

**RUSSIAN MARITIME REGISTER OF SHIPPING**

HEAD OFFICE

CIRCULAR LETTERNo. 314-26-863_c

dated 15.02.2016

Re:

Amendments to Appendix 1, Part II "Hull" of the Rules for the Classification and Construction of Sea-Going Ships, 2016, ND No. 2-020101-087-E

Item of technical supervision:

Ships under construction

Implementation 15.02.2016

Valid: till -

Validity period extended till -

Cancels / Amends/ Supplements Circular Letter No. - dated -

Number of pages: 1+9

Appendices: Appendix 1 "Testing Procedures of Watertight Compartments", Part II "Hull" of the Rules for the Classification and Construction of Sea-Going Ships, 2016, ND No. 2-020101-087-E

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Amends Appendix 1, Part II "Hull" of the Rules for the Classification and Construction of Sea-Going Ships, 2016, ND No. 2-020101-087-E

It is necessary to do the following:

- 1) Since 15 February 2016 apply the provisions of the Circular Letter in the practical activity.
- 2) Bring the content of the Circular Letter to the notice of the RS surveyors, interested organizations and shipowners in the area of the RS Branch Offices' activity.

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DMS "THESIS"
No.

No.15-317577

RULES FOR THE CLASSIFICATION AND CONSTRUCTION OF SEA-GOING SHIPS, 2016,
ND No. 2-020101-087-E

PART II. HULL

The text of Appendix 1 shall be amended to read:

“APPENDIX 1

TESTING PROCEDURES OF WATERTIGHT COMPARTMENTS

1 GENERAL

These test procedures shall confirm the watertightness of tanks and watertight boundaries and the structural adequacy of tanks which consist of the watertight subdivision of ships. These procedures may also be applied to verify the weathertightness of structures and shipboard outfitting. The tightness of all tanks and watertight boundaries of ships during new construction and those relevant to major conversions or major repairs¹ shall be confirmed by these test procedures prior to the delivery of the ship.

2 APPLICATION

2.1 All gravity tanks² and other boundaries required to be watertight or weathertight shall be tested in accordance with this Appendix and proven to be tight and structurally adequate as follows:

gravity tanks for their tightness and structural adequacy;
watertight boundaries other than tank boundaries for their watertightness; and
weathertight boundaries for their weathertightness.

2.2 The testing of cargo containment systems of liquefied gas carriers shall be in accordance with standards deemed appropriate by the Register.

2.3 The testing of structures not listed in Table 1 or 2 shall be specially considered.

3 TYPES OF TESTS AND DEFINITION OF TESTS

3.1 The following two types of tests are specified in this Appendix:

S t r u c t u r a l t e s t is a test to verify the structural adequacy of tank construction. This may be a hydrostatic test or, where the situation warrants, a hydropneumatic test;

L e a k t e s t is a test to verify the tightness of a boundary. Unless a specific test is indicated, this may be a hydrostatic/hydropneumatic test or an air test. A hose test may be considered an acceptable form of leak test for certain boundaries, as indicated by Footnote 9 of Table 1.

¹Major repair means a repair affecting structural integrity.

²Gravity tank means a tank that is subject to vapour pressure not greater than 70 kPa.

3.2 Definition of each type of test is as follows:

Hydrostatic test: (Leak and structural)	A test wherein a space is filled with a liquid to a specified head.
Hydropneumatic test: (Leak and structural)	A test combining a hydrostatic test and an air test, wherein a space is partially filled with a liquid and pressurized with air.
Hose test: (Leak)	A test to verify the tightness of a joint by a jet of water with the joint visible from the opposite side.
Air tests: (Leak)	A test to verify tightness by means of air pressure differential and leak indicating solution. It includes tank air test and joint air tests, such as compressed air fillet weld tests and vacuum box tests.
Compressed air fillet weld test: (Leak)	An air test of fillet welded tee joints wherein leak indicating solution is applied on fillet welds.
Vacuum box test: (Leak)	A box over a joint with leak indicating solution applied on the welds. A vacuum is created inside the box to detect any leaks.
Ultrasonic test: (Leak)	A test to verify the tightness of the sealing of closing devices such as hatch covers by means of ultrasonic detection techniques.
Penetration test: (Leak)	A test to verify that no visual dye penetrant indications of potential continuous leakages exist in the boundaries of a compartment by means of low surface tension liquids (i.e. dye penetrant test).

