP stand for stiffened and unstiffened panel respectively.
[2]A and B stand for Method A and Method B respectively.
[3] In case that the buckling carlings/brackets are irregularly arranged in the web of transverse/longitudinal girder, UP-B method may be used.

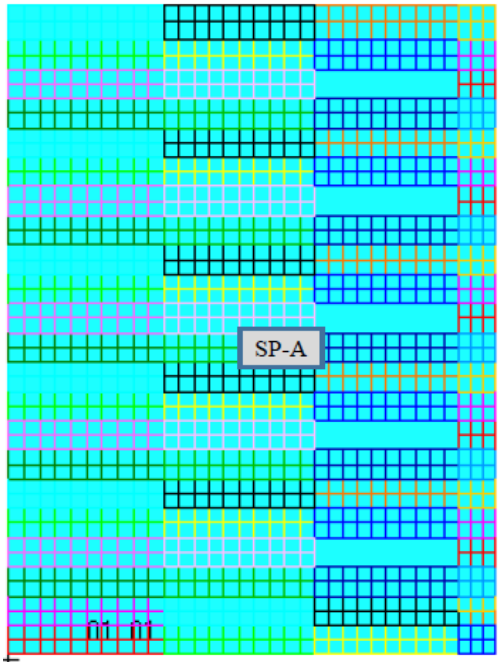


Fig. 7.10.6.24.3.2-1
Hatch cover top/bottom plating structures

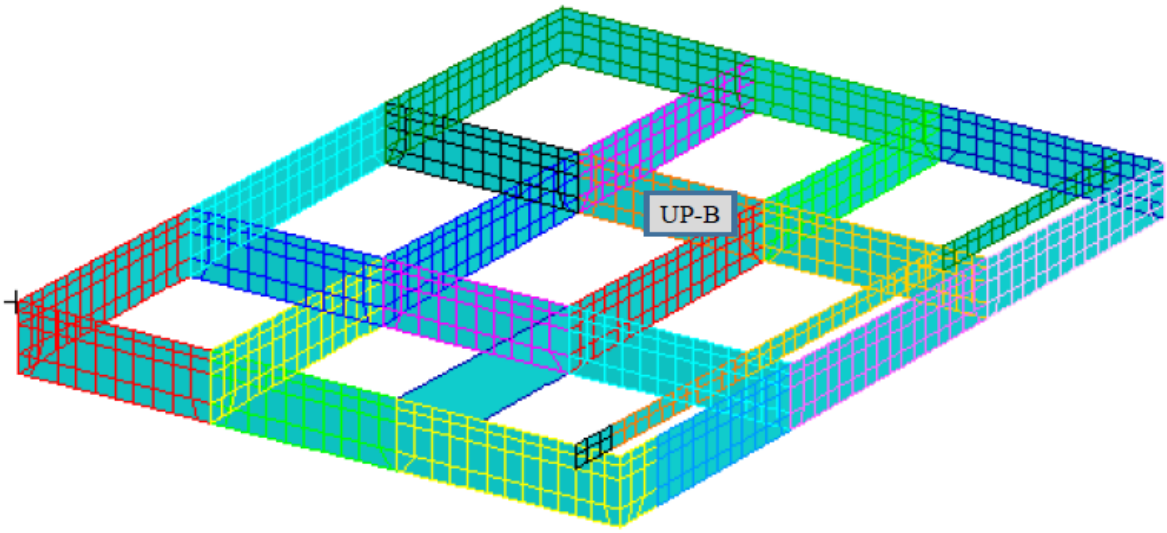


Fig. 7.10.6.24.3.2-2
Hatch cover webs of primary supporting members

7.10.6.24.3.3 Applied lateral pressure and stresses.

The buckling assessment of hatch covers is based on the lateral pressure as defined in 7.10.6.6, 7.10.6.8 and 7.10.6.9, and stresses obtained from FE analysis.

7.10.6.24.3.4 Safety factors.

For all hatch cover structural members, safety factor S=1,0 shall be applied to both of the plating and stiffener buckling capacity formulas as defined in 2.2 of Section 5 of IACS UR S35and 2.3 of Section 5 of IACS UR S35, respectively.

