S14 Testing Procedures of Watertight Compartments

(1996) (Rev.1 Feb 2001) (Rev.2 May 2001) (Rev.3 May 2010)

S14.1 General

S14.1.1 Definitions

Shop primer is a thin coating applied after surface preparation and prior to fabrication as a protection against corrosion during fabrication.

Protective coating is a final coating protecting the structure from corrosion.

Structural testing is a hydrostatic test carried out to demonstrate the tightness of the tanks and the structural adequacy of the design. Where practical limitations prevail and hydrostatic testing is not feasible (for example when it is difficult, in practice, to apply the required head at the top of the tank), hydropneumatic testing may be carried out instead. When a hydropneumatic testing is performed, the conditions should simulate, as far as practicable, the actual loading of the tank.

Hydropneumatic testing is a combination of hydrostatic and air testing, consisting in filling the tank with water up to its top and applying an additional air pressure. The value of the additional air pressure is at the discretion of the Society, but is to be at least as defined in S14.2.2.

Leak testing is an air or other medium test carried out to demonstrate the tightness of the structure.

Hose testing is carried out to demonstrate the tightness of structural items not subjected to hydrostatic or leak testing and to other components which contribute to the watertight or weathertight integrity of the hull.

S14.1.2 Application

The following requirements determine the testing conditions for:

- gravity tanks, excluding independent tanks of less than 5 m^3 in capacity,
- watertight or weathertight structures.

The purpose of these tests is to check the tightness and/or the strength of structural elements at the time of the ship's construction and on the occasion of major repairs.

Tests are to be carried out in the presence of the Surveyor at a stage sufficiently close to completion so that any subsequent work would not impair the strength and tightness of the structure.

For the general testing requirements, see items S14.3 and S14.4.

This UR does not apply to CSR Bulk Carriers and Oil Tankers.

S14.2 Testing methods

S14.2.1 Structural testing

S14 (cont)

Structural testing may be carried out after application of the shop primer.

Structural testing may be carried out after the protective coating has been applied, provided that one of the following two conditions is satisfied:

a) all the welds are completed and carefully inspected visually to the satisfaction of the Surveyor prior to the application of the protective coating,

b) leak testing is carried out prior to the application of the protective coating.

In absence of leak testing, protective coating should be applied after the structural testing of:

- all erection welds, both manual and automatic,

- all manual fillet weld connections on tank boundaries and manual penetration welds.

S14.2.2 Leak testing

Where leak testing is carried out, in accordance with Table 1, an air pressure of 0.15×10^5 Pa is to be applied during the test.

Prior to inspection, it is recommended that the air pressure in the tank is raised to 0.20×10^5 Pa and kept at this level for about 1 hour to reach a stabilized state, with a minimum number of personnel in the vicinity of the tank, and then lowered to the test pressure.

Individual Societies may accept that the test is conducted after the pressure has reached a stabilized state at 0.20×10^5 Pa, without lowering the pressure, provided they are satisfied of the safety of the personnel involved in the test.

Welds are to be coated with an efficient indicating liquid.

A U-tube filled with water up to a height corresponding to the test pressure is to be fitted to avoid overpressure of the compartment tested and verify the test pressure. The U-tube should have a cross section larger than that of the pipe supplying air.

In addition, the test pressure is also to be verified by means of one master pressure gauges. The Society may accept alternative means which are considered to be equivalently reliable.

Leak testing is to be carried out, prior to the application of a protective coating, on all fillet weld connections on tank boundaries, penetrations and erection welds on tank boundaries excepting welds made by automatic processes. Selected locations of automatic erection welds and pre-erection manual or automatic welds may be required to be similarly tested at the discretion of the Surveyor taking account of the quality control procedures operating in the shipyard. For other welds, leak testing may be carried out, after the protective coating has been applied, provided that these welds were carefully inspected visually to the satisfaction of the Surveyor.

Any other recognized method may be accepted to the satisfaction of the Surveyor.

S14.2.3 Hose testing

When hose testing is required to verify the tightness of the structures, as defined in Table 1, the minimum pressure in the hose, at least equal to 2×10^5 Pa, is to be applied at a maximum distance of 1.5 m. The nozzle diameter is not to be less than 12 mm.

S14 (cont)

S14.2.4 Hydropneumatic testing

When hydropneumatic testing is performed, the same safety precautions as for leak testing (see S14.2.2) are to be adopted.

S14.2.5 Other testing methods

Other testing methods may be accepted, at the discretion of the Society, based upon equivalency considerations.

S14.3 General testing requirements

General requirements for testing are given in Table 1.

S14.4 Additional requirements for special type vessels/tanks

In addition to the requirements of Table 1, particular requirements for testing of certain spaces within the cargo area of:

- liquefied gas carriers,
- edible liquid carriers,
- chemical carriers,

are given in Table 2.

