RUSSIAN MARITIME REGISTER OF SHIPPING

CIRCULAR LETTER **No. 314-04-1861c** dated 22.11.2022

Re:

amendments to the Rules for the Classification and Construction of Sea-Going Ships, 2022, ND No. 2-020101-152-E

Item(s) of supervision:

fiber-reinforced plastics (FRP), FRP ships

Entry-into-force date:
15.12.2022

~~Cancels / amends / adds Circular Letter No.~~ ~~dated~~

Number of pages: 1 + 7

Appendices:

Appendix 1: information on amendments introduced by the Circular Letter

Appendix 2: text of amendments to Part XVI "Structure and Strength of Fiber-Reinforced Plastic Ships"

Acting Director General Sergey A. Kulikov

Text of CL:

We hereby inform that the Rules for the Classification and Construction of Sea-Going Ships shall be amended as specified in the Appendices to the Circular Letter.

It is necessary to do the following:

1. Bring the content of the Circular Letter to the notice of the RS surveyors, interested organizations and persons in the area of the RS Branch Offices' activity.
2. Apply the provisions of the Circular Letter during review and approval of the technical documentation on materials used on ships contracted for construction or conversion on or after 15.12.2022, in the absence of data on ship, if review of documentation on materials is requested on or after 15.12.2022.

List of the amended and/or introduced paras/chapters/sections:

Part XVI: para 2.3.3.8, Table 2.3.3.8, paras 3.2.1.2.3, 3.2.2.2.4, 3.2.2.2.5, 3.2.3.2.4, 3.2.4.4, 3.2.4.7, 3.2.4.12, 3.2.5.3, 3.2.6.3.4, 3.2.6.3.5, 3.2.6.3.7 — 3.2.6.3.9, 3.3.2.3, 3.3.2.6, 3.3.2.12, 3.3.3.4, 4.2.4 and 4.3.1

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Appendix 1 to Circular Letter
No. 314-04-1861c dated 22.11.2022

Information on amendments introduced by the Circular Letter
(for inclusion in the Revision History to the RS Publication)

Nos.	Amended paras/chapters/ sections	Information on amendments	Number and date of the Circular Letter	Entry-into-force date
1	Para 2.3.3.8	Requirements for cores of sandwich structures have been amended	314-04-1861c of 22.11.2022	15.12.2022
2	Table 2.3.3.8	Requirements for cores of sandwich structures have been amended	314-04-1861c of 22.11.2022	15.12.2022
3	Para 3.2.1.2.3	Requirements for cores of sandwich shell have been specified	314-04-1861c of 22.11.2022	15.12.2022
4	Paras 3.2.2.2.4 and 3.2.2.2.5	Requirements for cores of sandwich plates have been specified	314-04-1861c of 22.11.2022	15.12.2022
5	Para 3.2.3.2.4	Requirements for cores of bulkhead platings have been specified	314-04-1861c of 22.11.2022	15.12.2022
6	Para 3.2.4.4	Requirements for cores of framing members have been specified	314-04-1861c of 22.11.2022	15.12.2022
7	Para 3.2.4.7.	Requirements for selection of section for framing members containing a core have been amended	314-04-1861c of 22.11.2022	15.12.2022
8	Para 3.2.4.12	Requirements for scantlings of T-shaped and L-shaped sections elements of framing members have been amended	314-04-1861c of 22.11.2022	15.12.2022
9	Para 3.2.5.3	Requirements for cores in area of reinforcement of openings in sandwich structures have been amended	314-04-1861c of 22.11.2022	15.12.2022
10	Paras 3.2.6.3.4, 3.2.6.3.5, 3.2.6.3.7 — 3.2.6.3.9	Requirements for cores in area of joints in sandwich structures have been specified	314-04-1861c of 22.11.2022	15.12.2022
11	Para 3.3.2.3	Requirements for core intended for superstructures of category I have been amended	314-04-1861c of 22.11.2022	15.12.2022
12	Para 3.3.2.6	Editorial amendment has been made	314-04-1861c of 22.11.2022	15.12.2022
13	Para 3.3.2.12	Requirements for core in closed box section of superstructures have been amended	314-04-1861c of 22.11.2022	15.12.2022