7.10.6.24.3.5 Buckling acceptance criteria.

A structural member is considered to have an acceptable buckling strength if it satisfies the following criterion:

$$\eta_{act} \leq \eta_{all}$$

where η_{act} = buckling utilisation factor based on the applied stress, as defined in 3.2.2 of Section 1 of IACS UR S35 and in Section 4 of UR S35, and calculated per Section 5 of UR S35;

η_{all} = allowable buckling utilisation factor, taken as given in Table 7.10.6.24.3.5.

Table 7.10.6.24.3.5

Allowable buckling utilisation factors

Structural component	Subject to	Allowable buckling utilisation factor η_{all}
Plates and stiffeners Web of PSM	External pressure, as defined in 7.10.6.6	0,80
	Other loads, as defined in 7.10.6.8 — 7.10.6.14	0,90 for static + dynamic load case 0,72 for static load case

7.10.6.25 Securing and arrangement of containers on the hatch covers shall comply with the Technical Requirements for the Arrangement and Securing of the International Standard Containers on Board the Ships Intended for Container Transportation. Structures under container load shall be calculated according to 7.10.6.5 — 7.10.6.14 using the permissible stresses as per 7.10.6.15.

7.10.6.26 To ensure weather tightness, the requirements of 7.10.6.37 — 7.10.6.43 applicable to hatch covers shall be met.

The packing material of hatch covers gaskets shall be suitable for all expected service conditions of the ship and shall be compatible with the cargoes to be transported. The packing material shall be selected with regard to dimensions and elasticity in such a way that expected deformations can be carried. Forces shall be carried by the steel structure only.

The packings shall be compressed so as to give the necessary tightness effect for all expected operating conditions. Special consideration shall be given to the packing arrangement

in ships with large relative movements between hatch covers and coamings or between hatch cover sections. The specification or grade of the packing material shall be indicated on the drawings.

7.10.6.27 For hatch covers of cargo holds solely for the transport of containers, upon request of the shipowner and subject to compliance with the following conditions the fitting of weather tight gaskets according to 7.10.6.26 may be dispensed with:

the hatchway coamings shall be not less than 600 mm in height;

the exposed deck on which the hatch covers are located is situated above a depth $H(x)$.

$H(x)$ shall be shown to comply with the following criteria:

$$H(x) \geq T_{fb} + f_b + h, \text{ in m} \qquad (7.10.6.27)$$

where T_{fb} = draught, in m, corresponding to the assigned summer load line;

f_b = minimum required freeboard, in m, determined in accordance with regulation 28 of LL-66/88, as amended, where applicable;

$h =$ 4,6 m for $x/L_{LL} \leq 0{,}75$;

$h =$ 6,9 m for $x/L_{LL} > 0{,}75$.

Labyrinths, gutter bars or equivalents shall be fitted proximate to the edges of each panel in way of the coamings. The clear profile of these openings shall be kept as small as possible.

Where a hatch is covered by several hatch cover panels, the clear opening of the gap in between the panels shall be not wider than 50 mm.

The labyrinths and gaps between hatch cover panels shall be considered as unprotected openings with respect to the requirements of intact and damage stability calculations.

Bilge alarms shall be provided in each hold fitted with non-weathertight covers.

Furthermore, Chapter 3 of IMO circular MSC/Circ. 1087 shall be referred to concerning the stowage and segregation of containers containing dangerous goods.

7.10.6.28 Cross-joints of multi-panel covers shall be provided with efficient drainage arrangements.

7.10.6.29 The net thickness of weather deck hatch coamings shall not be less than that determined by the following formulae:

for Type-1 ships:

$$t = 0{,}0142s\sqrt{\frac{P_A}{0{,}95R_{eH}}}, \text{ in mm;} \qquad (7.10.6.29\text{-}1)$$

$$t_{\min} = 6 + L_1/100, \text{ in mm;} \qquad (7.10.6.29\text{-}2)$$

for Type-2 ships:

$$t = 0{,}016s\sqrt{\frac{P_{coam}}{0{,}95R_{eH}}}, \text{ in mm;} \qquad (7.10.6.29\text{-}3)$$

$$t_{\min} = 9{,}5, \text{ in mm} \qquad (7.10.6.29\text{-}4)$$

where P_A = pressure, in kN/m^2, as defined in 7.10.6.8;

P_{coam} = pressure, in kN/m^2, as defined in 7.10.6.9;

s = stiffener spacing, in mm;

$L_1 = L$, need not be taken greater than 300 m.

