CHINA CLASSIFICATION SOCIETY

CCS Rule Change Notice For:

RULES FOR CLASSIFICATION OF SEA-GOING STEEL SHIPS

Version: January, 2016. RCN No.1

Effective date: 1 January, 2016

Beijing

CONTENTS

PART ONE PROVISIONS OF CLASSIFICATION

CHAPTER 4 SURVEYS DURING CONSTRUCTION

Section 3 is replaced as follows:

Section 3 PROCEDURES FOR TESTING TANKS AND TIGHT BOUNDARIES

4.3.1 GENERAL

4.3.1.1 These test procedures are to confirm the watertightness of tanks and watertight boundaries and the structural adequacy of tanks which consist of the watertight subdivisions of ships. These procedures may also be applied to verify the weathertightness of structures and shipboard outfitting.

4.3.1.2 The tightness of all tanks and watertight boundaries of ships during new construction and those relevant to major conversions or major repairs[①] is to be confirmed by these test procedures prior to the delivery of the ship.

4.3.2 APPLICATION

4.3.2.1 All gravity tanks[②] and other boundaries required to be watertight or weathertight are to be tested in accordance with this Procedure and proven to be tight and structurally adequate as follows:

(1) Gravity Tanks for their tightness and structural adequacy,

(2) Watertight Boundaries Other Than Tank Boundaries for their watertightness, and

(3) Weathertight Boundaries for their weathertightness.

4.3.2.2 The testing of cargo containment systems of liquefied gas carriers is to be in accordance with standards deemed appropriate by the CCS.

4.3.2.3 The testing of structures not listed in Table 1 or 2 is to be specially considered.

4.3.3 TEST TYPES AND DEFINITIONS

4.3.3.1 The following two types of tests are specified in this requirement:

(1) Structural Test: A test to verify the structural adequacy of tank construction. This may be a hydrostatic test or, where the situation warrants, a hydropneumatic test.

(2) Leak Test: 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 3 of Table 1.

4.3.3.2 The definition of each test type is as follows:

Hydrostatic Test: (Leak and Structural)	A test wherein a space is filled with a liquid to a specified head.
Hydropneumatic Test:	A test combining a hydrostatic test and an air test, wherein a space is

① Major repair means a repair affecting structural integrity.

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

(Leak and Structural)	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 Test: (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).

4.3.4 TEST PROCEDURES

4.3.4.1 General

(1) Tests are to be carried out in the presence of a 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, see 4.3.4.5, 4.3.4.6 and Table 3.

4.3.4.2 Structural test procedures

(1) Type and time of test

Where a structural test is specified in Table 1 or Table 2, a hydrostatic test in accordance with 4.3.4.4(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 4.3.4.4(2) may be accepted instead.

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

(2) Testing Schedule for New Construction or Major Structural Conversion

① The tank boundaries are to be tested from at least one side. The tanks for structural test are to be selected so that all representative structural members are tested for the expected tension and compression.

② Subject to agreement of the Administration of the flag State, structural tests are to 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 localised differences determined to be acceptable by the attending Surveyor) on each vessel 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. If the structural test founds that the penetration test does not detect the structural weakness or serious defects, structural tests of all tanks are to be carried out.

③ Additional tanks may require structural testing if found necessary after the structural testing of the first tank.

④ Where the structural adequacy of the tanks of a vessel were verified by the structural testing required in Table 1, subsequent vessels in the series (i.e. sister ships built from the same plans at the same shipyard) may be exempted from structural testing of tanks, provided that:

a. Water-tightness of boundaries of all tanks is verified by leak tests and thorough inspections are carried out.

b. Structural testing is carried out for at least one tank of each type among all tanks of each sister vessel.

c. Additional tanks may require structural testing if found necessary after the structural testing of the first tank or if deemed necessary by the attending 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 provisions of paragraph 4.3.4.2(2) ② shall apply in lieu of paragraph 4.3.4.2(2) ④b.

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 4.3.4.2(2) ④ at the discretion of CCS, provided that:

a. 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 CCS) and:

b. an enhanced NDT programme is implemented for the tanks not subject to structural tests.

⑥ For the watertight boundaries of spaces other than tanks structural testing may be exempted, provided that the water-tightness 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 4.3.4.2(2) ① to 4.3.4.2(2) ⑤ shall apply, for ballast holds, chain lockers and a representative cargo hold if intended for in-port ballasting.

4.3.4.3 Leak test procedures

(1) For the leak tests specified in Table 1, tank air tests, compressed air fillet weld tests, vacuum box tests in accordance with 4.3.4.4(4) through 4.3.4.4(6), or their combination, will be acceptable. Hydrostatic or hydropneumatic tests may also be accepted as leak tests provided that 4.3.4.5, 4.3.4.6 and 4.3.4.7 are complied with. Hose tests will also be acceptable for such locations as specified in Table 1, Footnote 3, in accordance with 4.3.4.4(3).

(2) 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. See also 4.3.4.5(1) for the application of final coatings and 4.3.4.6 for the safe access to joints and the summary in Table 3.

4.3.4.4 Test Methods

(1) Hydrostatic test

① Unless another liquid is approved, hydrostatic tests are to 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.

② In cases where a tank for higher density cargoes is to be tested with fresh water or sea water, the testing pressure height is to be specially considered.

③ All external surfaces of the tested space are to be examined for structural distortion, bulging and buckling, other related damage and leaks.

(2) Hydropneumatic test

① Hydropneumatic tests, where approved, are to 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 4.4.3(4) ⑥ will also apply to hydropneumatic tests.

② All external surfaces of the tested space are to be examined for structural distortion, bulging and buckling, other related damage and leaks.

(3) Hose test

① Hose tests are to be carried out with the pressure in the hose nozzle maintained at least at $2 \cdot 10^5$ Pa during the test. The nozzle is to 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 is to impinge directly upon the weld.

② 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) Tank air test

① All boundary welds, erection joints and penetrations, including pipe connections, are to be examined in accordance with 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 is to be arranged. The cross sectional area of the U-tube is not to 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 is to be made of tested welds. The first is to be immediately upon applying the leak indication solution; the second is to be after approximately four or five minutes in order to detect those smaller leaks which may take time to appear.

(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 are to 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 is also to be applied in the same manner as to fillet weld where the root face is large, i.e., 6-8 mm.

(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 $0.20 \cdot 10^5 – 0.26 \cdot 10^5$ Pa inside the box.

(7) Ultrasonic test

An ultrasonic echo transmitter is to be arranged inside of a compartment and a receiver is to 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.

(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 the expiration of a defined 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.

(9) Other test

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

4.3.4.5 Application of coating

(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 Surveyor.

Surveyors reserve the right to require a leak test prior to the application of final coating over automatic erection butt welds.

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

(2) Temporary coating

Any temporary coating which may conceal defects or leaks is to be applied at the time as specified for the final coating (see 4.3.4.5(1)). This requirement does not apply to shop primer.

4.3.4.6 Safe access to joints

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

4.3.4.7 Hydrostatic or hydropneumatic tightness test

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

Table 1
Test Requirements for Tanks and Boundaries

	Tank or boundary to be tested	**Test type**	**Test head or pressure**	**Remarks**
1	Double bottom tanks[4]	Leak and structural[1]	The greater of - top of the overflow, - to 2.4m above top of tank[2], or - to bulkhead deck	
2	Double bottom voids[5]	Leak	See 4.3.4.4(4)-(6), as applicable	including pump room double bottom and bunker tank protection double hull required by MARPOL Annex I
3	Double side tanks	Leak and structural[1]	The greater of - top of the overflow, - to 2.4m above top of tank[2], or - to bulkhead deck	
4	Double side voids	Leak	See 4.3.4.4(4)-(6), as applicable	
5	Deep tanks other than those listed elsewhere in this table	Leak and structural[1]	The greater of - top of the overflow, or - to 2.4m above top of tank[2]	
6	Cargo oil tanks	Leak and structural[1]	The greater of - top of the overflow, - to 2.4m above top of tank[2], or - to top of tank[2] plus setting of any pressure relief valve	
7	Ballast hold of bulk carriers	Leak and structural[1]	Top of cargo hatch coaming	
8	Peak tanks	Leak and structural[1]	The greater of - top of the overflow, or - to 2.4m above top of tank[2]	After peak to be tested after installation of stern tube
9	.1 Fore peak spaces with equipment	Leak	See 4.3.4.4(3)-(6), as applicable	
	.2 Fore peak voids	Leak and structural[1, 9]	To bulkhead deck	
	.3 Aft peak spaces with equipment	Leak	See 4.3.4.4(3)-(6), as applicable	
	.4 Aft peak voids	Leak	See 4.3.4.4(4)-(6), as applicable	After peak to be tested after installation of stern tube
10	Cofferdams	Leak	See 4.3.4.4(4)-(6), as applicable	
11	.1 Watertight bulkheads	Leak[8]	See 4.3.4.4(3)-(6), as applicable	