4 TEST PROCEDURES

4.1 General.

Tests shall be carried out in the presence of the RS surveyor at a stage sufficiently close to the completion of work with all hatches, doors, windows, etc., installed and all penetrations including pipe connections fitted, and before any ceiling and cement work is applied over the joints. Specific test requirements are given in 4.4 and Table 1. For the timing of the application of coating and the provision of safe access to joints, refer to 4.5, 4.6 and Table 3.

Table 1

Test requirements for tanks and boundaries

Nos.	Tank or boundary to be tested	Test type	Test head or pressure	Remarks
1	Double bottom tanks ¹	Leak and structural ²	The greater of: top of the overflow; to 2,4 m above top of tank ³ ; or to bulkhead deck	
2	Double bottom voids ⁴	Leak	Refer to 4.4.4 through 4.4.6, as applicable	Including pump room double bottom and bunker tank protection double hull required by MARPOL Annex I

Nos.	Tank or boundary to be tested	Test type	Test head or pressure	Remarks
3	Double side tanks	Leak and structural ²	The greater of: top of the overflow, to 2,4 m above top of tank ³ ; or to bulkhead deck	
4	Double side voids	Leak	Refer to 4.4.4 through 4.4.6, as applicable	
5	Deep tanks other than those listed elsewhere in this table	Leak and structural ²	The greater of: top of the overflow, or to 2,4 m above top of tank ³	
6	Cargo oil tanks	Leak and structural ²	The greater of: top of the overflow, to 2,4 m above top of tank ³ , or to top of tank ³ plus setting of any pressure relief valve	
7	Ballast hold of bulk carriers	Leak and structural ²	Top of cargo hatch coaming	
8	Peak tanks	Leak and structural ²	The greater of: top of the overflow, or to 2,4 m above top of tank ³	After peak to be tested after installation of stern tube
9	.1 Fore peak spaces with equipment	Leak	Refer to 4.4.3 through 4.4.6, as applicable	
	.2 Fore peak voids	Leak and structural ^{2, 5}	To bulkhead deck	
	.3 Aft peak spaces with equipment	Leak	Refer to 4.4.3 through 4.4.6, as applicable	
	.4 Aft peak voids	Leak	Refer to 4.4.4 through 4.4.6, as applicable	After peak to be tested after installation of stern tube
10	Cofferdams	Leak	Refer to 4.4.4 through 4.4.6, as applicable	
11	.1 Watertight bulkheads	Leak ⁶	Refer to 4.4.3 through 4.4.6, as applicable ⁷	
	.2 Superstructure end bulkheads	Leak	Refer to 4.4.3 through 4.4.6, as applicable	
12	Watertight doors below freeboard or bulkhead deck	Leak ^{7, 8}	Refer to 4.4.3 through 4.4.6, as applicable	
13	Double plate rudder blades	Leak	Refer to 4.4.4 through 4.4.6, as applicable	

Nos.	Tank or boundary to be tested	Test type	Test head or pressure	Remarks
14	Shaft tunnels clear of deep tanks	Leak ⁹	Refer to 4.4.3 through 4.4.6, as applicable	
15	Shell doors	Leak ⁹	Refer to 4.4.3 through 4.4.6, as applicable	
16	Weathertight hatch covers and closing appliances	Leak ^{7, 9}	Refer to 4.4.3 through 4.4.6, as applicable	Hatch covers closed by tarpaulins and battens excluded
17	Dual purpose tanks/dry cargo hatch covers	Leak ^{7, 9}	Refer to 4.4.3 through 4.4.6, as applicable	In addition to structural test in item 6 or 7
18	Chain lockers	Leak and structural ²	Top of chain pipe	
19	Lubricating oil sump. tanks and other similar tanks/spaces under main engines	Leak	Refer to 4.4.3 through 4.4.6, as applicable	
20	Ballast ducts	Leak and structural ²	The greater of: ballast pump maximum pressure; or setting of any pressure relief valve	
21	Fuel oil tanks	Leak and structural ²	The greater of: top of the overflow; to 2,4 m above top of tank ³ ; or to top of tank ³ plus setting of any pressure relief valves; or to bulkhead deck	
22	Sea chests and ice boxes	Leak and structural	The greater of: head to 1,25 m depthwise; or equal to blow system pressure	When testing ice boxes fitted with steam heating system, the test head shall in any case be below the heating system design pressure. Where air pipes are led through ice boxes, the tests are carried out by applying the hydraulic head to top of the overflow

¹Including tanks arranged in accordance with the provisions of SOLAS regulation II-1/9.4.