In addition, for both Type-1 and Type-2 ships, longitudinal strength aspects shall be observed.

Strength aspects of longitudinal hatch coamings for Type-1 and Type-2 ships shall meet the requirements of 1.6.5 of Part II "Hull".

7.10.6.30 The stiffeners shall be continuous at the coaming stays. For stiffeners with both ends constraint, the elastic net section modulus Z, in cm^3, and net shear area A_{shr}, in cm^2, calculated on the basis of net thickness, shall not be less than:

for Type-1 ships:

$$Z = \frac{P_A s l^2}{f_{bc} R_{eH}}; \quad (7.10.6.30\text{-}1)$$

$$A_{shr} = \frac{P_A s l}{R_{eH}} 10^{-2} \quad (7.10.6.30\text{-}2)$$

where f_{bc} = 12 in general;
f_{bc} = 8 for the end spans of stiffeners sniped at the coaming corners;
l = stiffener span, in m, to be taken as the spacing of coaming stays;
s = stiffener spacing, in mm.

For sniped stiffeners of coaming at hatch corners shear area at the fixed support shall be increased by 35 %. The gross thickness of the coaming plate at the sniped stiffener end shall not be less than those defined as per the formula

$$t_{gr} = 19{,}6\sqrt{\frac{P_A s (l - 0{,}0005 s)}{1000 R_{eH}}}, \text{ in mm;} \quad (7.10.6.30\text{-}3)$$

for Type-2 ships:

$$Z = 1{,}21 \frac{P_{Coam} s l^2}{f_{bc} c_p R_{eH}} \quad (7.10.6.30\text{-}4)$$

where f_{bc} = 16 in general;
f_{bc} = 12 for the end spans of stiffeners sniped at the coaming corners;
l = span of stiffeners, in m;
s = spacing of stiffeners, in mm;
P_A = pressure, in kN/m^2, as defined in 7.10.6.8;
P_{coam} = pressure, in kN/m^2, as defined in 7.10.6.9;
c_p = ratio of the plastic section modulus to the elastic section modulus of the stiffeners with an attached plate breadth, in mm, equal to $40t$, where t is the plate net thickness;
c_p = 1,16 in the absence of more precise evaluation.

For both Type-1 and Type-2 ships, horizontal stiffeners on hatch coamings, which are part of the longitudinal hull structure, shall be designed according to the requirements in 1.6.5 of Part II "Hull".

7.10.6.31 Coaming stays shall be designed for the loads transmitted through them and permissible stresses according to 7.10.6.15.

At the connection of the coaming stays with deck (refer to Figs. 7.10.6.31-1 and 7.10.6.31-2), the net section modulus Z, in cm^3, shall be taken not less than:

$$Z = \frac{P s_c H_c^2}{1{,}9 R_{eH}}, \text{ in cm}^3, \quad (7.10.6.31)$$

where H_c = stay height, in m;
s_c = stay spacing, in mm;
P = pressure on coaming, in kN/m^2, taken as P_A defined in 7.10.6.8 in general and as P_{Coam} defined in 7.10.6.9 for Type-2 ships.

For other designs of coaming stays, such as those shown in Figs. 7.10.6.31-3 and 7.10.6.31-4, the stresses shall be determined through FEM. The calculated stresses shall comply with the permissible stresses according to 7.10.6.15.

Coaming stays shall be supported by appropriate substructures. For calculating the section modulus of coaming stays, their face plate area shall be taken into account only when it is welded with full penetration welds to the deck plating and adequate underdeck structure is fitted to support the stresses transmitted by it.

