RUSSIAN MARITIME REGISTER OF SHIPPING

CIRCULAR LETTER **No. 313-69-1769c** dated 19.05.2022

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:

systems and piping, gears, gas internal combustion engines

Entry-into-force date:
01.07.2022

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

Number of pages: 1 + 11

Appendices:

Appendix 1: information on amendments introduced by the Circular Letter

Appendix 2: text of amendments to Parts VIII "Systems and Piping" and IX "Machinery"

Director General Konstantin G. Palnikov

Text of CL:

We hereby inform that in connection with coming into force on 01.07.2022 of IACS Unified Requirements (UR) M56 (Rev.4 Feb 2021 (Corr.1 Oct 2021)), M77 (Rev.3 Sep 2021), M78 (Rev.1 Feb 2021), P2.7.4 (Rev.10 Jan 2021), P2.12 (Rev.3 Feb 2021) and P2.13 (Rev.1 Jan 2021), 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 systems and piping, gears, gas internal combustion engines installed on board the ships contracted for construction or conversion on or after 01.07.2022, in the absence of a contract, during review and approval of the technical documentation on systems and piping, gears, gas internal combustion engines installed on board the ships requested for review on or after 01.07.2022.

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

Part VIII: paras 1.1.1, 1.2.1, 2.4.5.10, 2.4.5.11, 2.4.5.12, 2.5.1, 2.5.5.3, 2.5.5.7, 4.3.2.10, 5.3.2, 9.16.6.11, 11.3.2.9 and 20.6.3
Part IX: para 4.2.2.7.1.4, Table 4.2.2.7.1.9-1, paras 4.2.2.7.1.9.2, 4.2.2.7.1.10, 4.2.2.7.1.11, 4.2.2.7.2.1, 4.2.2.7.2.2, 4.2.2.7.2.6, 4.2.2.7.3, 4.2.2.7.3.2, 4.2.2.7.3.3, 4.2.2.7.4.1, 4.2.2.7.4.3, 4.2.2.7.1.4, 9.2.1 and 9.12.2.12

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Appendix 1 to Circular Letter
No. 313-69-1769c dated 19.05.2022

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	Part VIII, para 1.1.1	Applicability of the requirements of the Part has been specified	313-69-1769c of 19.05.2022	01.07.2022
2	Part VIII, para 1.2.1	New definitions "Easily accessible equipment", "Easily accessible space" and "Readily observed equipment" have been introduced considering IACS UR P2.7.4 (Rev.10 Jan 2021)	313-69-1769c of 19.05.2022	01.07.2022
3	Part VIII, para 2.4.5.10	Requirements for application of slip-on joints have been specified considering IACS UR P2.7.4 (Rev.10 Jan 2021)	313-69-1769c of 19.05.2022	01.07.2022
4	Part VIII, para 2.4.5.11	Application of different types of mechanical joints has been specified considering IACS UR P2.7.4 (Rev.10 Jan 2021). In Table 2.4.5.11-1 types of systems and test conditions have been specified considering IACS UR P2.7.4 (Rev.10 Jan 2021)	313-69-1769c of 19.05.2022	01.07.2022
5	Part VIII, para 2.4.5.12	Requirements for testing of mechanical joints have been specified considering IACS UR P2.7.4 (Rev.10 Jan 2021)	313-69-1769c of 19.05.2022	01.07.2022
6	Part VIII, para 2.5.1	Definition "Flexible hose assembly" has been specified considering IACS UR P2.12 (Rev.3 Feb 2021)	313-69-1769c of 19.05.2022	01.07.2022
7	Part VIII, para 2.5.5.3	Requirements for prototype testing have been specified considering IACS UR P2.12 (Rev.3 Feb 2021)	313-69-1769c of 19.05.2022	01.07.2022
8	Part VIII, para 2.5.5.7	Requirements for prototype testing have been specified considering IACS UR P2.12 (Rev.3 Feb 2021)	313-69-1769c of 19.05.2022	01.07.2022
9	Part VIII, para 4.3.2.10	Design of welded branch pipe has been specified	313-69-1769c of 19.05.2022	01.07.2022