Nos.	Amended paras/chapters/ sections	Information on amendments	Number and date of the Circular Letter	Entry-into-force date
14	Para 3.3.3.4	Requirements for core in locations of joints between sandwich panels of superstructures and metal hull have been amended	314-04-1861c of 22.11.2022	15.12.2022
15	Para 4.2.4	Requirements for core in sandwich shell of boats and motorboats have been amended	314-04-1861c of 22.11.2022	15.12.2022
16	Para 4.3.1	Requirements for core of framing members of boats and motorboats have been amended	314-04-1861c of 22.11.2022	15.12.2022

Appendix 2 to Circular Letter
No. 314-04-1861c dated 22.11.2022

RULES FOR THE CLASSIFICATION AND CONSTRUCTION OF SEA-GOING SHIPS, 2022,

ND No. 2-020101-152-E

PART XVI. STRUCTURE AND STRENGTH OF FIBER-REINFORCED PLASTIC SHIPS

2 MATERIALS

1 **Para 2.3.3.8** is replaced by the following text:

"**2.3.3.8** Physical and mechanical properties of PVC foams and PUR foam or cores of other types shall comply with the requirements in Table 2.3.3.8.".

2 **Table 2.3.3.8** is replaced by the following one:

"Table 2.3.3.8

Properties of materials used as cores of sandwich constructions

Parameter	Normal strength core		Increased strength core
	Bottom, sides, cargo deck and deck in areas of concentrated loads	All other elements	Reinforcements and special elements as specified in the text of the Rules
Rated density (reference data), in kg/m^3	80	60	130
Minimum shear strength, in MPa	0,80	0,50	1,9
Minimum compression strength, in MPa	0,90	0,60	2,4

".

3 HULL AND SUPERSTRUCTURES OF SHIPS

3 **Para 3.2.1.2.3** is replaced by the following text:

"**.3** for ships of more than 15 m in length, the shear strength values shall be as given in Table 2.3.3.8.

In case of ships of 10 m or less in length, for characteristics of normal strength core given in Table 2.3.3.8, a reduction of the minimum shear strength values to 0,45 MPa for all structural elements is allowed. In case of intermediate length values of 10 to 15 m, the permissible minimum shear strength values are determined by linear interpolation. The specified reduction in the minimum strength is permitted provided the structural strength criteria are met.

The specified recommendations are applicable to the listed structural members beyond reinforcement and joint areas (plate keel, sheerstrake, joint of the side to the deck, etc.). Recommendations for selection of densities of the cores for reinforcement and joint areas are specified below;".

4 **Para 3.2.2.2.4** is replaced by the following text:

"**.4** recommendations on selecting the foam plastic properties for the upper deck with an expanded core are specified in 3.2.1.2.3.

In such case, it shall be taken into account that in places of joint to other structures (sides, bulkheads, superstructure sides and ends, etc.) and in places of equipment fastening, the expanded foam density shall be increased to bear transverse local forces. Recommendations on selection of the foam plastic density for a core in deck and platform sandwich plates in such places are specified in 3.2.4 — 3.2.7;".

5 **Para 3.2.2.2.5** is replaced by the following text:

"**.5** structural orthotropic filler consisting of foam plastic with a minimum shear strength of 0,2 MPa and minimum compression strength of 0,3 MPa reinforced with a corrugated element may be applied as a core in deck sandwich plates (refer to Fig. 3.2.2.2.5). Where shear ties or similar methods of increasing shear strength are used instead of a corrugated element, the minimum shear strength of the filler can also be reduced (compared to that given in Table 2.3.3.8) based on calculation;".