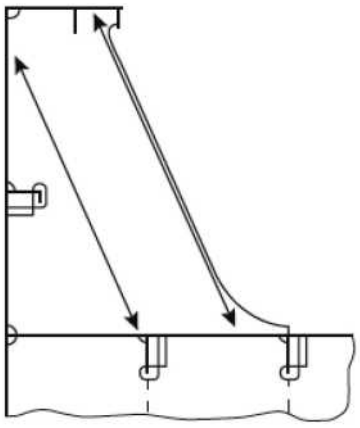


Fig. 7.10.6.31-1

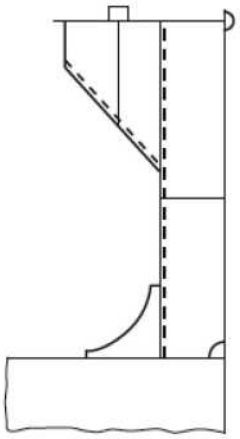


Fig. 7.10.6.31-2

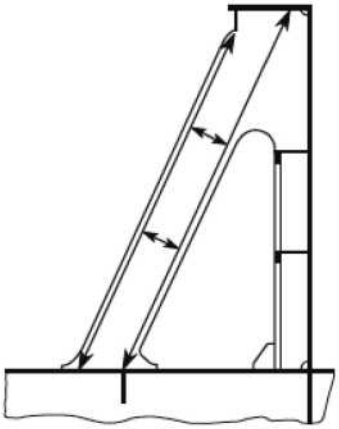


Fig. 7.10.6.31-3

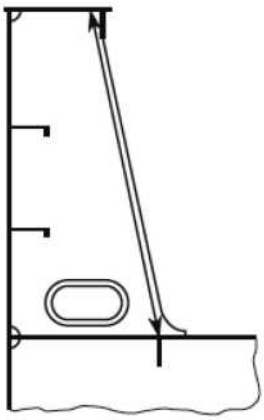


Fig. 7.10.6.31-4

7.10.6.32 At the connection with deck, the net thickness t_w, in mm, of the coaming stays shall be taken not less than:

$$t_w = \frac{2Ps_cH_c}{hR_{eH}} \qquad (7.10.6.32)$$

where H_c = stay height, in m;
h = stay depth, in mm, at the connection with the deck.

Webs shall be connected to the deck by fillet welds on both sides with a throat thickness of $a = 0{,}44t_w$.

For Type-2 ships, toes of stay webs shall be connected to the deck plating with full or partial penetration double bevel welds extending over a distance not less than 15 % of the stay width.

7.10.6.33 Hatch coamings which are part of the longitudinal hull structure shall be designed according to the requirements of 1.6.5 of Part II "Hull".

Longitudinal hatch coamings with a length exceeding $0{,}1L$ shall be provided with tapered brackets or equivalent transitions and a corresponding substructure at both ends. At the end of the brackets they shall be connected to the deck by full penetration welds of minimum 300 mm in length.

7.10.6.34 Hatch coamings and supporting structures shall be adequately stiffened to accommodate the loading from hatch covers, in longitudinal, transverse and vertical directions.

Structures under deck shall be checked against the load transmitted by the stays.

Unless otherwise stated, weld connections shall be dimensioned according to 1.7 of Part II "Hull" and materials shall be selected according to 2.2 of Part XIV "Welding".

7.10.6.35 On ships carrying cargo on deck, such as timber, coal or coke, the stays shall be spaced not more than 1,5 m apart.

Coaming plates shall extend to the lower edge of the deck beams or hatch side girders shall be fitted that extend to the lower edge of the deck beams. Extended coaming plates and hatch side girders shall be flanged or fitted with face bars or half round bars. Fig. 7.10.6.35 gives an example.

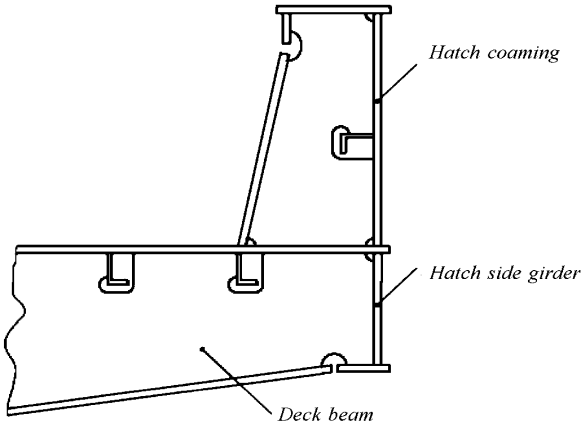


Fig. 7.10.6.35

7.10.6.36 If drain channels are provided inside the line of gasket by means of a gutter bar or vertical extension of the hatch side and end coaming, drain openings shall be provided at appropriate positions of the drain channels.

Drain openings in hatch coamings shall be arranged with sufficient distance to areas of stress concentration (e.g. hatch corners, transitions to crane posts).

Drain openings shall be arranged at the ends of drain channels and shall be provided with non-return valves to prevent ingress of water from outside. It is unacceptable to connect fire hoses to the drain openings for this purpose.