	Tank or boundary to be tested	Test type	Test head or pressure	Remarks
	.2 Superstructure end bulkheads	Leak	See 4.3.4.4(3)-(6), as applicable	
12	Watertight doors below freeboard or bulkhead deck	Leak[6, 7]	See 4.3.4.4(3)-(6), as applicable	
13	Double plate rudder blades	Leak	See 4.3.4.4(4)-(6), as applicable	
14	Shaft tunnels clear of deep tanks	Leak[3]	See 4.3.4.4(3)-(6), as applicable	
15	Shell doors	Leak[3]	See 4.3.4.4(3)-(6), as applicable	
16	Weathertight hatch covers and closing appliances	Leak[3, 7]	See 4.3.4.4(3)-(6), as applicable	Hatch covers closed by tarpaulins and battens excluded
17	Dual purpose tanks/dry cargo hatch covers	Leak[3, 7]	See 4.3.4.4(3)-(6), as applicable	In addition to structural test in item 6 or 7
18	Chain lockers	Leak and structural[1]	Top of chain pipe	
19	L.O. sump. tanks and other similar tanks/spaces under main engines	Leak	See 4.3.4.4(3)-(6), as applicable	
20	Ballast ducts	Leak and structural[1]	The greater of - ballast pump maximum pressure, or - setting of any pressure relief valve	
21	Fuel Oil Tanks	Leak and structural[1]	The greater of - top of the overflow, - to 2.4m above top of tank[2], or - to top of tank[2] plus setting of any pressure relief valves, or - to bulkhead deck	

Notes:

Refer to section 4.3.4.2(2).

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

Hose Test may also be considered as a medium of the test. See 4.3.3.2.

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

5 Including 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 12A and Chapter 4, Part A, regulation 22 respectively.

6 Where water tightness of a watertight door has not been confirmed by prototype test, testing by filling

watertight spaces with water is to be carried out. See SOLAS regulation II-1/16.2 and MSC/Circ.1176.

7 As an alternative to the hose testing, other testing methods listed in 4.3.4.4(7) through 4.3.4.4(9) may be applicable subject to adequacy of such testing methods being verified. See SOLAS regulation II-1/11.1. For watertight bulkheads (item 11.1) alternatives to the hose testing may only be used where a hose test is not practicable.

8 A "Leak and structural test", see 4.3.4.2(2) is to 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 is to be the maximum loading that will occur in-port as indicated in the loading manual.

9 Structural test may be waived where demonstrated to be impracticable to the satisfaction of CCS.

Table 2
Additional Test Requirements for Special Service Ships/Tanks

	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 UR G1	
		Hull structure supporting membrane or semi-membrane tanks			
		Independent tanks type A			
		Independent tanks type B			
		Independent tanks type C		Refer to UR G2	
2	Edible liquid tanks	Independent tanks	Leak and structural	The greater of - top of the overflow, or - to 0.9m above top of tank[1]	
3	Chemical carriers	Integral or independent cargo tanks	Leak and structural	The greater of - to 2.4m above top of tank[1], or - to top of tank[1] plus setting of any pressure relief valve	Where a cargo tank is designed for the carriage of cargoes with specific gravities larger than 1.0, an appropriate additional head is to be considered

Note:

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

Notes:

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 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 NDE testing show no significant defects.

CHAPTER 5 SURVEYS AFTER CONSTRUCTION

Section 4 HULL AND EQUIPMENT SURVEYS

5.4.2 Annual surveys

5.4.2.2 Scope of the survey for all ships

(1) Hull

⑪ examining the cargo hold water level detector and its audible and visual alarms of single skin single-hold cargo ships;

(6) Fire-fighting equipment

⑮ examining, when appropriate, the special arrangements for carrying dangerous goods, including checking the electrical equipment and wiring, the ventilation, the provision of protective clothing and portable appliances and the testing of the water supply, bilge pumping and any water spray system.

Section 6 ADDITIONAL REQUIREMENTS FOR HULL AND EQUIPMENT SURVEYS OF OIL TANKERS

5.6.2 Annual surveys

5.6.2.5 Other equipment

(8) Examining ~~Examination of~~ the emergency lighting in all cargo pump rooms ~~and for~~ of oil

tankers constructed after 1 July 2002~~, checking interlock between lighting supplied by main power and ventilation~~.

Section 12 is replaced as follows:

Section 12 SURVEYS OF PROPELLER SHAFTS AND TUBE SHAFTS

5.12.1 General

5.12.1.1 Application

(1) Unless alternative means are provided to assure the condition of the propeller shaft assembly, these requirements apply to all vessels with conventional shafting fitted with a propeller as follows:

① from 1 January 2016 for ships delivered on or after 1 January 2016;

② after the first shaft survey scheduled on or after 1 January 2016, for ships delivered before 1 January 2016[①].

5.12.1.2 Definitions[②]

(1) Shaft: For the purpose of this Unified Requirement shaft is a general definition that could mean:

① Propeller shaft

② Tube shaft

The definition does not include the intermediate shaft(s) which is(are) considered part of the propulsion shafting inside the vessel.

(2) Propeller Shaft: Propeller shaft is the part of the propulsion shaft to which the propeller is fitted. It may also be called screwshaft or tailshaft.

(3) Tube Shaft: Tube shaft is a shaft placed between the intermediate shaft and propeller shaft, normally arranged within a stern tube or running in open water.

It may also be called Stern Tube Shaft.

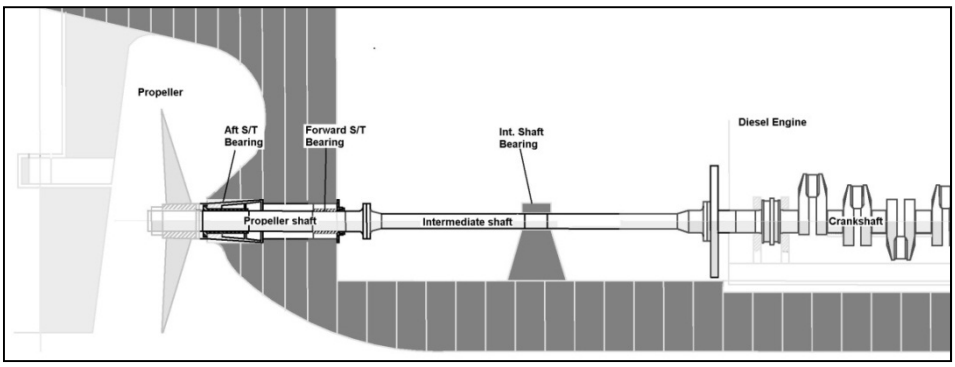

Figure 5.12.1.2 Typical Shafting Arrangement

(4) Sterntube: Tube or pipe fitted in the shell of a ship at the stern (or rear part of the ship), below the water-line, through which passes the tube shaft or aftermost section of the propeller-shaft. Sterntube is the housing of the shaft bearings, generally two (one aft and one fore), that sustain the shaft and allows its rotation with less frictional resistance. The stern tube also accommodates the shaft sealing arrangement.

---

① Upon the completion of the first shaft survey scheduled on or after 1 January 2016, the designation of dates for the next shaft survey is to be made based upon Rev.3 of this UR.

② See also Diagram 1.

(5) Close Loop (system) Oil Lubricated bearing: Closed loop oil lubricating systems use oil to lubricate the bearings and are sealed against the environment (seawater) by adequate sealing / gland devices.

(6) Water Lubricated Bearing: Water lubricated bearings are bearings cooled / lubricated by water (fresh or salt).