Nos.	Amended paras/chapters/ sections	Information on amendments	Number and date of the Circular Letter	Entry-into-force date
10	Part VIII, para 5.3.2	Requirements have been specified for protection of seawater pipes located in cargo holds considering IACS UR P2.13 (Rev.1 Jan 2021)	313-69-1769c of 19.05.2022	01.07.2022
11	Part VIII, para 9.16.6.11	Requirements have been specified for arrangement of connection for inert gas main	313-69-1769c of 19.05.2022	01.07.2022
12	Part VIII, para 11.3.2.9	Requirements have been specified for application of plastic integral tanks on FRP ships considering IACS UR M77 (Rev.3 Sep 2021)	313-69-1769c of 19.05.2022	01.07.2022
13	Part VIII, para 20.6.3	Application has been specified of copper and its alloys in system components contacting the thermal liquid	313-69-1769c of 19.05.2022	01.07.2022
14	Part IX, para 4.2.2.7.1.4	Requirements have been supplemented with the reference to ISO 6336-2:2019 considering IACS UR M56 (Rev.4 Feb 2021 (Corr.1 Oct 2021))	313-69-1769c of 19.05.2022	01.07.2022
15	Part IX, Table 4.2.2.7.1.9-1	Requirements have been supplemented with the reference to ISO 1328-2:2020 considering IACS UR M56 (Rev.4 Feb 2021)	313-69-1769c of 19.05.2022	01.07.2022
16	Part IX, para 4.2.2.7.1.9.2	Requirements have been supplemented with the reference to Method B of ISO 6336-1:2019 considering IACS UR M56 (Rev.4 Feb 2021)	313-69-1769c of 19.05.2022	01.07.2022
17	Part IX, para 4.2.2.7.1.10	Requirements have been supplemented with the reference to Method C of ISO 6336-1:2019 considering IACS UR M56 (Rev.4 Feb 2021)	313-69-1769c of 19.05.2022	01.07.2022
18	Part IX, para 4.2.2.7.1.11	Requirements have been supplemented with the reference to ISO 6336-5:2016 considering IACS UR M56 (Rev.4 Feb 2021)	313-69-1769c of 19.05.2022	01.07.2022
19	Part IX, para 4.2.2.7.2.1	Requirements have been supplemented with the reference to Method B of ISO 6336-1:2019 considering IACS UR M56 (Rev.4 Feb 2021)	313-69-1769c of 19.05.2022	01.07.2022

Nos.	Amended paras/chapters/ sections	Information on amendments	Number and date of the Circular Letter	Entry-into-force date
20	Part IX, para 4.2.2.7.2.2	Requirements have been supplemented with the reference to Method B of ISO 6336-2:2019 considering IACS UR M56 (Rev.4 Feb 2021)	313-69-1769c of 19.05.2022	01.07.2022
21	Part IX, para 4.2.2.7.2.6	Requirements have been supplemented with the reference to ISO 6336- 2:2019	313-69-1769c of 19.05.2022	01.07.2022
22	Part IX, para 4.2.2.7.3	Requirements have been supplemented with the reference to Method A of ISO 6336-3:2019 considering IACS UR M56 (Rev.4 Feb 2021)	313-69-1769c of 19.05.2022	01.07.2022
23	Part IX, para 4.2.2.7.3.2	Requirements have been supplemented with the reference to Method B of ISO 6336-3:2019 considering IACS UR M56 (Rev.4 Feb 2021)	313-69-1769c of 19.05.2022	01.07.2022
24	Part IX, para 4.2.2.7.3.3	Requirements have been supplemented with the reference to ISO 6336-3:2019 considering IACS UR M56 (Rev.4 Feb 2021)	313-69-1769c of 19.05.2022	01.07.2022
25	Part IX, para 4.2.2.7.4.1	Requirements have been supplemented with the reference to ISO 6336-5:2016 considering IACS UR M56 (Rev.4 Feb 2021)	313-69-1769c of 19.05.2022	01.07.2022
26	Part IX, para 4.2.2.7.4.3	Requirements have been supplemented with the reference to Method B of ISO 6336-3:2019 considering IACS UR M56 (Rev.4 Feb 2021)	313-69-1769c of 19.05.2022	01.07.2022
27	Part IX, para 9.2.1	Definitions "IGC Code" and "IGF Code" have been replaced considering IMO resolutions MSC.370(93), MSC.411(97), MSC.441(99) and MSC.422(98)	313-69-1769c of 19.05.2022	01.07.2022
28	Part IX, para 9.12.2.12	Existing references have been replaced by the references to standards IEC 60079-10-1:2015 and IEC 60092-502:1999 considering IACS UR M78 (Rev.1 Feb 2021)	313-69-1769c of 19.05.2022	01.07.2022