If a continuous outer steel contact between cover and ship structure is arranged, drainage from the space between the steel contact and the gasket shall also be provided for.

7.10.6.37 Securing devices between cover and coaming and at cross-joints shall be installed to provide weathertightness. Sufficient packing line pressure shall be maintained.

Securing devices shall be appropriate to bridge displacements between cover and coaming due to hull deformations.

Securing devices shall be of reliable construction and effectively attached to the hatchway coamings, decks or covers. Individual securing devices on each cover shall have approximately the same stiffness characteristics.

Sufficient number of securing devices shall be provided at each side of the hatch cover considering the requirements of 7.10.6.21. This applies also to hatch covers consisting of several parts.

7.10.6.38 Where rod cleats are fitted, resilient washers or cushions shall be incorporated.

Where hydraulic cleating is adopted, positive means shall be provided so that it remains mechanically locked in the closed position in the event of failure of the hydraulic system.

7.10.6.39 The gross sectional area, in cm^2, of the securing devices shall not be less than that defined by the formula

$$A = 0{,}28 q S_{SD} k_l \qquad (7.10.6.39)$$

where q = packing line pressure, in N/mm, minimum 5 N/mm;
S_{SD} = spacing between securing devices, in m, but shall not be taken less than 2 m;
$k_l = \left(\frac{235}{R_{eH}}\right)^e$;
R_{eH} = minimum yield strength of the material, in N/mm^2, but shall not be taken greater than $0{,}7R_m$ where R_m is the tensile strength of the material, in N/mm^2;
$e = 0{,}75$ for $R_{eH} > 235$ N/mm^2;
$e = 1{,}00$ for $R_{eH} \leq 235$ N/mm^2.

Rods or bolts shall have a gross diameter no less than 19 mm for hatchways exceeding 5 m² in area.

Securing devices of special design in which significant bending or shear stresses occur may be designed as anti-lifting devices according to 7.10.6.40. As load, the packing line pressure q multiplied by the spacing between securing devices S_{SD} shall be applied.

7.10.6.40 The securing devices of hatch covers, on which cargo is lashed, shall be designed for the lifting forces resulting from loads according to 7.10.6.12 — 7.10.6.14, refer to Fig. 7.10.6.40. Unsymmetrical loadings, which may occur in practice, shall be considered. Under these loadings the equivalent stress in the securing devices shall not exceed:

$$\sigma_{vm} = 150/k_l, \text{ N/mm}^2. \qquad (7.10.6.40)$$

N o t e . The partial load cases given in Table 7.10.6.13 may not cover all unsymmetrical loadings, critical for hatch cover lifting.

Chapter 5.6 of the current version[2] of IACS recommendation No. 14 (the document is available at the IACS website: www.iacs.org.uk) shall be referred to for the omission of anti-lifting devices.

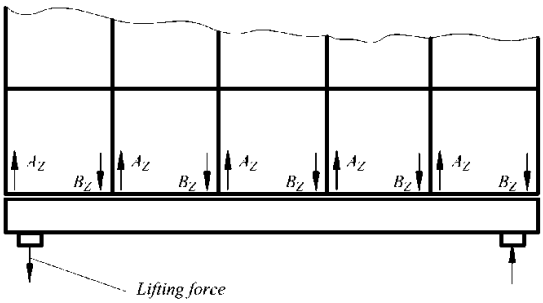


Fig. 7.10.6.40
Lifting forces at a hatch cover

7.10.6.41 For the design of the hatch cover supports, the horizontal mass forces $F_h = ma$ shall be calculated with the following accelerations:

$a_x = 0{,}2g$ in longitudinal direction;

$a_y = 0{,}5g$ in transverse direction;

$m =$ sum of mass of cargo lashed on the hatch cover and mass of hatch cover.

The accelerations in longitudinal direction and in transverse direction do not need to be considered as acting simultaneously.

7.10.6.42 For the transmission of the support forces resulting from the load cases specified in 7.10.6.5 — 7.10.6.14 and of the horizontal mass forces specified in 7.10.6.41, supports shall be provided which shall be designed such that the nominal surface pressures in general do not exceed the following values:

$$P_{n\max} = dP_n, \text{ in N/mm}^2 \qquad (7.10.6.42\text{-}1)$$

where $d = 3{,}75 - 0{,}015L$;
$d_{\max} = 3{,}0$;
$d_{\min} = 1{,}0$ in general;
$d_{\min} = 2{,}0$ for partial loading conditions, refer to 7.10.6.13;
P_n = permissible nominal surface pressure, refer to Table 7.10.6.42.

