



RUSSIAN MARITIME REGISTER OF SHIPPING

URGENT RULE CHANGE NOTICE **No. 431-03-2042** dated 08.04.2025

Entry-into-force date:

From the date of publication

Re: amendments to the Collection of the Rules for Containers (Part VIII "Portable Tanks with Fiber-Reinforced Plastics (FRP) Shell" of the Rules for the Manufacture of Containers and the Rules for Technical Supervision of Containers in Service), version 01.01.2025, DN No. 2-090201-014

Requirements for design, manufacture and testing of service equipment made of fiber-reinforced plastic have been introduced.

Instructions on application:

1. Bring the content of the Rule Change Notice 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 Notice in the RS practical activity from the entry-into-force date of the amendments*.

* Provisions of this Notice do not apply for works performed according to the already concluded contracts (contract-requests) on the date of publication of these amendments.

Director General

Sergey A. Kulikov

Person in charge: Gleb D. Lebedev

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+7(812) 315-46-98

PROPOSED AMEDNDMENTS TO THE COLLECTION OF THE RULES FOR CONTAINERS, VERSION 01.01.2025

RESIVION HISTORY

RULES FOR THE MANUFACTURE OF CONTAINERS

PART VIII. PORTABLE TANKS WITH FIBER-REINFORCED PLASTICS (FRP) SHELL

Item	Applied to	Description	Remarks
Para 1.2.1	Containers Products for containers FRP service equipment	Terms and definitions applicable to FRP service equipment have been introduced.	
Section 6	Containers Products for containers FRP service equipment	New Section with requirements for design, manufacture and testing of FRP service equipment has been introduced.	

RULES FOR TECHNICAL SUPERVISION OF CONTAINERS IN SERVICE

Item	Applied to	Description	Remarks
Para 3.5.6	Containers Products for containers FRP service equipment	Requirements for survey of FRP service equipment have been introduced.	

RULES FOR THE MANUFACTURE OF CONTAINERS

PART VIII. PORTABLE TANKS WITH FIBER-REINFORCED PLASTICS (FRP) SHELL

GENERAL

1.2 DEFINITIONS, EXPLANATIONS AND ABBREVIATIONS

Para 1.2.1. Para is supplemented by the following new definitions (listed in accordance with the existing sequence of the Russian version):

"FRP test specimen means an instance of FRP service equipment including gate and seal assemblies subjected to the fire resistance test.

FRP constituents means reinforcement fibers or particles, thermoset or thermoplastic polymer (matrix), adhesives, and additives.

Compression moulding means a process for producing composite parts in a wide range of volumes typically employing a matched metal tool in a heated (normally hydraulic) press to consolidate sheet materials or moulding compounds under pressure.

Inspection sample means a sample cut out from the FRP service equipment to establish the conformity of the serial FRP device to the prototype.

Injection moulding means a process of melting plastic pellets (thermosetting/thermoplastic polymers) and mixing with reinforcement agents like chopped glass fibers. Then, the mixture is metered into a mould with the help of high-pressure pumps or injection cylinders, which fills and solidifies to produce the final product.

FRP service equipment means service equipment as defined in 6.7.2.1 of the IMDG Code made of FRP materials including parts fabricated from other materials, as gate and seal assemblies, metallic parts, e.g. springs, fixings, applicable to both metallic and FRP shells of the portable tanks.

Reinforced reaction injection moulding (RRIM) means a process of mixing of two or more resins together in the mixing chamber to form a thermosetting polymer under high pressure. Reinforcement agents like glass fibers are added to the mixture. Then, the resin mixture is metered into a mould with the help of high-pressure pumps or injection cylinders.

FRP coupon-sample means an FRP sample fabricated and tested in accordance with national and/or international standards to determine design allowables."

New Section 6 is introduced reading as follows:

"6 FRP SERVICE EQUIPMENT

6.1 GENERAL

6.1.1 Scope of application.

6.1.1.1 The requirements of the present Section apply to the FRP service equipment used on UN T1-T23 tank containers (portable tanks).