Appendix 2 to Circular Letter
No. 313-69-1769c dated 19.05.2022

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

ND No. 2-020101-152-E

PART VIII. SYSTEMS AND PIPING

1 GENERAL

1 **Para 1.1.1** is replaced by the following text:

"**1.1.1** The requirements of this Part apply to the following pumping and piping arrangements used in ships:

.1 bilge and drain;
.2 ballast, heel and trim;
.3 special systems of tankers and combination carriers;
.4 liquefied gas;
.5 toxic media;
.6 steam and blow-down pipelines;
.7 feed water and condensate;
.8 fuel oil;
.9 lubricating oil;
.10 water cooling;
.11 compressed air;
.12 air, venting, overflow and sounding pipes;
.13 exhaust gas;
.14 ventilation;
.15 open-ended steam pipes from safety valves;
.16 cleaning and washing of tanks;
.17 hydraulic drives;
.18 containing organic coolants.

Special requirements for systems other than stated above are set out in the relevant parts of the Rules.

Systems and piping of ships of less than 500 gross tonnage as well as of berth-connected ships shall comply with the requirements of this Part in so much as applicable and sufficient unless expressly provided otherwise below.

The requirements for systems of polar class ships (refer to 2.2.3.1, Part I "Classification") are set forth in Section 3, Part XVII "Distinguishing Marks and Descriptive Notations in the Class Notation Specifying Structural and Operational Particulars of Ships".".

2 **Para 1.2.1**. After the definition "Sea chest" new definitions "Easily accessible equipment" and "Easily accessible space" are introduced reading as follows:

"E a s i l y a c c e s s i b l e e q u i p m e n t is an equipment located in an easily accessible space clear of or protected from obstructions, moving equipment and hot surfaces that prevent operation or servicing and within arm's reach, or, within reach of a normally employed remote control device.

E a s i l y a c c e s s i b l e s p a c e is a space normally entered without the use of tools or keys.".

After the definition "Pipelines formed components (fittings)" a new definition "Readily observed equipment" is introduced reading as follows:

"Readily observed equipment is an equipment visible from positions routinely occupied by the crew.".

2 METAL PIPING

3 **Para 2.4.5.10** is replaced by the following text:

"**2.4.5.10** Slip-on joints shall not be used in pipelines in cargo holds, tanks and other spaces which are not easily accessible, except that these joints may be permitted in tanks that contain the same media. Usage of slip type slip-on joints as the main means of pipe connection is not permitted except for cases where compensation of axial pipe deformation is necessary.".

4 **Para 2.4.5.11** is replaced by the following text:

"**2.4.5.11** Application of different types of mechanical joints and their acceptable use for each service is indicated in Table 2.4.5.11-1, dependence upon the class of piping and pipe dimensions is indicated in Table 2.4.5.11-2. However, in all cases, acceptance of the joint type shall be subject to approval for the intended application, and subject to conditions of the approval and applicable Rules. Further, relevant statutory and national requirements shall be taken into consideration. In cases exposure time t is greater than 30 min, the dry-wet test conditions are 8 min dry and, accordingly, the wet period (t – 8) min.