These requirements intend generally to verify the adequacy of the structural design of the tank, based on the loading conditions which prevailed when determining the tank structure scantlings.

S14 (cont)

Table 1 – General testing requirements

Item number	Structure to be tested	Type of testing	Structural test pressure	Remarks
1	Double bottom tanks	Structural testing [1]	The greater of the following: • head of water up to the top of overflow • head of water up to the margin line	Tank boundaries tested from at least one side
2	Double side tanks	Structural testing [1]	The greater of the following: • head of water up to the top of overflow • 2.4 m head of water above highest point of tank	Tank boundaries tested from at least one side
3	Tank bulkheads, deep tanks	Structural testing [1]	The greater of the following [2]: • head of water up to the top of overflow • 2.4 m head of water above highest point of tank • setting pressure of the safety relief valves, where relevant	Tank boundaries tested from at least one side
	Fuel oil bunkers	Structural testing		
4	Ballast holds in bulk carriers	Structural testing [1]	The greater of the following: • head of water up to the top of overflow • 0.90 m head of water above top of hatch	
5	Fore peak and after peak used as tank	Structural testing	The greater of the following: • head of water up to the top of overflow • 2.4 m head of water above highest point of tank	Test of the after peak carried after the stern tube has been fitted
	Fore peak not used as tank	Refer to SOLAS Ch. II.1 Reg. 14		
	After peak not used as tank	Leak testing		
6	Cofferdams	Structural testing [3]	The greater of the following: • head of water up to the top of overflow • 2.4 m head of water above highest point of tank	
7	Watertight bulkheads	Refer to SOLAS Ch. II.1 Reg. 14 [4]		
8	Watertight doors below freeboard or bulkhead deck	Refer to SOLAS Ch. II.1 Reg. 18		
9	Double plate rudders	Leak testing		
10	Shaft tunnel clear or deep tanks	Hose testing		
11	Shell doors	Hose testing		
12	Watertight hatch covers of tanks in bulk-carriers	Hose testing		
	Watertight hatch covers of tanks in combination carriers	Structural testing [1]	The greater of the following: • 2.4 m head of water above the top of the hatch cover • setting pressure of the safety relief valves, where relevant	At least every 2nd hatch cover are to be tested

S14 (cont)

Item number	Structure to be tested	Type of testing	Structural test pressure	Remarks
13	Weathertight hatch covers and closing appliances	Hose testing		
14	Chain locker (if aft of collision bulkhead)	Structural testing	Head of water up to the top	
15	Independent tanks	Structural testing	Head of water up to the top of the overflow, but not less than 0.9 m	
16	Ballast ducts	Structural testing	Ballast pump maximum pressure	

Note:

[1] Leak or hydropneumatic testing may be accepted under the conditions specified in S14.2.2, provided that at least one tank for each type is structurally tested, to be selected in connection with the approval of the design. In general, structural testing need not be repeated for subsequent vessels of a series of identical newbuildings. This relaxation does not apply to cargo space boundaries in tankers and combination carriers and tanks for segregated cargoes or pollutants. If the structural test reveals weakness or severe faults not detected by the leak test, all tanks are to be structurally tested.

[2] Where applicable, the highest point of tank is to be measured to the deck and excluding hatches. In holds for liquid cargo or ballast with large hatch covers, the highest point of tank is to be taken at the top of the hatch.

[3] Leak or hydropneumatic testing may be accepted under the conditions specified in S14.2.2 when, at the Society's discretion, the latter is considered significant also in relation to the construction techniques and the welding procedures adopted.

[4] When hose test cannot be performed without damaging possible outfitting (machinery, cables, switchboards, insulation, etc.) already installed, it may be replaced, at the Society's discretion, by a careful visual inspection of all the crossings and welded joints; where necessary, dye penetrant test or ultrasonic leak test may be required.

S14
(cont)

Table 2 - Additional testing requirements for spaces within the cargo area of certain types of ships

Item number	Types of ships	Structure to be tested	Testing requirements	Structural test pressure	Remarks
1	Liquefied gas carriers	Integral tanks	Refer to UR G1		
		Hull structure supporting membrane or semi-membrane tanks	Refer to UR G1		
		Independent tanks type A	Refer to UR G1		
		Independent tanks type B	Refer to UR G1		
		Independent tanks type C	Refer to UR G2		
2	Edible liquid carriers	Independent tanks	Structural testing	Head of water up to the top of overflow without being less than 0.9 m	
3	Chemical carriers	Integral or independent tanks	Structural testing of cargo tanks boundaries from at least one side	The greater of the following: • 2.4 m head of water above highest point of tank • setting pressure of the safety relief valves, where relevant	

End of Document