6.1.1.2 Service equipment other than that indicated in this Section as well as designed for installation on UN T50 and UN T75 tank containers (portable tanks) is subject to separate consideration by RS.

6.1.3 Technical documentation.

6.1.3.1 The scope of the technical documentation submitted for consideration as well as the forms for confirming the compliance of the technical documentation with the RS requirements, are specified in Table 6.1.3.1 and may be changed upon the agreement with RS.

Table 6.1.3.1

No.	Document name	Set ¹	Review result ²	
1	Technical conditions or technical specification	I	A	
2	Operation instruction (manual) ³	II	Ag	
3	Calculation of service equipment strength in accordance with the requirements of 6.2.4 using finite element method or other methods ensuring reliability of the obtained results	I	Ag	
4	Program of:			
	.1	prototype testing	I	A
	.2	series testing	II	A
5	Service equipment drawing	I	A	
6	Marking drawing	II	A	

¹ In case of submission of technical documentation by parts, documents marked with the number (I) should be submitted with the first part. Documents marked with the number (II) may be submitted with the second and subsequent parts. The volume of technical documentation provided with the first part may be changed upon the agreement with RS.

² A — approved; Ag — agreed. If necessary, the documents may be approved and/or agreed subject to the implementation of the comments of the RS letter.

³ The document shall contain criteria for assessing the condition of FRP service equipment at the time of RS periodic inspections during its service life to monitor its condition.

Note. Documents specified in this table may not be provided upon the agreement with RS, if all necessary information is contained in other documents included in the set of technical documentation.

6.1.4 General provisions on design and manufacture.

6.1.4.1 The FRP service equipment shall be designed and manufactured in accordance with national and/or international standards that cover pressurized vessels, as well as take into consideration national and/or international standards applicable to FRP, taking into account the requirements of this Part.

6.1.4.2 A firm (manufacturer) of FRP service equipment shall establish, document, implement and maintain a quality management system in compliance with the requirements of ISO 9001/ GOST R ISO 9001 (updated version) or integrated management system, certified by an accredited certification body of the national accreditation system or in a system of voluntary certification of the RS management systems.

6.1.4.3 FRP service equipment shall be manufactured by compression moulding, injection moulding or hand lay-up. Other manufacturing methods with reference to the technology development may be applied upon RS approval.

6.2 TECHNICAL REQUIREMENTS

6.2.1 FRP service equipment including metallic parts (springs, fixings and etc.) shall be subject to the requirements of 6.7.2.2.11, 6.7.2.5.1 — 6.7.2.5.7, 6.7.2.5.10, 6.7.2.6.3, 6.7.2.8.2, 6.7.2.8.3, 6.7.2.9, 6.7.2.12, 6.7.2.14 and 6.7.2.15 of the IMDG Code.

6.2.3 FRP shall have rigid joints to the tank container (portable tank) shell. The connection design shall cause no local stress concentrations exceeding the design allowables for all operating and test conditions.

6.2.4 Strength test.

6.2.4.1 FRP service equipment in assembly shall be designed and manufactured to withstand a test pressure that is not less than 1,5 times MAWP.

6.2.4.2 Stop valve body, piping devices and pipe fittings intended for filling and discharging shall be designed and manufactured to withstand a pressure that is not less than 4 times MAWP.

6.2.4.3 Considerations shall be given to the special provisions applied to substances specified in the relevant instruction on tank containers (portable tanks), provided in column 13 of the Dangerous Goods List and specified in 4.2.5 of the IMDG Code, or in a special provision on tank containers (portable tanks), specified in column 14 of the Dangerous Goods List and specified in 4.2.5.3 of the IMDG code.

6.2.5 FRP service equipment shall remain operative under environmental conditions with regard to the design temperature range, vibration, operational impacts and conveyed medium range.