6 **Para 3.2.3.2.4** is replaced by the following text:

"**.4** in case of the expanded-type foam, its properties shall comply with the requirements of Table 2.3.3.8 (refer to column "All other elements");".

7 **Para 3.2.4.4** is replaced by the following text:

"**3.2.4.4** If foam plastics are used as a filler (core) of a closed box section of framing members (refer to 2.3.3.6 — 2.3.3.8) and the strength of these materials meets the strength requirements in Table 2.3.3.8 for the hull shell area supported by the framing element, the requirements of 3.2.4.7.2 for scantling ratios of elements may not apply. The minimum web and face plate thickness in any case shall not be less than 3 mm.".

8 **Para 3.2.4.7** is replaced by the following text:

"**3.2.4.7** Scantlings of closed box section elements of framing members.

.1 scantlings of closed box section elements of framing members shall be selected at the first approximation from the following:

$B_c/H_c = 0{,}35 \div 0{,}5$; $t_w/H_c = 0{,}034 \div 0{,}05$; $t_{fp}/t_w = 1{,}8 \div 2{,}2$;

$1{,}2B_c \geq b_f \geq 10t_w \geq 30$ mm; $t_f = t_w$,

где B_c, H_c = width and depth pf the section core respectively;
t_{fp}, t_w = thicknesses of face plate and webs respectively;
b_f = width of flanges;
t_f = flange thickness in transition radius R_f to webs (refer to Fig. 3.2.4.2.1, *a*).

The value B_c for the trapezoidal section corresponds to the length of the trapezoid median, and it may be assumed equal to B_c/H_c = 0,7÷1,0, when the ratio of the shorter and longer base shall be approximately 0,6÷0,7;

.2 scantling ratios of closed box section elements of framing members shall meet the following criteria (except for the case specified in 3.2.4.4):

$t_w/H_c \geq 0{,}034$; $t_{fp}/B_c \geq 0{,}05$.".

9 **Para 3.2.4.12** is replaced by the following text:

«**3.2.4.12** Scantlings of T-shaped and L-shaped section elements of framing members.

.1 scantlings of T-section elements of framing members shall be selected at the first approximation based on the following (refer to Figure 3.2.4.9):

$B_{fp}/H_w = 0{,}35 \div 0{,}5$; $t_w/H_w = 0{,}06 \div 0{,}08$; $t_{fp}/t_w = 2{,}0 \div 2{,}5$.

Parameters of moulding-in angles shall be selected in accordance with the requirements of 3.2.4.8.

.2 scantling ratios of T-shaped and L-shaped section elements of framing members shall meet the following criteria:

$$t_w/H_w \geq 0{,}06;\ t_{fp}/B_{fph} \geq 0{,}1$$

where B_{fph} = width of projecting part of face plate
(for T-shaped section, $B_{fph} = (B_{fp} - t_w)/2$).".

10 **Para 3.2.5.3** is replaced by the following text:

"**3.2.5.3** To reinforce openings in the shell, deck and bulkhead plating of the sandwich structure, the following techniques are recommended to be applied:

local thickening of load-bearing layers over the specified area around the opening;

replacement with a foam plastic with higher density over the thickness at least $3h$ where h is 1/2 of the core thickness from the edge of a foam plastic opening, along the opening contour (refer to Fig. 3.2.5.2-1, *b* and 3.2.5.3).

Load-bearing layers shall be thickened with straps by matting on additional fiber layers simultaneously with moulding of the structure edge along the opening contour.

The foam plastic (of increased density) added in the core along the opening contour shall have a compression strength of 0,3÷1,0 MPa higher than the ultimate strength of the foam plastic core used for this structure. In this case, where the core is made of the lightweight mat reinforced with fabric (refer to Fig. 3.1.1, *c*), its reinforcement along the opening contour is not required.".