²Refer to section 4.2.2.

³The top of a tank is the deck forming the top of the tank, excluding any hatchways.

⁴Including duct keels and dry compartments arranged in accordance with the provisions of SOLAS regulation II-1/11.2 and II-1/9.4 respectively, and/or oil fuel tank protection and pump room bottom protection arranged in accordance with the provisions of MARPOL Annex I, Chapter 3, Part A regulation 12 and Chapter 4, Part A, regulation 22 respectively.

Nos.	Tank or boundary to be tested	Test type	Test head or pressure	Remarks
⁵ Structural test may be waived where demonstrated to be impracticable to the satisfaction of the Register. ⁶ A "Leak and structural test", refer to 4.2.2 shall be carried out for a representative cargo hold if intended for in-port ballasting. The filling level requirement for testing cargo holds intended for in-port ballasting shall be the maximum loading that will occur in-port as indicated in the Loading Manual. ⁷ As an alternative to the hose testing, other testing methods listed in 4.4.7 to 4.4.9 may be applicable subject to adequacy of such testing methods being verified. Refer to SOLAS regulation II-1/11.1. For watertight bulkheads (refer to 11.1) alternatives to the hose testing may only be used where a hose test is not practicable. ⁸ Where water tightness of a watertight door has not been confirmed by prototype test, testing by filling watertight spaces with water shall be carried out. Refer to SOLAS regulation II-1/16.2 and IMO circular MSC/Circ.1176. ⁹ Hose test may also be considered as a medium of the test. Refer to 3.2.				

4.2 Structural test procedures.

4.2.1 Type and time of test.

Where a structural test is specified in Table 1 or Table 2, a hydrostatic test in accordance with 4.4.1 will be acceptable. Where practical limitations (strength of building berth, light density of liquid, etc.) prevent the performance of a hydrostatic test, a hydropneumatic test in accordance with 4.4.2 may be accepted instead.

A hydrostatic test or hydropneumatic test for the confirmation of structural adequacy may be carried out while the ship is afloat, provided the results of a leak test are confirmed to be satisfactory before the ship is afloat.

4.2.2 Testing schedule for new construction or major structural conversion.

4.2.2.1 The tank boundaries shall be tested from at least one side. The tanks for structural test shall be selected so that all representative structural members are tested for the expected tension and compression.

4.2.2.2 Structural tests shall be carried out for at least one tank of a group of tanks having structural similarity (i.e. same design conditions, alike structural configurations with only minor localized differences determined to be acceptable by the attending RS surveyor) on each ship provided all other tanks are tested for leaks by an air test. The acceptance of leak testing using an air test instead of a structural test does not apply to cargo space boundaries adjacent to other compartments in tankers and combination carriers or to the boundaries of tanks for segregated cargoes or pollutant cargoes in other types of ships.

Table 2

Additional test requirements for special service ships/tanks

Nos.	Type of ship/tank	Structures to be tested	Type of test	Test head or pressure	Remarks
1	Liquefied gas carriers	Integral tanks	Leak and structural	Refer to IACS UR G1	
		Hull structure supporting membrane or semimembrane tanks			
		Independent tanks type A			

		Independent tanks type B			
		Independent tanks type C		Refer to IACS UR G2	
2	Edible liquid tanks	Independent tanks	Leak and structural	The greater of: top of the overflow; or to 0,9 m above top of tank ¹	
3	Chemical tankers	Integral or independent cargo tanks	Leak and structural	The greater of: to 2.4 m above top of tank ¹ ; or to top of tank ¹ plus setting of any pressure relief valve	Where a cargo tanks is designed for the carriage of cargoes with specific gravities larger than 1,0, an appropriate additional head shall be considered
¹ Top of tank is deck forming the top of the tank excluding any hatchways.					