(7) Closed Loop System Fresh Water Lubricated Bearing: Closed loop water lubricating systems use fresh water to lubricate the bearings and are sealed against the environment (such as seawater) by adequate sealing / gland devices.

(8) Open Systems (water): Open water lubricating systems use water to lubricate the bearings and are exposed to the environment.

(9) Adequate means for protection against corrosion: An adequate means for protection against corrosion is an approved means for full protection of the core shaft against sea water intrusion and subsequent corrosion attack. Such means are used for the protection of common steel material against corrosion particularly in combination with water lubricated bearings. Typical means are for example:

① continuous metallic, corrosion resistant liners,
② continuous cladding,
③ multiple layer synthetic coating,
④ multiple layer of fiberglass,
⑤ combinations of above mentioned,
⑥ rubber / elastomer covering coating.

The means for protection against corrosion are installed / applied according to CCS approved procedures.

(10) Corrosion Resistant Shaft: Corrosion resistant shaft is made in approved corrosion resistant steel as core material for the shaft.

(11) Sterntube Sealing System: Sterntube Sealing system is the equipment installed on the inboard extremity and, for closed systems, at outboard extremity of the sterntube. Inboard Seal is the device fitted on the fore part of the sterntube that achieve the sealing against the possible leakage of the lubricant media in to the ship internal. Outboard seal is the device fitted on the aft part of the sterntube that achieve the sealing against the possible sea water ingress and the leakage of the lubricant media.

(12) Service records: Service records are regularly recorded data showing in-service conditions of the shaft(s) and may include, as applicable: lubricating oil temperature, bearing temperature and oil consumption records (for oil lubricated bearings) or water flow, water temperature, salinity, pH, make-up water and water pressure (for closed loop fresh water lubricated bearings depending on design).

(13) Oil sample examination: An oil sample examination is a visual examination of the stern tube lubricating oil taken in presence of the surveyor with a focus on water contamination.

(14) Lubricating oil analysis: Lubricating oil analysis is to be carried out at regular intervals not exceeding six (6) months taking into account IACS Rec. 36. The documentation on lubricating oil analysis is to be available on board. Oil samples, to be submitted for the analysis, should be taken under service conditions.

(15) Fresh Water sample test: Fresh water sample test should be carried out at regular intervals not exceeding six (6) months

Samples are to be taken under service conditions and are to be representative of the water circulating within the sterntube.

Analysis results are to be retained on board and made available to the surveyor.

At time of survey the sample for the test has to be taken at the presence of the surveyor.

Fresh water sample test shall include the following parameters:

① chlorides content;

② pH value;

③ presence of bearing particles or other particles (only for laboratory analysis, not required for tests carried out in presence of the surveyor).

(16) Keyless connection: Keyless connection is the forced coupling Methodology between the shaft and the propeller without a key achieved through interference fit of the propeller boss on the shaft tapered end.

(17) Keyed connection: Keyed connection is the forced coupling Methodology between the shaft and the propeller with a key and keyway achieved through the interference fit of the propeller boss on the shaft tapered end.

(18) Flanged connection: Flanged connection is the coupling Methodology, between the shaft and the propeller, achieved by a flange, built in at the shaft aft end, bolted to propeller boss.

(19) Alternative means: Alternative Means: are shafting arrangements with configuration other than described in the present document.

5.12.2 Oil Lubricated shafts or Closed Loop System Fresh Water Lubricated Shafts (closed system)

5.12.2.1 Shaft Survey Methods

(1) METHOD 1

The survey is to consist of:

① Drawing the shaft and examining the entire shaft, seals system and bearings

② For keyed and keyless connections:

a. Removing the propeller to expose the forward end of the taper,

b. Performing a non-destructive examination (NDE) by an approved surface crack-detection method all around the shaft in way of the forward portion of the taper section, including the keyway (if fitted). For shaft provided with liners the NDE shall extended to the after edge of the liner.

③ For flanged connection:

a. Whenever the coupling bolts of any type of flange-connected shaft are removed or the flange radius is made accessible in connection with overhaul, repairs or when deemed necessary by the surveyor, the coupling bolts and flange radius are to be examined by means of an approved surface crack detection method.

④ Checking and recording the bearing clearances.

⑤ Verification that the propeller is free of damages which may cause the propeller to be out of balance.

⑥ Verification of the satisfactory conditions of inboard and outboard seals during the re-installation of the shaft and propeller.

⑦ Recording the bearing weardown measurements (after re-installation)

(2) METHOD 2

The survey is to consist of:

① For keyed and keyless connections:

a. Removing the propeller to expose the forward end of the taper,

b. Performing a non-destructive examination (NDE) by an approved surface crack-detection Method all around the shaft in way of the forward portion of the taper section, including the keyway (if fitted).

② For flanged connection:

a. Whenever the coupling bolts of any type of flange-connected shaft are removed or the flange radius is made accessible in connection with overhaul, repairs or when deemed necessary by the surveyor, the coupling bolts and flange radius are to be examined by means of a an approved surface crack detection Method.

③ Checking and recording the bearing weardown measurements.

④ Visual Inspection of all accessible parts of the shafting system.

⑤ Verification that the propeller is free of damages which may cause the propeller to be out of balance.

⑥Seal liner found to be or placed in a satisfactory condition.

⑦ Verification of the satisfactory re-installation of the propeller including verification of satisfactory conditions of inboard and outboard seals.

Pre-requisites to satisfactorily verify in order to apply METHOD 2:

① Review of service records.

② Review of test records of:

a. Lubricating Oil analysis (for oil lubricated shafts), or

b. Fresh Water Sample test (for closed system fresh water lubricated shafts).

③Oil sample Examination (for oil lubricated shafts), or Fresh Water Sample test (for closed system fresh water lubricated).

④ Verification of no reported repairs by grinding or welding of shaft and/or propeller.

(3) METHOD 3

The survey is to consist of:

① Checking and recording the bearing weardown measurements.

② Visual Inspection of all accessible parts of the shafting system.

③ Verification that the propeller is free of damages which may cause the propeller to be out of balance.

④ Seal liner found to be or placed in a satisfactory condition.

⑤ Verification of the satisfactory conditions of inboard and outboard seals.

Pre-requisites to satisfactorily verify in order to apply METHOD 3:

① Review of service records.

②Review of test records of

a. Lubricating Oil analysis (for oil lubricated shafts), or

b. Fresh Water Sample test (for closed system fresh water lubricated shafts).

③ Oil sample Examination (for oil lubricated shafts), or Fresh Water Sample test (for closed system fresh water lubricated).

④ Verification of no reported repairs by grinding or welding of shaft and/or propeller.

5.12.2.2 Shaft extension surveys - Extension types

(1) Extension up to 2,5 years

The survey is to consist of:

① Checking and recording the bearing weardown measurements, as far as practicable.
② Visual Inspection of all accessible parts of the shafting system.
③ Verification that the propeller is free of damages which may cause the propeller to be out of balance.
③ Verification of the effectiveness of the inboard seal and outboard seals.

Pre-requisites to satisfactorily verify in order to apply extension up to 2.5 years:

① Review of service records.
② Review of test records of
a. Lubricating Oil analysis (for oil lubricated shafts), or
b. Fresh Water Sample test (for closed system fresh water lubricated shafts).
③ Oil sample Examination (for oil lubricated shafts), or Fresh Water Sample test (for closed system fresh water lubricated).
④ Verification of no reported repairs by grinding or welding of shaft and/or propeller.
⑤ Confirmation from the Chief Engineer that the shafting arrangement is in good working condition.

(2) Extension up to 1 year

The survey is to consist of:

① Visual Inspection of all accessible parts of the shafting system.
② Verification that the propeller is free of damages which may cause the propeller to be out of balance.
③ Verification of the effectiveness of the inboard seal and outboard seals.

Pre-requisites to satisfactorily verify in order to apply EXTENSION UP TO 1YEAR:

① Review of the previous weardown and/or clearance recordings.
② Review of service records.
③ Review of test records of
a. Lubricating Oil analysis (for oil lubricated shafts), or
b. Fresh Water Sample test (for closed system fresh water lubricated shafts).
④ Oil sample Examination (for oil lubricated shafts), or Fresh Water Sample test (for closed system fresh water lubricated).

⑤ Verification of no reported repairs by grinding or welding of shaft and/or propeller.
⑥ Confirmation from the Chief Engineer that the shafting arrangement is in good working condition.