6.2.6 FRP service equipment shall meet the requirements of 2.1.1.

6.3 MATERIALS

6.3.1 Plastic binders (resins) and additives shall meet the requirements of 2.3.8.1 and 2.3.8.3.

6.3.2 The use of chopped or continuous fibers of several types is permitted.

6.3.3 Materials shall be compatible with the cargo being transported.

6.4 CALCULATION CRITERIA

6.4.1 FRP service equipment shall be of a design capable of being stress-analyzed mathematically or experimentally by resistance strain gauges, or by other methods approved by RS.

6.4.2 FRP service equipment shall be designed and manufactured to withstand the test pressure, specified in 6.2.4.

6.4.3 At the specified test pressure, the maximum tensile relative deformation measured in mm/mm in the FRP service equipment shall not result in the formation of microcracks, and therefore not be greater than the first measured point of elongation-based fracture or damage of the resin, measured during the tensile tests specified in 4.2.1 and 4.2.2.3.

6.4.4 For the internal test pressure specified in 6.2.4, the failure criterion (FC) shall not exceed the following value:

$$FC = 1/K, \quad (6.4.4-1)$$

where

$$K = K_0 \times K_1 \times K_2 \times K_3 \times K_4 \times K_5, \quad (6.4.4-2)$$

where K – shall be at least 4;

K_0, K_1, K_2, K_3, K_4 – are given in 3.2.3;

K_5 – is a factor related to the deterioration in the material properties due to effects of salt fog spray and ultraviolet exposure. It shall be determined by the formula

$$K_5 = \sigma_n / \sigma_{eff}, \quad (6.4.4-3)$$

where σ_n – is the nominal (under normal conditions) tensile strength of the FRP material;

σ_{eff} – is the tensile strength of the material after consecutive salt fog exposure in accordance with ISO 12944-2 and ISO 12944-6, 168 hours at +35 (±2)°C and ultraviolet exposure in accordance with ISO 4892-2, 168 h at +23 (±2)°C;

A design validation exercise using numerical analysis and a suitable composite failure criterion shall be undertaken to verify that stresses in the FRP service equipment are below the allowables. Suitable composite failure criteria include, but are not limited to strain invariant failure theory, maximum strain, or maximum stress. Other relations for the strength criterion are allowed upon agreement with the competent authority. The method, a proof of suitability for the chosen failure criterion with a list of relevant experiments for all parameters used in the chosen failure criterion, and results of this design validation exercise shall be submitted to RS.

The parameters used in the chosen failure criterion shall be determined using the relevant experiments and the maximum strain in tension specified in 3.2.4, combined with factor of safety K . At least all experiments specified in 6.5.2 shall be performed.

6.4.5 Check calculations of the strength for FRP service equipment and its joints to the portable tank shell shall be performed by finite element method. Treatment of singularities shall be undertaken using appropriate national and/or international standards applied to pressure vessels.

6.5 MATERIAL TESTING

6.5.1 Resins.

During manufacture of the specimens for the materials testing, the resin shall be processed in the same manner as for FRP coupon-samples taking into account mix ratios, resin additives, post-cure, and any other parameters deemed relevant to cure.

Plastic binders (resins) shall comply with 4.2.1.

6.5.2 Coupon-samples.

Coupon-samples shall be manufactured by the same technology as the appropriate FRP service equipment.

6.5.2.1 Ultimate tensile strength and elongation shall be tested in accordance with ISO 527-4 or ISO 527-5 according to reinforcing fibers and layups.

6.5.2.2 FRP compressive properties shall be determined in accordance with ISO 14126.

6.5.2.3 In-plane shear stress/strain response and shear modulus shall be determined in accordance with ISO 20337.

6.5.2.4 Mass density shall be determined in accordance with ISO 1183-1.

6.5.2.5 Mass content and composition of the reinforcement fibers shall be tested in accordance with ISO 1172 or ISO 14127. The fiber mass content of the coupon-samples shall be between 90 % and 100 % of the minimum fiber mass content specified for the appropriate FRP service equipment and obtained from testing of the inspection-samples.