Table 2.4.5.11-1

Application of mechanical joints and their acceptable use for each service

Nos.	Systems	Kind of connections			Classification of pipe system	Fire endurance test condition [1]
		Pipe unions	Compression couplings	Slip-on joints		
Flammable fluids (Flash point ≤ 60 °C)						
1	Cargo oil lines[2]	+	+	+	dry	30 min dry
2	Crude oil washing lines[2]	+	+	+	dry	
3	Vent lines[3]	+	+	+	dry	
Inert gas						
4	Water seal effluent lines	+	+	+	wet	30 min wet
5	Scrubber effluent lines	+	+	+	wet	
6	Main lines[2, 4]	+	+	+	dry	30 min dry
7	Distribution lines[2]	+	+	+	dry	
Flammable fluids (Flash point > 60 °C)						
8	Cargo oil lines[2]	+	+	+	dry	30 min dry
9	Fuel oil lines[3, 4]	+	+	+	wet	30 min wet
10	Lubricating oil lines[3, 4]	+	+	+	wet	
11	Hydraulic oil[3, 4]	+	+	+	wet	
12	Thermal oil[3, 4]	+	+	+	wet	
Sea water						
13	Bilge lines[5]	+	+	+	dry/ wet	8 min dry + 22 min wet
14	Permanent water filled fire extinguishing systems, e.g., fire main, sprinkler systems[3]	+	+	+	wet	30 min wet
15	Non-permanent water filled fire extinguishing systems, e.g., foam, drencher systems and fire main[3]	+	+	+	dry/ wet	8 min dry + 22 min wet
16	Ballast system[5]	+	+	+	wet	30 min wet
17	Cooling water system[5]	+	+	+	wet	30 min wet
18	Tank cleaning services	+	+	+	dry	Fire endurance test not required
19	Non-essential systems	+	+	+	dry, dry/wet, wet	Fire endurance test not required
Fresh water						
20	Cooling water system[5]	+	+	+	wet	30 min wet
21	Condensate return[5]	+	+	+	wet	30 min wet
22	Non-essential system	+	+	+	dry, dry/wet, wet	Fire endurance test not required

Nos.	Systems	Kind of connections			Classification of pipe system	Fire endurance test condition [1]
		Pipe unions	Compression couplings	Slip-on joints		
	Sanitary/Drains/Scuppers					
23	Deck drains (internal)[6]	+	+	+[2]	dry	Fire endurance test not required
24	Sanitary drains	+	+	+	dry	
25	Scuppers and discharge (overboard)	+	+	–	dry	
	Sounding/Vent					
26	Water tanks/Dry spaces	+	+	+	dry, wet	Fire endurance test not required
27	Oil tanks (Flash point > 60 °C[3,4])	+	+	+	dry	
	Miscellaneous					
28	Starting/Control air[5]	+	+	–	dry	30 min dry
29	Service air (non-essential)	+	+	+	dry	Fire endurance test not required
30	Brine	+	+	+	wet	
31	CO_2 system (outside protected space)	+	+	–	dry	30 min dry
32	CO_2 system (inside protected space)	+	+	–	dry	Non-combustible materials only[7]
33	Steam	+	+	+[8]	wet	Fire endurance test not required

S y m b o l s :
"+" — application is allowed;
"–" — application is not allowed.
Fire endurance test — refer to 8.5.4.8.8, Part IV "Technical Supervision during Manufacture of Products" of the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships.

_____
Fire resistance capability
If mechanical joints include any components which readily deteriorate in case of fire, the following footnotes shall be observed:
[1] if a connection has passed the "30 min dry" test, it is considered suitable also for applications for which the "8 min dry+22 min wet" and/or "30 min wet " tests are required. If a connection has passed the "8 min dry+22 min wet" test, it is considered suitable also for applications for which the "30 min wet" test is required;
[2] fire endurance test shall be applied when mechanical joints are installed in pump rooms and open decks;
[3] approved fire-resistant types except in cases where such mechanical joints are installed on open decks, as defined in SOLAS II-2/Reg. 9.2.3.3.2.2(10) and not used for fuel oil lines;
[4] slip-on joints are not accepted inside machinery spaces of category A or accommodation spaces. May be accepted in other machinery spaces provided the joints are located in easily visible and accessible positions;
[5] fire endurance test shall be applied when mechanical joints are installed inside machinery spaces of category A;
[6] only above bulkhead deck of passenger ships and freeboard deck of cargo ships;
[7] fire endurance tests are not required, but mechanical joints shall be constructed of materials with melting point above 925 °C according to Chapter 5, FSS Code;
[8] slip type slip-on joints as shown in Table 2.4.5.1. May be used for pipes on deck with a design pressure of 1 MPa or less.

".

Table 2.4.5.11-2 remains unamended.