(3) Extension up to 3 months

The survey is to consist of:

① Visual Inspection of all accessible parts of the shafting system.
②Verification of the effectiveness of the inboard seal.

Pre-requisites to satisfactorily verify in order to apply extension up to 3 months:

① Review of the previous weardown and/or clearance recordings.
② Review of service records.
③ Review of test records of.
a. Lubricating Oil analysis (for oil lubricated shafts), or
b. Fresh Water Sample test (for closed system fresh water lubricated shafts).
④ Oil sample Examination (for oil lubricated shafts), or Fresh Water Sample test (for closed

system fresh water lubricated).

⑤ Verification of no reported repairs by grinding or welding of shaft and/or propeller.

⑥ Confirmation from the Chief Engineer that the shafting arrangement is in good working condition.

5.12.2.3 Oil lubricated shafts

(1) Survey intervals

For surveys completed within 3 months before the shaft survey due date, the next period will start from the shaft survey due date.

① Flanged propeller connection

The following Methods are applicable:

a. Method 1 every 5 years, or

b. Method 2 every 5 years (pre- requisites have to be fulfilled), or

c. Method 3 every 5 years (pre-requisites have to be fulfilled).

② Keyless propeller connection

The following Methods are applicable:

a. Method 1 every 5 years, or

b. Method 2 every 5 years (pre-requisites have to be fulfilled), or

c. Method 3 every 5 years with the maximum of two consecutive Method 3 surveys (pre-requisites have to be fulfilled). The maximum interval between two surveys carried out according to Method 1 or Method 2 shall not exceed 15 years, except in the case when one extension for no more than three months is granted.

③ Keyed propeller connection

The following Methods are applicable:

a. Method 1 every 5 years, or

b. Method 2 every 5 years (pre-requisites have to be fulfilled).

(2) Survey extensions

For all types of propeller connections, the interval between two consecutive surveys may be extended after the execution of extension survey as follows:

a. Extension up to a maximum of 2.5 years: no more than one extension can be granted. No further extension, of other type, can be granted.

b. Extension up to a maximum of 1 year: no more than two consecutive “one year extensions” can be granted. No further extension, of other type, can be granted.

c. Extension up to a maximum of 3 months: no more than one “three months extension” can be granted. In the event an additional extension is requested the requirements of the “one year extension” are to be carried out and the shaft survey due date, prior to the previous extension, is extended for a maximum of one year.

The extension survey should normally be carried out within 1 month of the shaft survey due date and the extension counts from the shaft survey due date.

If the extension survey is carried out more than 1 month prior to the shaft survey due date, then the period of extension counts from the date of the extension survey was completed.

5.12.2.4 Closed loop system fresh water lubricated shafts

The maximum interval between two surveys carried out according to Method 1 shall not exceed 15 years. An extension for no more than three months can be granted.

(1) Survey intervals

For surveys completed within 3 months before the shaft survey due date, the next period will start from the shaft survey due date.

Flanged propeller connection

The following Methods are applicable:

a. Method 1 every 5 years, or

b. Method 2 every 5 years (pre-requisites have to be fulfilled), or

c. Method 3 every 5 years (pre-requisites have to be fulfilled).

② Keyless propeller connection

The following Methods are applicable:

a. Method 1 every 5 years, or

b. Method 2 every 5 years (pre-requisites have to be fulfilled), or

c. Method 3 every 5 years (pre-requisites have to be fulfilled).

③ Keyed propeller connection

The following Methods are applicable:

a. Method 1 every 5 years, or

b. Method 2 every 5 years (pre-requisites have to be fulfilled).

(2) Survey extensions

For all types of propeller connections, the interval between two consecutive surveys may be extended after the execution of extension survey as follows:

a. Extension up to a maximum of 2,5 years, no more than one extension can be granted. No further extension, of other type, can be granted.

b. Extension up to a maximum of 1 year, no more than two consecutive extensions can be granted. No further extension, of other type, can be granted.

c. Extension up to a maximum of 3 months, no more than one “three months extension” can be granted. In the event an additional extension is requested the requirements of the “one year extension” are to be carried out and the shaft survey due date prior to the previous extension is extended for a maximum of one year.

The extension survey should normally be carried out within 1 month of the shaft survey due date and the extension counts from the shaft survey due date.

If the extension survey is carried out more than 1 month prior to the shaft survey due date, then the period of extension counts from the date of the extension survey was completed.

The maximum interval between two surveys carried out according to Method 1 shall not exceed 15 years, except in the case when one extension for no more than three months is granted.

5.12.2.5 TABLE of Survey Intervals (closed systems)

SURVEY INTERVALS (closed systems)			
Oil Lubricated			
	Flanged Propeller Coupling	Keyless Propeller Coupling	Keyed Propeller Coupling[c]
Every five years[a]	Method1 or Method 2 or Method 3	Method1 or Method 2 or Method 3[d]	Method1 or Method 2
Extension 2,5 Y[b]	Yes[e]	Yes[e]	Yes[e]
Extension 1 Y[b]	Yes[f]	Yes[f]	Yes[f]
Extension 3 M[d]	Yes[g]	Yes[g]	Yes[g]
Closed Loop System Fresh Water Lubricated			

	Flanged Propeller Coupling	Keyless Propeller Coupling	Keyed Propeller Coupling[c]
Every five years[a]	Method1[h] or Method 2 or Method 3	Method1[h] or Method 2 or Method 3	Method1[h] or Method 2
Extension 2,5 Y[b]	Yes[e]	Yes[e]	Yes[e]
Extension 1 Y[d]	Yes[f]	Yes[f]	Yes[f]
Extension 3 M[d]	Yes[g]	Yes[g]	Yes[g]

General notes:

For surveys (Method 1, or Method 2, or Method 3) completed within 3 months before the shaft survey due date, the next period will start from the shaft survey due date.

The extension survey should normally be carried out within 1 month of the shaft survey due date and the extension counts from the shaft survey due date. If the extension survey is carried out more than 1 month prior to the shaft survey due date, then the period of extension counts from the date of the extension survey was completed.

Notes:

a: unless an Extension type (Extension 2,5 Y, Extension 1 Y, Extension 3 M) is applied in between.

b: only one Extension type can be applied in between of two Methods (Extension 2,5 Y, or Extension 1 Y) except for what concern the Extension 3 M (see further note g).

c: Method 3 not allowed.

d: maximum of two consecutives Method 3 surveys. The maximum interval between two surveys carried out according to Method 1 or Method 2 shall not exceed 15 years, except in the case when one extension for no more than three months is granted.

e: no more than one extension can be granted. No further extension of other type can be granted.

f: no more than two consecutive extensions can be granted. No further extension of other type can be granted.

g: no more than one three months extension can be granted. In the event an additional extension is requested the requirements of the one year extension are to be carried out and the shaft survey due date prior to the previous extension is extended for a maximum of one year.

h: The maximum interval between two surveys carried out according to Method 1 shall not be more than 15 years.

5.12.3. Water Lubricated shafts (open systems)

5.12.3.1 Shaft Survey Methods

(1) METHOD 4

The survey is to consist of:

① Drawing the shaft and examining the entire shaft (including liners, corrosion protection system and stress reducing features, where provided), inboard seal system and bearings.

② For keyed and keyless connections:

a. removing the propeller to expose the forward end of the taper,

b. performing a non-destructive examination (NDE) by an approved surface crack-detection Method all around the shaft in way of the forward portion of the taper section, including the keyway (if fitted). For shaft provided with liners the NDE shall be extended to the after edge of the liner

③ For flanged connection:

a. Whenever the coupling bolts of any type of flange-connected shaft are removed or the flange radius is made accessible in connection with overhaul, repairs or when deemed necessary by the surveyor, the coupling bolts and flange radius are to be examined by means of an approved surface

crack detection method.

④ Checking and recording the bearing clearances.

⑤ Verification that the propeller is free of damages which may cause the propeller to be out of balance.

⑥ Verification of the satisfactory conditions of inboard seal during re-installation of the shaft and propeller.

5.12.3.2 Shaft extension surveys - Extension types

(1) Extension up to 1 year

The survey is to consist of:

①Visual Inspection of all accessible parts of the shafting system.

②Verification that the propeller is free of damages which may cause the propeller to be -out of balance.