11 **Para 3.2.6.3.4**. The first paragraph is replaced by the following text:

"**.4** for a stressed fillet joint, a horizontal single-skin member may be thickened under a vertical member, which may be both single-skin and sandwich, e.g. joint of a single-skin hull shell with a sandwich bulkhead. The foam plastic of normal strength in core of the bulkhead in the area of joint with single-skin shell shall be replaced by foam plastic with compression strength of 0,3÷1,0 MPa higher (increased density) in the form of embedded elements of certain scantlings (refer to Fig. 3.2.6.3.4).".

12 **Para 3.2.6.3.5** is replaced by the following text:

"**.5** where both members, e.g. a bulkhead and a shell, are of sandwich construction and stressed, their fillet joint is recommended to be made with triangular support elements made of foam plastic of increased strength (refer to Table 2.3.3.8), which shall be mounted on the shell from both sides of a transverse bulkhead via adhesive which is applied on the contact surface of the bulkhead to shell joint. The edge of a vertical member (bulkhead) shall be sheathed passing over onto outer surfaces to the depth equal to at least the value of its thickness.

The foam plastic of normal strength in cores of the bulkhead and shell shall be replaced by that with compression strength of 0,3÷1,0 MPa higher (increased density) in the form of embedded elements of certain scantlings in the joint area (refer to Fig. 3.2.6.3.5).

Basic parameters of these joints shall be selected from the following:

$$c \geq 0{,}6(S_{shell} + S_{bulk});\ l^d_{angl} = 0{,}2s_d;\ l^{shell}_{angl} = 2(1{,}1c + S_{shell}) + s_d;$$
$$t_{angl} = 1{,}2\max(\delta^d, \delta^{shell});$$
$$b_{angl} = 16t_{angl} + c \geq 2S_{shell};\ R_{angl} \geq 2t_{angl};\ \beta = 45°;".$$

13 **Para 3.2.6.3.7** is replaced by the following text:

"**.7** where single-skin side and deck have comparatively greater thicknesses (over 15 — 20 mm), it is recommended their angle joint be made by thinning the side and deck

platings where they connect to each other and by installation of a triangular support element (refer to Fig. 3.2.6.3.7) made of the foam plastic of increased strength (refer to Table 2.3.3.8).

Basic parameters of this joint shall be assumed as follows:

$c \geq 2\max(S_s, S_d)$;

$h_d \geq 0{,}5S_d$; $h_s \geq 0{,}5S_s$;

$t_{angl}^{out} \geq 0{,}6S_s$; $b_{angl}^{out} \geq 20t_{angl}^{out}$;

$t_{angl}^{in} \geq 0{,}4S_s$; $b_{angl}^{in} \geq 16t_{angl}^{in} + c$;

$l^d = b_{angl}^{out} - s^d$; $l^s = b_{angl}^{out} - S_s$.".

14 **Para 3.2.6.3.8** is replaced by the following text:

"**.8** where the upper deck and side platings are of sandwich constructions, the following design joint types are recommended:

Type A. The deck laminate is connected to the side laminate with adhesive and moulding-in angles, with the use of a support element made of the foam plastic of increased strength (refer to Table 2.3.3.8). In the place of joint, the upper deck laminate / edge is sheathed with 2 – 3 layers of woven roving with (0°/90°) reinforcement (refer to Fig. 3.2.6.3.8-1).

Basic parameters of this joint shall be selected from the following:

$c \geq 1{,}2\max(s_s, s_d)$; $t_{angl}^{out} = 2\max(\delta^d, \delta^s)$; $b_{angl}^{out} \geq 18t_{angl}^{out} \geq 3{,}5s_s$;

$t_{angl}^{in} = 1{,}2\delta^s$; $b_{angl}^{in} \geq 15t_{angl}^{in} + c \geq 2s_s$; $\beta = 45°$; $l_d = b_{angl}^{in} + s_s + s_d$; $l_s = b_{angl}^{in} + s_s$.