6.5.2.6 Heat distortion temperature shall be tested in accordance with ISO 75-1, ISO 75-2, ISO 75-3 according to reinforcing fibers and layups.

6.5.2.7 Hardness shall be defined in accordance with ISO 868.

6.5.2.8 Creep factor α shall be measured in accordance with 4.2.2.5. The test samples shall be taken in accordance with ISO 14125.

6.5.2.9 Aging factor β shall be determined in accordance with the procedure specified in 4.2.2.6. The test samples shall be taken in accordance with ISO 14125. Testing may be undertaken on either pristine samples or on samples pre-subjected to salt fog spray exposure conditioning as specified in 6.5.2.10.

6.5.2.10 Salt fog exposure test shall be determined in accordance with ISO 12944-2 and ISO 12944-6, 168 hours at +35 (± 2)°C.

6.5.2.11 Ultraviolet exposure test shall be determined in accordance with ISO 4892-2, 168 h at +23 (± 2)°C.

6.5.2.12 The chemical compatibility with the transported substances shall be tested in accordance with 4.2.3.

6.5.3 Additional material tests.

Additional material tests shall be carried out for determination of material properties required for design calculation:

.1 flexural strength shall be measured in accordance with ISO 14125;

.2 bearing test shall be determined in accordance with ISO 12815.

6.5.4 Inspection-samples.

Prior to testing all coatings shall be removed from samples. The tests shall be carried out in accordance with 6.5.2.1 — 6.5.2.8.

6.6 TESTING AND INSPECTION

6.6.1 General.

6.6.1.1 Tests of service equipment shall be performed in accordance with the RS approved technical documentation.

The tests shall be carried out in the sequence specified in the technical documentation, except for the shell strength test, which shall be performed first.

6.6.1.2 For service equipment size ranges covering seven sizes or more, prototype tests shall be conducted on three sizes. If the size range is limited to six sizes, the number of sizes tested may be reduced to two sizes.

6.6.1.3 Tests to be carried out for service equipment are listed in Table 6.6.1.3.

Table 6.6.1.3

No.	Testing name	Requirements of the RS Rules	Prototype	Serial production
1	Testing of all types of service equipment			
1.1	Visual testing ¹	—	x	x
1.2	Assembly strength test	6.2.4.1	x	x
1.3	Assembly leakproofness test	6.6.3	x	x
1.4	Assembly fire resistance test	6.7	x	—
1.5	Assembly electrical resistance test ²	—	x	x ³
1.6	Assembly functional tests at minimum operating temperature	6.6.4	x	—
1.7	Checking of marking	6.8	x	x
2	Safety valves testing			
2.1	Testing under ISO 4126-1	—	x	x ⁴
3	Stop devices testing			
3.1	Shell strength testing	6.2.4.2	x	—
3.2	Service life test ⁵	—	x	—
¹ In accordance with international or national standards, for example ISO 5208. ² The electrical surface resistance of the inside and outside surfaces of the FRP service equipment shall not exceed 10 ⁹ Ohm. ³ At least 10 % of a batch. ⁴ Each production sample shall be pressure tested only at the beginning of opening, full opening and full closing time. ⁵ Necessity and scope of tests are determined by the designer on agreement with the customer depending on the purpose and operating conditions.				

6.6.1.4 Subject to RS agreement, equivalent test methods, equipment and procedures may be used in accordance with national or international standards.

6.6.2 Strength test.

6.6.2.1 The strength test shall be carried out in accordance with applicable requirements of 3.9.2.1 of the Rules for Technical Supervision During Manufacture of Containers, Materials and Products for Containers.

6.6.3 Leakproofness test.

6.6.3.1 If the results of strength test of assembled FRP service equipment are satisfactory, the service equipment shall be subjected to leakproofness test.