③Checking and recording the clearances of bearing.

④Verification of the effectiveness of the inboard seal.

Pre-requisites to satisfactorily verify in order to apply extension up to 1 year:

①Review of the previous clearance recordings.

②Service records.

③Verification of no reported repairs by grinding or welding of shaft and/or propeller.

④ Confirmation from the Chief Engineer that the shafting arrangement is in good working condition.

(2) Extension up to 3 months

The survey is to consist of:

① Visual Inspection of all accessible parts of the shafting system.

② Verification that the propeller is free of damages which may cause the propeller to be out of balance.

③ Verification of the effectiveness of the inboard seal.

Pre-requisites to satisfactorily verify in order to apply extension up to 3 months:

① Review of the previous clearance recordings.

② Service records.

③ Verification of no reported repairs by grinding or welding of shaft and/or propeller.

④ Confirmation from the Chief Engineer that the shafting arrangement is in good working condition.

5.12.3.3 Shaft Survey Intervals

(1) Survey Intervals

The following survey intervals between surveys according to Method 4 are applicable to all types of propeller connections. For keyless propeller connections the maximum interval between two consecutive dismantling and verifications of the shaft cone by means of non-destructive examination (NDE) shall not exceed 15 years. For surveys completed within 3 months before the shaft survey due date, the next period will start from the shaft survey due date.

① Configurations allowing 5 year intervals

a. Single shaft operating exclusively in fresh water.

b. Single shaft provided with adequate means of corrosion protection, single corrosion resistant shaft.

c. All kinds of multiple shafts arrangements.

② Other systems

Shaft not belonging in one of the configurations listed in 3.3.1.1 has to be surveyed according to Method 4 every 3 years.

(2) Survey extensions

For all types of propeller connections, the interval between two consecutive surveys may be extended after the execution of extension survey as follows:

① Extension up to a maximum of 1 year: no more than one extension can be granted. No further extension, of other type, can be granted.

② Extension up to a maximum of 3 months: no more than one “three months extension” can be granted. In the event an additional extension is requested the requirements of the “one year extension” are to be carried out and the shaft survey due date prior to the previous extension is extended for a maximum of one year.

The extension survey should normally be carried out within 1 month of the shaft survey due date and the extension counts from the shaft survey due date.

If the extension survey is carried out more than 1 month prior to the shaft survey due date, then the period of extension counts from the date of the extension survey was completed.

5.12.3.4 TABLE of Survey Intervals (open systems)

<table>
<tr><td colspan="4">SURVEY INTERVALS (open systems)</td></tr>
<tr><td colspan="2">- Single Shaft operating exclusively in Fresh Water.
- Single Shaft provided with adequate means of corrosion protection, Single corrosion resistant shaft.
- All kinds of Multiple shafts arrangements.</td><td colspan="2">Other shaft configuration.</td></tr>
<tr><td colspan="2">All kinds of Propeller Coupling[d]</td><td colspan="2">All kinds of Propeller Coupling[d]</td></tr>
<tr><td>Every five years[a]</td><td>Method 4</td><td>Every three years[a]</td><td>Method 4</td></tr>
<tr><td>Extension 1 Y</td><td>Yes[b]</td><td>Extension 1 Y</td><td>Yes[b]</td></tr>
<tr><td>Extension 3 M</td><td>Yes[c]</td><td>Extension 3 M</td><td>Yes[c]</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="4">General notes:
For surveys (Method 4) completed within 3 months before the shaft survey due date, the next period will start from the shaft survey due date.
The extension survey should normally be carried out within 1 month of the shaft survey due date and the extension counts from the shaft survey due date. If the extension survey is carried out more than 1 month prior to the shaft survey due date, then the period of extension counts from the date of the extension survey was completed.
Notes:
a: unless an Extension type (Extension 1 Y, Extension 3 M) is applied in between.
b: no more than one extension can be granted. No further extension, of other type, can be granted.
c: no more than one extension can be granted. In the event an additional extension is requested the requirements of the one year extension are to be carried out and the shaft survey due date prior to the previous extension is extended for a maximum of one year.
d: For keyless propeller connections the maximum interval between two consecutive dismantling and verifications of the shaft cone by means of non-destructive examination (NDE) shall not exceed 15 years</td></tr>
</table>

5.12.4 Survey related to notation SCM

5.12.4.1 For ships which are assigned the notation SCM in accordance with Appendix 14 “Guidelines for Screwshaft Condition Monitoring System” of this Chapter, if they are found satisfactory at a survey of the items specified in 5.12.4.3, 5.12.4.4 and 5.12.5.5, the interval of drawing the shaft for examination as specified in 5.12.2 or 5.12.3 for the normal survey may be extended to a maximum period not exceeding 15 years.

5.12.4.2 Notwithstanding the notation SCM, the interval between normal surveys is to comply with 5.12.2 or 5.12.3.

5.12.4.3 For oil-lubricated propeller shafts, the shaft condition monitoring (SCM) is to be verified during each annual survey of the ship, covering:

(1) onboard condition monitoring records, including lubricating oil consumption records, lubricating oil operating temperature records, propeller shaft condition records, etc.;

(2) confirmation that lubricating oil samples have been submitted to an approved analysis organization at least once every 6 months for analysis and test of water content, chloride content, content of bearing metal particles and oil aging (resistance to oxidation);

(3) verification that analysis and test records of the analysis organization together with a conclusion on the condition and suitability of the oil are kept on board;

(4) verification of an oil analysis report from the last 6 months.

5.12.4.4 For water-lubricated propeller shafts, the shaft condition monitoring (SCM) is to be verified during each annual survey of the ship, covering:

(1) propeller shaft condition records, including alarm records, examination and maintenance records, lubricating water sampling/testing records and closed cycle lubricating water consumption records (if applicable);

(2) confirmation that lubricating water samples have been submitted to a laboratory analysis organization complying with international standards (e.g. ISO17025) or accepted by CCS complying with equivalent standards at least once every 6 months for analysis and test of the samples according to the testing technology and the allowable ranges of sample analysis criteria provided by the manufacturer, the water quality parameters include:

① size and proportion of suspended particles;

② chloride content, bearing material and metal particles content (closed cycle water system).

(3) verification that water quality analysis report issued by the analysis organization, together with a qualification certificate of the organization and a conclusion on the condition and suitability of the water, are kept on board; the Surveyor is to verify a water quality analysis report from the last 6 months;

(4) examination and confirmation that the lubricating water supply system (including pumping and water filters/separators), alarm system and shaft starting interlock are in normal condition.

5.12.4.5 In addition to the items of 5.12.4.3 or 5.12.4.4 above, the following are to be confirmed for all shafts during the normal survey specified in 5.12.2 or 5.12.3:

(1) weardown of the ~~bearings~~tailshafts;

(2) effectiveness of shaft glands.

5.12.4.6 For shafts with keyed propeller attachment, the propeller is to be removed during the period of the normal survey specified in 5.12.2 or 5.12.3 for non-destructive examination by an approved crack-detection method (e.g. magnetic particle or dye penetrant inspection) of exposed portions of key, keyway and propeller shaft.

5.12.4.7 For the ship assigned with the SCM notation, the normal survey may be carried out without drawing of the shaft, and the above requirements are to be complied with. If the surveyor deems that the available information is not satisfactory or any doubt exists, the shaft is to be sufficiently drawn to permit an entire examination.

5.12.5 Surveys of other propulsion arrangements

5.12.5.1 An operational test is to be carried out to the controllable pitch propellers to detect leakage. The controllable pitch propellers are to be dismantled for examining the working parts and control gear when considered necessary.

5.12.5.2 Azimuth propulsion arrangements (Z propulsion arrangement, Duck propulsion arrangement, REX propulsion arrangement and steering oar arrangement) are to be dismantled for examining propeller, shafts, gearing and control gear.

5.12.5.3 Water jet propulsion arrangements are to be dismantled for examining impeller, casing, shaft, shaft seal, shaft bearing, inlet and outlet channels, steering nozzles, reversion units and control gear.

Appendix 8 is replaced as follows:

Appendix 8 Procedural Requirements for Service Suppliers

1. General

1.1 To approve firms providing services, such as measurements, tests or maintenance of safety systems and equipment, CCS is to apply procedures in this unified requirement and relevant Annex 1.