5 **Para 2.4.5.12** is replaced by the following text:

"**2.4.5.12** Mechanical joints shall be tested in accordance with a program approved by the Register, which shall include at least the following:

.1 leakage test;
.2 vacuum test (where necessary);
.3 vibration (fatigue) test;
.4 fire endurance test (where necessary);
.5 burst pressure test;
.6 pressure pulsation test (where necessary);
.7 assembly test (where necessary);
.8 pull out test (where necessary).

The scope and nature of tests shall be specified subject to the joint type and pipeline service.".

6 **Para 2.5.1** is replaced by the following text:

"**2.5.1** F l e x i b l e h o s e a s s e m b l y is a short length of metallic or non-metallic hose normally with prefabricated end fittings ready for installation. Flexible hose assemblies for essential services or containing either flammable or toxic media shall not exceed 1,5 m in length.".

7 **Para 2.5.5.3** is replaced by the following text:

"**2.5.5.3** Prototype tests shall be carried out for each size of hose assembly. However, for ranges with more than 3 different diameters, the prototype tests shall be carried out for at least:

the smallest diameter;

the largest diameter;

intermediate diameters selected based on the principle that prototype tests carried out for a hose assembly with a diameter D are considered valid only for the diameters ranging between 0,5D and 2D.

For fire resistance tests the specimens shall be selected in accordance with ISO 15540:2016.".

8 **New para 2.5.5.7** is introduced reading as follows:

"**2.5.5.7** Except for prototype tests, each flexible hose assembly shall be tested by test pressure equal to 1,5 times the design pressure during 5 min. No residual deformations or damages are accepted.".

4 ELEMENTS OF THE SYSTEMS AND PIPING

9 **Para 4.3.2.10** is replaced by the following text:

"**4.3.2.10** Bottom and side valves shall be attached to welded pads.

The stud holes shall not penetrate the shell plating and shall be only within the welded pads.

The valves may be also installed on branch pipes welded to the shell plating, provided they are rigid enough and have the minimum length and cathodic protection against contact corrosion. Branch pipes shall be located in readily accessible places for maintenance and for measuring of shell plating thickness under service conditions. The use of flanged joins of *D* and *E* types (refer to 2.4.3.2), thread and mechanical joints to install bottom and side valves below the waterline is not allowed.

For cooling systems of main or auxiliary machinery the wall thickness of a branch pipe shall be at least 12 mm thick. In systems, used for pumping periodically, as well as in blow-off systems thickness of side branch pipes may be taken in accordance with 4.3.2.6.

For ships with aluminium alloy hulls, the thickness of welded side branch pipes may be reduced but shall not be less than the thickness of the shell plating.".

5 PIPING LAYING

10 **Para 5.3.2** is replaced by the following text:

"**5.3.2** Seawater pipes located in cargo holds and in other spaces where pipes may be subject to impacts (e.g., fish holds, chain lockers), shall be protected from mechanical damage. Seawater pipes in cargo holds for dry cargoes, including cargo spaces of container ships, ro-ro ships, shall be protected from impact of cargo where they are liable to be damaged.".

9 SYSTEMS SPECIAL FOR CARRIAGE OF CARGOES IN BULK

11 **Para 9.16.6.11** is replaced by the following text:

"**9.16.6.11** An arrangement shall be provided to connect the inert gas main to the external supply of inert gas. The arrangement shall consist of a flange with bolt connections for a pipe with nominal diameter 250 mm isolated from the inert gas main by means of a valve and fitted forward of the non-return valve specified in 9.16.6.5. Flange design shall comply with the requirements of 2.4.3.".

11 EXHAUST GAS SYSTEM

12 **Para 11.3.2.9** is replaced by the following text:

"**.9** reductant tanks shall be of steel or other equivalent material with a melting point above 925 °C. Plastic integral tanks on FRP ships are allowed if they comply with the requirements of 1.7, Part VI "Fire Protection" as well as for FRP ships, e.g., yachts, fast patrol, navy vessels, etc., generally of less than 500 gross tonnage.

Piping shall be of steel or other equivalent material with a melting point above 925 °C, except downstream of the tank valve, provided this valve is metal seated and arranged as fail-to-closed or with quick closing from a safe position outside the space in the event of fire. In such case, type approved plastic piping may be accepted even if it has not passed a fire endurance test. Reductant tanks and piping systems shall be made with a material compatible with reductant or coated with appropriate anti-corrosion coating;".