Type B. Sandwich deck laminate and side laminate transit to single-skin structures smoothly by bringing load-bearing layers together. Using adhesive, a triangular support element made of the foam plastic of increased strength (refer to Table 2.3.3.8) is installed, and inner and outer moulding-in angles are laid (refer to Fig. 3.2.6.3.8-2).

Basic parameters of this joint are recommended to be selected from the following:

$t_{angl}^{out} = 2\max(\delta^d, \delta^s)$; $b_{angl}^{out} \geq 20t_{angl}^{out}$; $t_{angl}^{in} = 1{,}2\max(\delta^d, \delta^s)$; $b_{angl}^{in} \geq 18t_{angl}^{in}$;

For both joint types, where the deck and side are provided with a deck stringer and a sheerstrake accordingly, the values of δ^d, δ^s specified in the above-mentioned correlations shall be assumed equal to the thicknesses of load-bearing layers of these members;".

15 **Para 3.2.6.3.9**. The first paragraph is replaced by the following text:

"**.9** inner decks (platforms) are connected to the side plating by means of moulding-in angles and triangular support element made of the foam plastic of increased strength (refer to Table 2.3.3.8).".

16 **Para 3.3.2.3** is replaced by the following text:

"**3.3.2.3** Foams plastics and other materials meeting the requirements of Table 2.3.3.8 for side structures are allowed as cores for superstructures of category I. Structural orthotropic filler consisting of foam plastic with a minimum shear strength of 0,2 MPa and minimum compression strength of 0,3 MPa reinforced with a corrugated element may be applied as a core in superstructure sandwich plates (refer to Fig. 3.2.2.2.5). Where shear ties or similar methods of increasing shear strength are used instead of a corrugated element, the minimum shear strength of the filler can also be reduced (compared to that given in Table 2.3.3.8) based on calculation.

For lightweight superstructures and deckhouses, foam plastics or other materials meeting the requirements of Table 2.3.3.8 (refer to column "All other elements") are allowed.".

17 **Para 3.3.2.6** is replaced by the following text:

"**3.3.2.6** The core thickness of ends and sides of the sandwich construction and of the superstructure top and other constructions may be determined subject to compliance with the requirements for heat insulation of internal spaces while structural strength and stiffness are maintained.".

18 **Para 3.3.2.12**. The last paragraph is replaced by the following text:

"Where a pillar is fitted, the foam plastic core in closed box section members shall be substituted with the foam plastic of increased strength (refer to Table 2.3.3.8), or made with a glued laminated hardwoods (oak, birch, etc.).".

19 **Para 3.3.3.4** is replaced by the following text:

"**3.3.3.4** In these types of joints in the section of sandwich panels of the members arranged between metal elements, the core shall be made of the foam plastic of increased strength (refer to Table 2.3.3.8). Metal elements (coamings, plates) are fitted on load-bearing layers of sandwich panels using adhesive and after drilling are screwed up with bolts and then welded to the hull.".

4 HULLS OF BOATS AND MOTORBOATS

20 **Para 4.2.4** is replaced by the following text:

"**4.2.4** As a core in a sandwich shell, it is allowed to use foam plastics, lightweight mats or other materials meeting the requirements of Table 2.3.3.8 and 3.2.1.2.3, which may be additionally reinforced with fabric layers if it is necessary to increase their shear and compression strength characteristics.".

21 **Para 4.3.1** is replaced by the following text:

"**4.3.1** Framing members with a closed box (trapezoidal) section may be made hollow or with a filler (core). When the foam with the strength equivalent to the strength of the foam for the hull shell area supported by the framing element (refer to 3.2.4.4) is used for the core, the requirements of 3.2.4.7.2 for scantling ratios of elements may not apply. The minimum web and face plate thickness in any case shall not be less than 3 mm. Where framing members serve as seating members for attachment of engines and equipment, they may have either T-shaped or L-shaped section (refer to 3.1.7 and 3.1.8).

For boat hulls up to 8 m, air cases may serve as framing.".