2. Objective

2.1 The objective of this procedure is to set minimum requirements for approval and certification of service suppliers and is applicable to both initial and renewal audits.

3. Definitions

3.1 Manufacturer: A company that manufactures equipment required to be periodically serviced and/or maintained.

3.2 Service Supplier (A Service Supplier or category of Service Supplier may be referred to here after simply as 'supplier'): A person or company, not employed by an IACS Member, who at the request of an equipment manufacturer, shipyard, vessel's owner or other client acts in connection with inspection work and provides services for a ship or a mobile offshore drilling unit such as measurements, tests or maintenance of safety systems and equipment, the results of which are used by surveyors in making decisions affecting classification or statutory certification and services.

3.3 Agent: A Person or Company authorised to act for or to represent a Manufacturer or approved/recognized service supplier.

3.4 Subsidiary: A Company partly or wholly owned by a Manufacturer or approved/recognized service supplier.

3.5 Subcontractor: A Person or Company providing services to a Manufacturer or approved/recognized service supplier, with a formal contract defining the assumption of the obligations of the service supplier.

4. Application

4.1 This procedure applies to the approval of the following categories of service suppliers:

4.1.1 Statutory services

(1) Firms engaged in servicing inflatable liferafts, inflatable lifejackets, hydrostatic release units, inflatable rescue boats, marine evacuation systems

(2) Firms engaged in inspections and testing of radio communication equipment

(3) Firms engaged in inspections and maintenance of self contained breathing apparatus

(4) Firms engaged in annual performance testing of Voyage Data Recorders (VDR) and simplified Voyage Data Recorders (S-VDR)

(5) Firms engaged in sound pressure level measurements of public address and general alarm systems on board ships

(6) Firms engaged in inspections of low location lighting systems using photo luminescent materials and evacuation guidance systems used as an alternative to low-location lighting systems

(7) Firms engaged in the servicing and maintenance of lifeboats, launching appliances, on-load release gear and davit-launched liferaft automatic release hooks.

(8) Firms engaged in inspection, performance testing and maintenance of Automatic Identification Systems (AIS)

4.1.2 Classification and/or Statutory services:

(1) Firms engaged in thickness measurements on ships except

① non-ESP ships less than 500 gross tonnage and

② all fishing vessels.

(2) Firms carrying out in-water survey of ships and mobile offshore units

(3) Firms engaged in inspections and maintenance of fire extinguishing equipment and systems

(4) Firms engaged in tightness testing of closing appliances such as hatches, doors etc. with ultrasonic equipment

(5) Firms engaged in measurements of noise level on board ships

(6) Firms engaged in examination of Ro-Ro ship's bow, stern, side and inner doors

(7) Firms engaged in testing of coating systems in accordance with IMO Resolution MSC.215(82), as amended, and IACS UI SC223 and/or MSC.288(87), as amended.

(8) Firms engaged in tightness testing of primary and secondary barriers of gas carriers with membrane cargo containment systems for vessels in service

4.1.3 Where CCS accepts work of a third party (eg., service supplier) approved by itself, CCS shall verify the performance of such services. For statutory service, the flag State may increase the scope of verification to be applied to these services. The process shall be defined within CCS quality management system. For the purpose of accountability to the flag State, the work performed by the third party (eg., service supplier) constitutes the work of CCS and shall be subject to the requirements incumbent upon CCS under the RO Code IMO MSC.349 (92) and MEPC.237(65).

4.2 Where the results of the following service providers are used by a Surveyor of CCS in making decisions affecting classification services then that service provider must be approved and verified by CCS.

- Firms engaged in thickness measurements on ships except
  (1) non-ESP ships less than 500 gross tonnage and
  (2) all fishing vessels.
- Firms carrying out in-water survey of ships and mobile offshore units

  Firms engaged in tightness testing of closing appliances such as hatches, doors etc. with ultrasonic equipment

4.3 Where such services are used by Surveyors in making decisions affecting statutory certification service, the firms are subject to approval and verification by CCS where CCS is so authorised by the relevant flag Administration (i.e. the flag of the ship on which the servicing is to be done or the service equipment is to be used). For such services CCS may accept approvals done by:

i. the flag Administration itself,

ii. duly authorized organizations acting on behalf of the flag Administration, or

iii. other organizations those are acceptable to the flag Administration (e.g. other

governments, etc.).

4.4 Use of the approved service suppliers is not mandatory for the following services, unless instructed otherwise by the flag Administration with respect to statutory certification

Firms engaged in inspections of low location lighting systems using photo luminescent materials and evacuation guidance systems used as an alternative to low-location lighting systems

Firms engaged in sound pressure level measurements of public address and general alarm systems on board ships

Firms engaged in measurements of noise level onboard ships

Firms engaged in testing of coating systems in accordance with IMO Resolution MSC.215(82) as amended and IACS UI SC223 and/or MSC.288(87) as amended

Firms engaged in examination of Ro-Ro ships bow, stern, side and inner doors

4.5 Detailed requirements specific to the various categories of suppliers are given in Annex 1. National and/or international requirements may give additional requirements. References to such national and/or international requirements are given in Annex 1.

5. Procedure for Approval and Certification

5.1 Submission of documents

5.1.1 The following documents are to be submitted to CCS for review. General requirements concerning suppliers are given in 5.2, and specific requirements as relevant, in Annex 1.

- Outline of company, e.g. organisation and management structure, including subsidiaries to be included in the approval/certification
- List of nominated agents, subsidiaries and subcontractors
- Experience of the company in the specific service area
- For categories of Service Suppliers that require authorization from manufacturers, manufacturer's documentary evidence that the Service Supplier has been authorized or licensed to service the particular makes and models of equipment for which approval is sought shall be provided.
- List of operators/technicians/inspectors documenting training and experience within the relevant service area, and qualifications according to recognised national, international or industry standards, as relevant
- Description of equipment used for the particular service for which approval is sought
- A guide for operators of such equipment
- Training programmes for operators/technicians/inspectors
- Check lists and record formats for recording results of the services referred to in Annex 1
- Quality Manual and/or documented procedures covering requirements in 5.5
- Documented procedures for communication with the crew prior to commencing work, so that it is safe to decommission the equipment being maintained, and to provide a safe system of work in place
- Evidence of approval/acceptance by other bodies, if any
- Information on the other activities which may present a conflict of interest
- Record of customer claims and of corrective actions requested by certification bodies

5.2 General requirements:

5.2.1 Extent of Approval – The supplier shall demonstrate, as required by 5.2.2 – 5.2.11, that it has the competence and control needed to perform the services for which approval is sought.

5.2.2 Training of personnel – The supplier is responsible for the qualification and training of its personnel to a recognised national, international or industry standard as applicable. Where such standards do not exist, the supplier is to define standards for the training and qualification of its personnel relevant to the functions each is authorised to perform. The personnel shall also have adequate experience and be familiar with the operation of any necessary equipment. Operators/technicians/inspectors shall have had a minimum of one year tutored on-the-job training. Where it is not possible to perform internal training, a program of external training may be considered as acceptable.

5.2.3 Supervision – The supplier shall provide supervision for all services provided. The responsible supervisor shall have had a minimum of two years of experience as an operator/technician/inspector within the activity for which the supplier is approved. For a supplier consisting of one person, that person shall meet the requirements of a supervisor.

5.2.4 Personnel records – The supplier shall keep records of the approved operators/technicians/inspectors. The record shall contain information on age, formal education, training and experience for the services for which they are approved.

5.2.5 Equipment and facilities – The supplier shall have the necessary equipment and facilities for the service to be supplied. A record of the equipment used shall be kept and available. The record shall contain information on maintenance and results of calibration and verifications. CCS shall assess and record the validity of previous measuring results when the equipment is found not to conform to requirements. CCS shall take appropriate action on the equipment affected.

5.2.6 Control of data:

When computers are used for the acquisition, processing, recording, reporting, storage, measurement assessment and monitoring of data, the ability of computer software to satisfy the intended application shall be documented and confirmed by the service supplier. This shall be undertaken prior to initial use and reconfirmed as necessary.

Note: Commercial off-the-shelf software (e.g. wordprocessing, database and statistical programmes) in general use within their designed application range may be considered to be sufficiently validated and do not require any subsequent confirmation.