20 THERMAL LIQUID SYSTEMS

13 **Para 20.6.3** is replaced by the following text:

"**20.6.3** The use of copper and its alloys is not recommended for the system components contacting the thermal liquid.".

PART IX. MACHINERY

4 GEARS, DISENGAGING AND ELASTIC COUPLINGS

14 **Para 4.2.2.7.1.4** is replaced by the following text:

"**4.2.2.7.1.4** The elasticity factor, which accounts for the material properties of the pinion and wheel material is, for all cases, equal to

$$Z_E = \sqrt{\frac{1}{\pi\left(\frac{1-\nu_1^2}{E_1}+\frac{1-\nu_2^2}{E_2}\right)}}.$$

For steel gears ($E_1 = E_2 = 2{,}06 \cdot 10^5$ MPa, $\nu_1 = \nu_2 = 0{,}3$)

$Z_E = 189{,}8\ \mathrm{MPa}^{0,5}$.

In other cases ISO 6336-2:2019 shall be applied.".

15 **Table 4.2.2.7.1.9-1** is replaced by the following text:

"Table 4.2.2.7.1.9-1

Values of the factor K_1 for the calculation of the factor K_v

Accuracy grade	K_1 According to GOST 1643-81 (ISO 1328-2:2020)					
	3	4	5	6	7	8
Spur gears	2,1	3,9	7,5	14,9	26,8	39,1
Helical gears	1,9	3,5	6,7	13,3	23,9	34,8

".

16 **Para 4.2.2.7.1.9.2** is replaced by the following text:

"**.2** for helical gears with overlap ratio $\varepsilon\beta < 1$ the value of the factor K_v shall be determined by linear interpolation between values determined for spur gears ($K_{v\alpha}$) and helical gears (K_{vb}) in accordance with

$$K_v = K_{v\alpha} - \varepsilon_\beta (K_{v\alpha} - K_{v\beta}) \qquad (4.2.2.7.1.9.2\text{-}1)$$

where $K_{v\alpha}$ = K_v value for spur gears, in accordance with 4.2.2.7.1.9.1;
$K_{v\beta}$ = K_v value for helical gears, in accordance with 4.2.2.7.1.9.1.

This method may be applied only to cases where all the following conditions are satisfied: running velocity in the subcritical range, i.e.:

$$\frac{vz_1}{100}\sqrt{u^2/(1+u^2)} < 10\ m/s$$

where spur gears ($\beta = 0°$) and helical gears ($\beta \leq 30°$);
pinions with relatively low number of teeth $z_1 < 50$;
solid disc wheels or heavy steel gear rim, and to all types of gears if

$$\frac{vz_1}{100}\sqrt{u^2/(1+u^2)} < 3\ m/s$$

(as well as to helical gears where $\beta > 30°$).

For gears other than indicated above, Method B outlined in ISO 6336-1:2019 shall be applied.
The factor K_v accounting for the internally generated dynamic loads in case where the pinion speed exceeds $0{,}85n_{E1}$ shall be determined from Table 4.2.2.7.1.9-2.".

17 **Para 4.2.2.7.1.10**. The first paragraph is replaced by the following text:

"**4.2.2.7.1.10** The face load distribution factor, which accounts for the effect of non-uniform distribution of load along the face width, is determined according to Method C outlined in ISO 6336-1:2019 and defined as follows:".

18 **Para 4.2.2.7.1.11**. The first paragraph is replaced by the following text:

"**4.2.2.7.1.11** The transverse load distribution factor $K_{H\alpha}$ for the simultaneously contacting teeth pairs may be determined by one of the formulae (refer to Method B of ISO 6336- 1:2019):".

19 **Para 4.2.2.7.2.1.** The first paragraph is replaced by the following text:

"**4.2.2.7.2.1** In the absence of test results, the endurance limits for contact stress σ_{Hlim} shall be taken from Table 4.2.2.7.2.1 (refer to ISO 6336-5:2016).".