For metallic supporting surfaces not subjected to relative displacements, the nominal surface pressure shall be calculated by the formula

$$P_{n\max} = 3P_n, \text{ in N/mm}^2. \qquad (7.10.6.42\text{-}2)$$

Drawings of the supports shall be submitted to the Register. In the drawings of supports the permitted maximum pressure given by the material manufacturer shall be specified.

Where large relative displacements of the supporting surfaces are expected, the use of material having low wear and frictional properties is recommended.

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[2] That is effective on the date of this version of the Rules.

The substructures of the supports shall be of such a design, that a uniform pressure distribution is achieved.

Irrespective of the arrangement of stoppers, the supports shall be able to transmit the following force P_h in the longitudinal and transverse directions:

$$P_h = \mu \frac{P_V}{\sqrt{d}} \qquad (7.10.6.42\text{-}3)$$

where P_V = vertical supporting force;
μ = frictional coefficient, in general equal to 0,5.

For non-metallic, low-friction support materials on steel, the friction coefficient may be reduced but not to be less than 0,35.

Supports as well as the adjacent structures and substructures shall be designed such that the permissible stresses according to 7.10.6.15 are not exceeded.

Table 7.10.6.42

Permissible nominal surface pressure P_n

Support material	P_n, in N/mm^2, when loaded by	
	vertical force	horizontal force (on stoppers)
Hull structural steel	25	40
Hardened steel	35	50
Lower friction materials	50	—

7.10.6.43 Hatch covers shall be sufficiently secured against horizontal shifting. Stoppers shall be provided for hatch covers, on which cargo is carried.

The greater of the loads resulting from 7.10.6.8 and 7.10.6.41 shall be applied for the dimensioning of the stoppers and their substructures.

The permissible stress in stoppers, their substructures, in the cover, and of the coamings shall be determined according to 7.10.6.14. In addition, the requirements in 7.10.6.42 shall be observed.

Specifically for Type-2 ships, the following additional requirements shall be complied with.

Hatch covers shall be effectively secured, by means of stoppers, against the transverse forces arising from a pressure of 175 kN/m^2.

With the exclusion of No.1 hatch cover, hatch covers shall be effectively secured, by means of stoppers, against the longitudinal forces acting on the forward end arising from a pressure of 175 kN/m^2.

No. 1 hatch cover shall be effectively secured, by means of stoppers, against the longitudinal forces acting on the forward end arising from a pressure of 230 kN/m^2.

This pressure may be reduced to 175 kN/m^2 when a forecastle is fitted in accordance with IACS UR S28.

The equivalent stress in stoppers and their supporting structures and calculated in the throat of the stopper welds shall not exceed the allowable value of $0{,}8R_{eH}$.

7.10.6.44 Corrosion additions (corrosion allowance) t_s, in mm, for hatch covers and hatch coamings are given in Table 7.10.6.44.

Table 7.10.6.44

Corrosion additions t_s for hatch covers and hatch coamings

Application	Structure	t_s, in mm
Weather deck cargo hatches of container ships, car carriers, paper carriers, passenger ships	Hatch covers	1,0
	Hatch coamings	1,5
Weather deck cargo hatches of Type-2 ships	Hatch covers in general	2,0
	Top and bottom plating of double skin hatch covers	2,0
	Internal structure of double skin hatch covers	1,5
	Hatch coamings and coaming stays	1,5
Weather deck cargo hatches of all other ship type	Hatch covers in general	2,0
	Weather exposed plating and bottom plating of double skin hatch covers	1,5

Application	Structure	t_s, in mm
	Internal structure of double skin hatch covers and closed box girders (hollow beams)	1,0
	Hatch coamings not part of the longitudinal hull structures	1,5
	Hatch coamings part of the longitudinal hull structures	2
	Coaming stays and stiffeners	1,5

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Chapter 7.13 and reference thereto in para 7.5.1.1 are deleted. Existing **Chapters 7.14** and **7.15** are renumbered **Chapters 7.13** and **7.14** accordingly.