5.2.7 Where several servicing stations are owned by a given company, each station is to be assessed and approved except as specified in 5.5.3

5.2.8 Procedures – The supplier shall have documented work procedures covering all services supplied.

5.2.9 Subcontractors – The supplier shall give information of agreements and arrangements if any parts of the services provided are subcontracted. Particular emphasis shall be given to quality management by the supplier in following-up such subcontracts. Subcontractors providing anything other than equipment shall also meet the requirements of sections 5.2 and 5.5.

5.2.10 Verification – The supplier shall verify that the services provided are carried out in accordance with approved procedures.

5.2.11 Reporting – The report shall be prepared in a form acceptable to CCS. The report should detail the results of inspections, measurements, tests, maintenance and/or repairs carried out. Special guidelines may be given in Annex 1. The report shall include a copy of the Certificate of Approval.

5.2.12 Documented procedures and instructions should be available for the recording of

damages and defects found during inspections, servicing and repair work. This documentation is to be made available upon request.

5.3 Auditing of the Supplier – Upon reviewing the submitted documents with satisfactory result, the supplier is audited in order to ascertain that the supplier is duly organised and managed in accordance with the submitted documents, and that it is considered capable of conducting the services for which approval/certification is sought.

5.4 Certification is conditional on a practical demonstration of the performance of the specific service as well as satisfactory reporting being carried out. At renewal audits, evidence of performance, verified by class surveyor, since the previous audit is sufficient to satisfy this requirement.

5.5 Quality System

5.5.1 The supplier shall have a documented system covering at least the following:

- code of conduct for the relevant activity
- maintenance and calibration of equipment
- training programmes for operators/technicians/inspectors
- supervision and verification to ensure compliance with operational procedures
- recording and reporting of information
- quality management of subsidiaries, agents and subcontractors
- job preparation
- periodic review of work process procedures, complaints, corrective actions, and issuance, maintenance and control of documents

5.5.2 A documented Quality system complying with the most current version of ISO 9000 series and including the above items, would be considered acceptable.

5.5.3 If a manufacturer of equipment (and/or its service supplier) applies to CCS for inclusion of its nominated agents and/or subsidiaries in the approval, then it must have implemented a quality system certified in accordance with the most current version of ISO 9000 series. The quality system must contain effective controls of the manufacturer's (and/or service supplier's) agents and/or subsidiaries. The nominated agents/subsidiaries must also have in place an equally effective quality system complying with the most current version of ISO 9000 series. Such approvals shall be based upon an evaluation of the quality system implemented by the parent company against the most current version of ISO 9000 series. CCS may require follow-up audits on such agents or subsidiaries against the most current version of ISO 9000 series to confirm adherence to this quality system.

5.6 Service Suppliers Relations with the Equipment Manufacturer

5.6.1 A company which works as a service station for manufacturer(s) of equipment (and as a service supplier in this field), shall be assessed by the manufacturer(s) and nominated as their agent. The manufacturer shall ensure that appropriate instruction manuals, material etc. are available for the agent as well as proper training of the agent's technicians. Such suppliers shall be approved either on a case by case basis, or in accordance with 5.5.3.

6. Certification

6.1 Upon satisfactory completion of both the audit of the supplier and the demonstration test, as applicable, CCS may issue a Certificate of Approval stating that the supplier's service operation system has been found to be satisfactory and that the results of services performed in accordance with that system may be accepted and utilised by CCS Surveyors in making decisions affecting

classification or statutory certification, as relevant. The Certificate shall clearly state the type and scope of services and any limitations or restrictions imposed including type of equipment and/or names of Manufacturers of equipment where this is a limiting restraint. The supplier may also be included in CCS record of approved service suppliers.

6.2 Renewal or endorsement of the Certificate is to be made at intervals not exceeding five (5) years by verification through audits that approved conditions are maintained or, where applicable, on expiry of the supplier's approval received from an equipment Manufacturer, whichever comes first. In the latter case, CCS is to be informed in due course by the Service Supplier. CCS may require renewal or endorsement of the Certificate at intervals shorter than five (5) years and may require intermediate audits. For firms engaged in thickness measurements, renewal/endorsement of the Certificate is to be made at intervals not exceeding 3 years by verification that original conditions are maintained.

7. Information Regarding Alterations to the Certified Service Operating System

7.1 When any alteration to the certified service operating system of the supplier is made, such alteration is to be immediately informed to CCS. Re-audit may be required when deemed necessary by CCS.

8. Cancellation of Approval

8.1 CCS reserves the right to cancel the approval and to inform the IACS Members accordingly (For Firms engaged in thickness measurements refer to PR23).

8.2 Approval may be cancelled in the following cases:

8.2.1 Where the service was improperly carried out or the results were improperly reported.

8.2.2 Where a Surveyor finds deficiencies in the approval service operating system of the supplier and appropriate corrective action is not taken.

8.2.3 Where alterations have been made to the Company's Quality System relevant to the service supplier certificates, without written notification to CCS.

8.2.4 Where the intermediate audit, if requested as per 6.2, has not been carried out.

8.2.5 Where wilful acts or omissions are ascertained.

8.2.6 Where any deliberate misrepresentation has been made by the Service Supplier.

8.3 A supplier whose approval was cancelled, may apply for re-approval provided it has corrected the non-conformities which resulted in cancellation, and CCS is able to confirm it has effectively implemented the corrective action.

8.4 Expiration or cancellation of the Supplier's parent company approval automatically invalidates approval of all agents and subsidiaries if these are certified according to 5.5.3

9. Existing Approvals

Approvals for the categories of service suppliers granted before the date of implementation of UR Z17 by CCS may remain valid as stated in the respective certificates for a period up to but not exceeding 3 years. Renewals of such certificates must be carried out in accordance with UR Z17.

ANNEX 1

Special Requirements for Various Categories of Service Suppliers

1. Firms engaged in thickness measurements on ships

1.1 Extent of engagement – Thickness measurement of structural material of ships except

(1) non-ESP ships less than 500 gross tonnage and

(2) all fishing vessels.

1.2 Supervisor – The responsible supervisor shall be qualified according to a recognised

national or international industrial NDT standard (e.g. EN 473 level II as amended or ISO 9712 level II as amended).

1.3 Operators – The operators carrying out the measurements shall be certified to a recognised national or international industrial standard (e.g. EN 473 level I as amended or ISO 9712 level I as amended) and shall have adequate knowledge of ship structures sufficient to elect a representative position for each measurement.

1.4 Equipment – On coated surfaces, instruments using pulsed echo technique (either with oscilloscope or digital instruments using multiple echoes, single crystal technique) are required. Single echo instruments may be used on uncoated surfaces, which have been cleaned and ground.

1.5 Procedures – Documented work procedures are at least to contain information on inspection preparation, selection and identification of test locations, surface preparation, protective coating preservation, calibration checks, and report preparation and content.

1.6 Reporting – The report shall be based on the guidelines given in UR Z7, UR Z7.1, UR Z7.2, Z10.1, Z10.2, Z10.3, Z10.4 and Z10.5, as relevant.

1.7 Verification – The supplier must have the Surveyor's verification of each separate job, documented in the report by the attending Surveyor(s) signature.

2. Firms engaged in tightness testing of closing appliances such as hatches, doors etc. with ultrasonic equipment

2.1 Extent of engagement – Ultrasonic tightness testing of closing appliances such as hatches, doors etc.

2.2 Operators – The operator is to have the following qualifications:

- Have knowledge of different closing appliances such as hatches, doors etc. including their design, functioning and sealing features
- Have experience with the operation and maintenance of different closing appliances such as hatches, doors etc.
- Be able to document theoretical and practical training onboard in using the ultrasonic equipment specified

2.3 It shall be demonstrated to the Surveyor that the ultrasonic equipment is fit for the purpose of detecting leakages in closing appliances.

2.4 Procedures – The supplier shall have documented work procedures which shall include the manual for the ultrasonic equipment specified, its adjustment, its maintenance, its operation and approval criteria.