20 **Para 4.2.2.7.2.2** is replaced by the following text:

"**4.2.2.7.2.2** The life factor Z_N shall be determined according to Method B outlined in ISO 6336-2:2019.
For ahead running, the life factor $Z_N = 1$.
For astern running and in other cases of a limited life Z_N is recommended to take as 1,1.
At the maximum load $T_{1\max}$, the life factor Z_N is equal to:
1,6 — for through-hardened or surface-hardened steel;
1,3 — for gas-nitrided steel;
1,1 — for bath-nitrided steel.".

21 **Para 4.2.2.7.2.6** is replaced by the following text:

"**4.2.2.7.2.6** The roughness factor accounting for the effects of surface roughness is determined by the following formula (refer to ISO 6336-2:2019):

$Z_R = \left(\frac{3}{R_{Z100}}\right)^{C_{ZR}}$.

The condition $Z_R \leq 1{,}15$ shall be considered.

R_{Z100} is determined by means of equations:

$R_{Z100} = R_Z \sqrt[3]{100/a_w}$;

$R_Z \simeq 6\, R_a$;

$R_a = 0{,}5(R_{a1} + R_{a2})$.

If $850\ MPa \leq \sigma_{Hlim} \leq 1200\ MPa$

$C_{ZR} = 0{,}12 + \frac{1000 - \sigma_{Hlim}}{5000}$.

If $\sigma_{Hlim} < 850$ MPa, take $C_{ZL} = 0{,}83;\ C_{Zv} = 0{,}85;\ C_{ZR} = 0{,}15$, and
if $\sigma_{Hlim} > 1200\ MPa\ C_{ZL} = 0{,}91;\ C_{Zv} = 0{,}93;\ C_{ZR} = 0{,}08$.".

22 **Para 4.2.2.7.3**. The first paragraph is replaced by the following text:

"**4.2.2.7.3** The rated values of bending stress in the critical section, in MPa, are calculated separately for the pinion teeth and wheel teeth.

For larger pressure angles (αn) (above 25°) and larger helix angles (β) (above 30°) the calculated results shall be confirmed by experience as by Method A of ISO 6336-3:2019.

For pressure angles (αn) up or equal to 25° and helix angles (β) up or equal to 30° the stresses shall be determined by the following formulae:".

23 **Para 4.2.2.7.3.2**. The text after Figure (refer to Fig. 4.2.2.7.3.2-1) is replaced by the following:

"To determine h_F^* and S_{Fn}^* the calculations are carried out according to Method B of ISO 6336-3:2019:".

24 **Para 4.2.2.7.3.3**. The text before Formula (4.2.2.7.3.3-1) is replaced by the following:

"**4.2.2.7.3.3** The stress correction factor, which account for stress concentration, is determined by the following formula (refer to ISO 6336-3:2019)".

25 **Para 4.2.2.7.4.1**. The text before Table 4.2.2.7.4.1 is replaced by the following:

"**4.2.2.7.4.1** In the absence of test data, the values of endurance limit of teeth in bending are taken from Table 4.2.2.7.4.1 (refer to ISO 6336-5:2016).".

26 **Para 4.2.2.7.4.3** is replaced by the following text:

"**4.2.2.7.4.3** The life factor Y_N shall be determined according to Method B outlined in ISO 6336-3:2019.

For basic ratings, the life factor $Y_N = 1$.

For limited life (when running astern, for instance) $Y_N > 1$ may be permitted on agreement with the Register.

For the maximum load $T_{1\max}$ condition, the values of Y_N are given in Table 4.2.2.7.4.1.".

9 GAS INTERNAL COMBUSTION ENGINES

27 **Para 9.2.1**. The definitions "IGC Code" and "IGF Code" are replaced by the following text:

"I G C C o d e means the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (as amended by IMO resolutions MSC.370(93), MSC.411(97) and MSC.441(99)).

I G F C o d e means the International Code of Safety for Ships Using Gases or other Low Flashpoint Fuels (IMO resolution MSC.391(95) as amended by IMO resolution MSC.422(98)).".

28 **Para 9.12.2.12**. The last paragraph is replaced by the following text:

"However, if they are not rated for the zone they are intended for, it shall be documented that they are suitable for that zone. Documentation and analysis shall be based on IEC 60079-10-1:2015 or IEC 60092-502:1999.".