The test pressure shall be 0,25 — 0,9 of the MAWP which is subject to review by RS on a case-by-case basis.

The FRP service equipment shall be pressurized for the time required for a complete leakproofness test, but not less than 5 min.

There shall be no pressure drop during the test. Leakproofness of the service equipment shall be maintained.

6.6.4 Functional tests at minimum operating temperature.

6.6.4.1 Functional test of service equipment is carried out at the minimum operating temperature.

6.6.4.2 Stop valves are tested at a pressure equal to the operating pressure of the medium with at least three "open — close" cycles. Valves shall be opened (closed) completely by the standard control body by force or torque specified in the approved technical documentation. The number of cycles shall be in accordance with the approved technical documentation. The tightness of stop valves shall be maintained after each cycle.

6.6.4.3 At least 3 "open — close" cycles shall be performed for full opening and closing of a pressure relief valve. The tightness of relief valves shall be maintained after each cycle.

6.6.4.4 Leakproofness of the service equipment shall be maintained after warming up to a temperature of 20 (±2) °C.

6.6.5 Test report.

The test report of a service equipment prototype shall include as least the following:

- .1 test results of the materials (or a reference to the materials test report) used for fabrication of FRP service equipment in accordance with 6.5.1 — 6.5.3;
- .2 test results in accordance with Table 6.6.1.3;
- .3 results of other tests prescribed in applicable pressure equipment standards or codes in agreement with RS (if applicable).

6.7 FIRE RESISTANCE TEST

6.7.1. General.

6.7.1.1 The fire resistance test shall be conducted by the test laboratories recognized by RS or having state accreditation to perform this type of test.

Requirements for testing laboratories are specified in 10.1 and 10.3.2, Part I "General Regulations for Technical Supervision" of the Rules of Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships.

6.7.1.2 Equivalent test methods, equipment and procedures subject to RS agreement may be used in accordance with national or international standards.

6.7.2. Test method.

6.7.2.1 The fire resistance test is carried out for the test specimen installed in a closed position, filled with water with initial temperature of 20 ± 5 °C under maximum allowable working pressure (MAWP) and exposures to flame for at least 30 min.

Pressure relief devices are subjected to pressure, which is 10 % below nominal pressure set to discharge.

The test specimen shall be completely engulfed in the flame including the gate and seal assemblies. The general test scheme is given in Fig. 6.7.2.1. If the test specimen is a part of equipment which is not intended to be the outermost closure in a multi-closure system (such as a valve), the test specimen may be equipped with a blind flange, at its outermost interface which would otherwise be exposed to flame during the test.