Table 3

Application of leak test, coating and provision of safe access for type of welded joints

Type of welded joints		Leak test	Coating ¹		Safe access ²	
			Before leak test	After leak test but before structural test	Leak test	Structural test
Butt	Automatic	Not required	Allowed ³	N/A	Not required	Not required
	Manual or semi-automatic ⁴	Required	Not allowed	Allowed	Required	Not required
Fillet	Boundary including penetrations	Required	Not allowed	Allowed	Required	Not required
¹ Coating refers to internal (tank/hold coating), where applied, and external (shell/deck) painting. It does not refer to shop primer. ² Temporary means of access for verification of the leak test. ³ The condition applies provided that the welds have been carefully inspected visually to the satisfaction of the RS surveyor. ⁴ Flux core arc welding (FCAW) semiautomatic butt welds need not be tested provided that careful visual inspections show continuous uniform weld profile shape, free from repairs, and the results of NDT show no significant defects.						

4.2.2.3 Additional tanks may require structural testing if found necessary after the structural testing of the first tank.

4.2.2.4 Where the structural adequacy of the tanks of a ship were verified by the structural testing required in Table 1, subsequent ships in the series (i.e. sister ships built from the same plans at the same shipyard) may be exempted from the structural testing of tanks, provided that:

.1 watertightness of boundaries of all tanks is verified by leak tests and thorough inspections are carried out;

.2 structural testing is carried out for at least one tank of each type among all tanks of each sister ship;

.3 additional tanks may require structural testing if found necessary after the structural testing of the first tank or if deemed necessary by the attending RS surveyor.

For cargo space boundaries adjacent to other compartments in tankers and combination carriers or boundaries of tanks for segregated cargoes or pollutant cargoes in other types of ships, the requirements of 4.2.2.2 shall apply in lieu of 4.2.2.4.2.

4.2.2.5 Sister ships built (i.e. keel laid) two years or more after the delivery of the last ship of the series, may be tested in accordance with 4.2.2.4 at the discretion of the Register, provided that:

.1 general workmanship has been maintained (i.e. there has been no discontinuity of shipbuilding or significant changes in the construction methodology or technology at the yard, shipyard personnel are appropriately qualified and demonstrate an adequate level of workmanship as determined by the Register); and

.2 an enhanced NDT program is implemented for the tanks not subject to structural tests.

4.2.2.6 For the watertight boundaries of spaces other than tanks structural testing may be exempted, provided that the watertightness of boundaries of exempted spaces is verified by leak tests and inspections. Structural testing may not be exempt and the requirements for structural testing of tanks in 4.2.2.1 to 4.2.2.5 shall apply, for ballast holds, chain lockers and a representative cargo hold if intended for in-port ballasting.

4.3 Leak test procedures.

For the leak tests specified in Table 1, tank air tests, compressed air fillet weld tests, vacuum box tests in accordance with 4.4.4 to 4.4.6, or their combination, will be acceptable. Hydrostatic or hydropneumatic tests may also be accepted as leak tests provided that 4.5, 4.6 and 4.7 are complied with. Hose tests will also be acceptable for such locations as specified in Table 1, Footnote 9, in accordance with 4.4.3.

Air tests of joints may be carried out in the block stage provided that all work on the block that may affect the tightness of a joint is completed before the test. Refer also to 4.5.1 for the application of final coatings and 4.6 for the safe access to joints and the summary in Table 3.

4.4 Tests methods.

4.4.1 Hydrostatic test.

Unless another liquid is approved, hydrostatic tests shall consist of filling the space with fresh water or sea water, whichever is appropriate for testing, to the level specified in Table 1 or Table 2.

In cases where a tank for higher density cargoes shall be tested with fresh water or sea water, the testing pressure height shall be specially considered.

All external surfaces of the tested space shall be examined for structural distortion, bulging and buckling, other related damage and leaks.

4.4.2 Hydropneumatic test.

Hydropneumatic tests, where approved, shall be such that the test condition, in conjunction with the approved liquid level and supplemental air pressure, will simulate the actual loading as far as practicable. The requirements and recommendations for tank air tests in 4.4.4 will also apply to hydropneumatic tests.