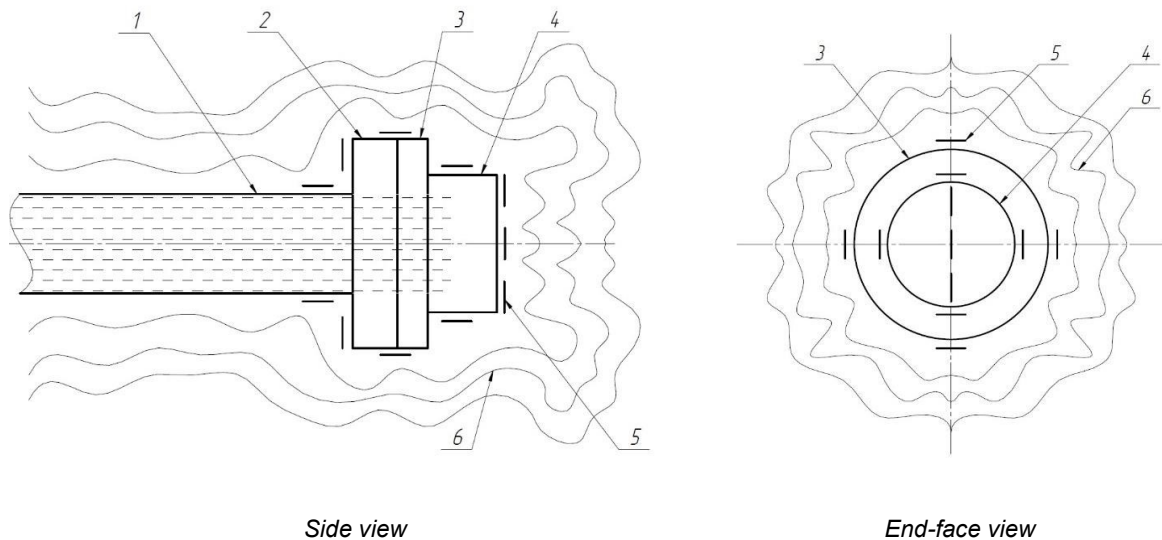


Fig. 6.7.2.1

Fire resistance test scheme:

- 1 — pressure system with water supply, 2 — fixture to join the test specimen to the pressure system, 3 — flange of the test specimen, 4 — test specimen, 5 — temperature and heat flow measuring system, 6 — flame

6.7.2.2 The fire exposure parameters shall comply with 4.3.5. The fire shall be equivalent to a theoretical fire with a flame temperature of 800 °C, emissivity of 0,9 and a minimum net heat flux of 75 kW/m² calibrated in accordance with ISO 21843:2018.

6.7.2.3 The intensity of heat exposure shall be measured using temperature and heat flux sensors in accordance with the requirements of ISO 21843-2018.

6.7.3 Test apparatus.

6.7.3.1 General requirements.

6.7.3.1.1 The fire resistance test bed shall generally include:

- .1 a fire chamber with dimensions sufficient to accommodate the test specimen and the temperature and heat flux measuring system;
- .2 a fuel supply and combustion system;
- .3 a pressure system with water supply ((1) in Fig. 6.7.2.1);
- .4 a fixture to join the test specimen to the test bed ((2) in Fig. 6.7.2.1);
- .5 a temperature and heat flux measuring system ((5) in Fig. 6.7.2.1) in accordance with ISO 21843:2018.

6.7.3.1.2 The specific types of testing equipment may be modified and supplemented in accordance with the requirements of the testing laboratory.

6.7.3.1.3 The test bed facilities shall not expose the test specimen to external influences that can affect the test results.

6.7.3.1.4 The heat regime shall be provided by burning liquid fuel or gas.

6.7.3.1.5 The test bed shall ensure uniform flame coverage of the test specimen.

6.7.3.1.6 The firing chamber shall provide a horizontal gap between any part of the test specimen and its own shell of at least 150 mm.

6.7.3.1.7 The fire source (nozzles) shall be located at least 150 mm away from the test specimen and temperature sensors and shall provide sufficient power to ensure that the test specimen is completely engulfed in flame.

6.7.3.1.8 The fuel supply and combustion system shall be controlled.

6.7.3.2 Requirements for the measuring system.

6.7.3.2.1 During the test the following parameters shall be measured:

- .1 temperature and heat flux on the surface of the test specimen;
- .2 internal pressure during fire and cooling (pressure gauge records);
- .3 leakproofness of the test specimen.

6.7.3.2.2 The general scheme of installation of the test specimen and temperature and heat flow sensors is shown in Fig. 6.7.2.1.

6.7.3.2.3 Measurement tolerances shall not be more than:

- ± 3 % when measuring pressures;
- ± 5 % when measuring temperature and heat flux;
- ± 2 % when measuring time.

6.7.4 Test procedure.

6.7.4.1 The temperature and heat flux sensors shall be installed and calibrated in accordance with ISO 21843.

6.7.4.2 Before the test, the test specimen and attachments shall be completely filled with water.

6.7.4.3 After the system is completely filled with water, the system shall be loaded with MAWP at a temperature of 20 °C. Then the leakproofness of the test specimen and pipelines shall be checked.

6.7.4.4 The fuel supply to the burners shall be opened, ignited and the flame be adjusted with a control valve. The fire parameters shall be maintained in accordance with 6.7.2.2 for, at least, 30 min. The temperature and heat flux are recorded every 30 s with separate records for each sensor during the test.

6.7.4.5 The fuel supply shall be turned off after the test (at least 30 min after the test).

6.7.4.6 The test specimen shall be removed after complete cooling (wall temperature less than 50 °C).

6.7.5 Performance criteria.

6.7.5.1 The test specimen shall demonstrate leakproofness under MAWP after fire exposure and cooling. At least 3 "open — close" cycles shall be performed for pressure relief devices, unless otherwise agreed with RS.

6.7.6 Test report.

6.7.6.1 The test report shall contain:

- .1 the name of the organization conducting tests;
- .2 the name of FRP service equipment manufacturer;
- .3 the date of fire resistance tests;
- .4 a description of the FRP service equipment, including dimensions, weight, diameter of the gate section, body and lid materials, seal material, marking;

- .5 a recording of the controlled parameters in accordance with 6.7.3.2 and the results of their processing and analysis;
- .6 the results of visual observations;
- .7 a description of the damage or failure (if any);
- .8 the start time of the test (ignition of the burners);
- .9 the conclusion on the compliance or non-compliance of the FRP service equipment with the requirements of 6.7.5.

6.7.7 Safety requirements.

As the fire resistance test of the FRP service equipment is potentially dangerous, the safety of personnel shall be ensured. Considering the possibility of failure of the test, protective screens and other appropriate means to protect personnel shall be used.

6.8 MARKING OF FRP SERVICE EQUIPMENT

6.8.1 Relief (safety) devices.

6.8.1.1 Each relief device shall be marked as follows:

- .1 name of the manufacturer and the serial number of the equipment;
- .2 name (grade) of body and seal materials and a reference(s) to standard(s) for material(s);
- .3 RS type approval certificate number;
- .4 working pressure (MPa or bar);
- .5 the allowable tolerance at the discharge pressure for spring-loaded devices;
- .6 the rated flow capacity of spring-loaded pressure relief devices under normal conditions (external pressure is 1 bar and ambient temperature is 0 °C) in standard (normal) cubic meters of air per second, m³/s (determined in accordance with 6.7.2.13.2 of the IMDG Code);
- .7 cross-sectional area of spring-loaded pressure relief devices, mm²;
- .8 maximum allowable working pressure (MAWP), MPa or bar;
- .9 external design pressure (if relevant), MPa or bar;
- .10 design temperature range.

6.8.2 Stop valves.

6.8.2.1 Each stop valve shall be marked as follows:

- .1 name of the manufacturer and the serial number of the equipment;
- .2 name (grade) of body and seal materials and a reference(s) to standard(s) for material(s);
- .3 RS type approval certificate number;
- .4 designation (type) of the stop device;
- .5 nominal diameter, mm;
- .6 maximum allowable working pressure (MAWP), MPa or bar;
- .7 test pressure, MPa or bar;
- .6 direction of medium flow;
- .8 design temperature range."

RULES FOR TECHNICAL SUPERVISION OF CONTAINERS IN SERVICE

3 PERIODICAL SURVEYS

3.5 SURVEY OF TANK CONTAINERS WITH FIBER-REINFORCED PLASTICS

New para 3.5.6 is introduced reading as follows:

"3.5.6 Service equipment.

3.5.6.1 Periodic inspections and testing of FRP service equipment shall be carried out during survey of tank containers in accordance with 3.5.1 — 3.5.3 as per survey program approved by RS in compliance with 6.1.3.1, Part VIII "Portable Tanks with Fiber-Reinforced Plastics (FRP) Shell" of the Rules for the Manufacture of Containers.

3.5.6.2 Repair work of FRP service equipment shall be limited to replacement of damaged components by the RS-approved components."