All external surfaces of the tested space shall be examined for structural distortion, bulging and buckling, other related damage and leaks.

4.4.3 Hose test.

Hose tests shall be carried out with the pressure in the hose nozzle maintained at least at $2 \cdot 10^5$ Pa during the test. The nozzle shall have a minimum inside diameter of 12 mm and be at a perpendicular distance from the joint not exceeding 1,5 m. The water jet shall impinge directly upon the weld.

Where a hose test is not practical because of possible damage to machinery, electrical equipment insulation or outfitting items, it may be replaced by a careful visual examination of welded connections, supported where necessary by means such as a dye penetrant test or ultrasonic leak test or the equivalent.

4.4.4 Tank air test.

All boundary welds, erection joints and penetrations, including pipe connections, shall be examined in accordance with the approved procedure and under a stabilized pressure differential above atmospheric pressure not less than $0,15 \cdot 10^5$ Pa, with a leak indicating solution such as soapy water/detergent or a proprietary brand applied.

A U-tube with a height sufficient to hold a head of water corresponding to the required test pressure shall be arranged. The cross sectional area of the U-tube shall not be less than that of the pipe supplying air to the tank. Instead of using a U-tube, two calibrated pressure gauges may be acceptable to verify required test pressure.

A double inspection shall be made of tested welds. The first shall be immediately upon applying the leak indicating solution; the second shall be after approximately four or five minutes in order to detect those smaller leaks which may take time to appear.

4.4.5 Compressed air fillet weld test.

In this air test, compressed air is injected from one end of a fillet welded joint and the pressure verified at the other end of the joint by a pressure gauge. Pressure gauges shall be arranged so that an air pressure of at least $0,15 \cdot 10^5$ Pa can be verified at each end of all passages within the portion being tested.

Note. Where a leak test is required for fabrication involving partial penetration welds, a compressed air test shall also be applied in the same manner as to fillet weld where the root face is large, i.e. 6 to 8 mm.

4.4.6 Vacuum box test.

A box (vacuum testing box) with air connections, gauges and an inspection window is placed over the joint with a leak indicating solution applied to the weld cap vicinity. The air within the box is removed by an ejector to create a vacuum of $0,20 \cdot 10^5$ to $0,26 \cdot 10^5$ Pa inside the box.

4.4.7 Ultrasonic test.

An ultrasonic echoes transmitter shall be arranged inside of a compartment and a receiver shall be arranged on the outside. The watertight/weathertight boundaries of the compartment are scanned with the receiver in order to detect an ultrasonic leak indication. A location where sound is detectable by the receiver indicates a leakage in the sealing of the compartment.

4.4.8 Penetration test.

A test of butt welds or other weld joints uses the application of a low surface tension liquid at one side of a compartment boundary or structural arrangement. If no liquid is detected on the opposite sides of the boundaries after expiration of a definite period of time, this indicates tightness of the boundaries. In certain cases, a developer solution may be painted or sprayed on the other side of the weld to aid leak detection.

4.4.9 Other tests.

Other methods of testing may be considered by Register upon submission of full particulars prior to the commencement of testing.

4.5 Application of coating.

4.5.1 Final coating.

For butt joints welded by an automatic process, the final coating may be applied any time before the completion of a leak test of spaces bounded by the joints, provided that the welds have been carefully inspected visually to the satisfaction of the RS surveyor.

RS surveyor reserves the right to require a leak test prior to the application of the final coating over automatic erection butt welds.

For all other joints, the final coating shall be applied after the completion of the leak test of the joint. Refer also to Table 3.

4.5.2 Temporary coating.

Any temporary coating which may conceal defects or leaks shall be applied at the time as specified for the final coating (refer to 4.5.1). This requirement does not apply to shop primer.

4.6 Safe access to joints.

For leak tests, safe access to all joints under examination shall be provided. Refer also to Table 3.

4.7 Hydrostatic or hydropneumatic tightness test.

In cases where the hydrostatic or hydropneumatic tests are applied instead of a specific leak test, examined boundaries shall be dew-free, otherwise small leaks are not visible.