3. Firms carrying out in-water survey of ships and mobile offshore units

3.1 Extent of engagement – In-water survey of ships and mobile offshore units by diver or Remote Operated Vehicle.

3.2 Training of personnel – The supplier is responsible for the qualification of its divers and the diving equipment utilised when carrying out inspection. Knowledge of the following shall be documented:

- Ship's underwater structure and appendages, tail shaft, propeller, rudder and its bearings, etc.
- Non-destructive testing in accordance with a recognised national or international industrial NDT standard. This requirement only applies if an in-water survey company performs non-destructive testing.
- Bearing clearance measurements on rudders and tail shaft

- Under-water video monitoring with TV-monitors on deck, as well as still picture work
- Operation of under-water communication system
- Special equipment and tools e.g. hull cleaners, grinders, cutters, etc.

3.3 A plan for training of personnel in the reporting system, minimum Rule requirements for relevant ship types, ship's underwater structure, measuring of bearing clearances, the recognition of corrosion damage, buckling and deteriorated coatings, etc. shall be included.

3.4 Supervisor – The supervisor shall be qualified according to the supplier's general requirements and shall have a minimum of two years' experience as a diver carrying out inspection.

3.5 Divers carrying out inspection – The diver carrying out the inspection shall have had at least one year's experience as an assistant diver carrying out inspection (including participation in a minimum of 10 different assignments).

3.6 Equipment – The following shall be available:

- Closed circuit colour television with sufficient illumination equipment
- Two-way communication between diver and surface staff
- Video recording device connected to the closed circuit television
- Still photography camera
- Equipment for carrying out thickness gauging, non-destructive testing and measurements, e.g. clearances, indents, etc., as relevant to the work to be performed.
- Equipment for cleaning of the hull
- Remote Operated Vehicle, if applicable

3.7 Procedures and guidelines – The supplier shall have documented operational procedures and guidelines for how to carry out the inspection and how to handle the equipment. These shall include:

- Two-way communication between diver and surface
- Video recording and closed circuit television operation
- Guidance of the diver along the hull to provide complete coverage of the parts to be inspected
- Guidance for the operation and maintenance of the Remote Operated Vehicle, if applicable

3.8 Verification – The supplier must have the Surveyor's verification of each separate job, documented in the report by the attending Surveyor(s) signature.

4. Firms engaged in inspection **and maintenance of fire extinguishing equipment and systems**

4.1 Extent of engagement – Inspections and maintenance of fire-extinguishing equipment and systems such as fixed fire extinguishing systems, portable fire extinguishers and fire detection and alarm systems.

4.2 Extent of Approval

- Service Suppliers are to have professional knowledge of fire theory, fire-fighting and fire-extinguishing appliances sufficient to carry out the maintenance and/or inspections14.6, and to make the necessary evaluations of the condition of the equipment
- In demonstrating professional knowledge, Service Suppliers are to have an understanding of the various types of fires and the extinguishing media to be used on them

- For fixed fire-extinguishing systems, Service Suppliers are to demonstrate an understanding of the principles involved with gas, foam, deluge, sprinkler and water-mist systems, as relevant for the approval being sought

4.3 Procedures

- Service Suppliers are to have documented procedures and instructions on how to carry out the servicing of the equipment and/or system. These are to either contain or make reference to the Manufacturer's servicing manuals, servicing bulletins, instructions and training manuals, as appropriate, and to international requirements
- Additionally they are to make reference to any requirements (e.g. what markings should be appended to the equipment/system)

4.4 Reference Documents - The Service Supplier is to have access to the following documents:

- Manufacturer's servicing manuals, servicing bulletins, instructions and training manuals, as appropriate
- Type Approval certificates showing any conditions that may be appropriate during the servicing and/or maintenance of fire-extinguishing equipment and systems
- SOLAS, MSC.1/Circular.1318 (Guidelines for the Maintenance and Inspections of Fixed Carbon Dioxide Fire-Extinguishing Systems), International Code for Fire Safety Systems (FSS Code), ISO 6406 (Periodic inspection and testing of seamless steel gas cylinders), and any documentation specified in the authorisation or license from the equipment manufacturer
- MSC/Circ.670 (Guidelines for the Performance and Testing Criteria and Surveys of High Expansion Foam Concentrates for fixed Fire-Extinguishing Systems)
- MSC/Circ.798 (Guidelines for the Performance and Testing Criteria and Surveys of Medium Expansion Foam Concentrates for fixed Fire-Extinguishing Systems)
- MSC/Circ.799 ((Guidelines for the Performance and Testing Criteria and Surveys of Expansion Foam Concentrates for fixed Fire-Extinguishing Systems of Chemical Tankers)
- MSC.1/Circ.1312 (Revised Guidelines for the Performance and Testing Criteria and Surveys of Foam Concentrates for fixed Fire-Extinguishing Systems as corrected by MSC/Circ.1312/Corr.1)
- MSC.1/Circ.1432 (Revised Guidelines for the maintenance and Inspection of Fire Protection Systems and Appliances)
- IMO Res. A. 951(23) – Improved guidelines for marine portable fire extinguishers
- MSC.1/Circ.1370 – Guidelines for the design, construction and testing of fixed hydrocarbon gas detection systems
- Guidelines adopted by IMO for fire extinguishing equipment and systems specifically intended for service by service suppliers

4.5 Equipment and Facilities

4.5.1 General Requirements

- If Service Suppliers undertake shore-based inspecting and maintenance, they should maintain and implement procedures for workshop cleanliness, ventilation and arrangement, with due cognisance of the spares and extinguishing media being stored, to ensure safe and effective working procedures
- Service Suppliers undertaking inspecting and maintenance of equipment and systems

onboard are to provide the appropriate facilities to either complete the work onboard or remove the necessary items to their workshops

4.5.2 Equipment

Sufficient and appropriate spares and tools are to be available as applicable, which should include:

- Various scales to weigh items
- Means to hydrostatically pressure test components/systems/storage bottles
- Liquid/gas, flow meters, as appropriate
- Pressure gauges or manometers
- In the cases of foam concentrates and portable fire-extinguishers, chemical analysis equipment and a testing bay, respectively; and
- Specific equipment/spares as may be specified by Manufacturer
- Level measuring equipment for bottles
- Recharging facilities for pressurized bottles, extinguishers and cartridges

5. Firms engaged in servicing inflatable liferafts, inflatable lifejackets, hydrostatic release units, inflatable rescue boats, marine evacuation systems

5.1 Extent of engagement

- Servicing of inflatable liferafts, inflatable lifejackets, hydrostatic release units and/or inflatable rescue boats
- Servicing of marine evacuation systems

5.2 Equipment and facilities – IMO Res. A.761(18) as amended by MSC.55(66) gives recommendations on conditions for the approval of servicing stations for inflatable liferafts which shall be observed as relevant. Where inflatable liferafts are subject to extended service intervals, MSC.1/Circ.1328 should also be followed.

5.3 Procedures and instructions – The supplier shall have documented procedures and instructions for how to carry out service of equipment. Where inflatable liferafts are subject to extended service intervals in accordance with the requirements of SOLAS Regulation III/20.8.3, MSC.1/Circ.1328 should be followed in addition to Resolution A.761(18) as amended by MSC.55(66).

5.4 The supplier shall provide evidence that it has been authorised or licensed to service the particular makes and models of equipment for which approval is sought by the equipment's manufacturer.

5.5 Reference Documents - The Service Supplier is to have access to the following documents:

- IMO - Resolution A.761(18) - Recommendation on Conditions for the Approval of Servicing Stations for Inflatable Liferafts - (adopted on 4 November 1993), amended by Resolution MSC.55(66)
- IMO - Resolution MSC.55(66)
- IMO – MSC.1/Circ.1328 – Guidelines for the Approval of Inflatable Liferafts Subject to Extended Service Intervals Not Exceeding 30 Months
- Manufacturer's servicing manuals, servicing bulletins, instructions and training manuals, as appropriate
- Type Approval certificates, showing any conditions that may be appropriate during the servicing and/or maintenance of inflatable liferafts, inflatable rescue boats, inflatable lifejackets, and hydrostatic release units
- LSA code/Chap.IV, 1995 SOLAS Conference Resolution 4 regarding marine evacuation

systems

6. Firms engaged in inspections **and testing of radio communication equipment**

6.1 Extent of engagement

- Surveys, inspection, testing, and/or measurement of radio equipment aboard ships or mobile offshore units for compliance with SOLAS regulations
- Annual testing of 406 MHz satellite EPIRBs for compliance with SOLAS Regulation IV/15.9
- The principles of this section also apply to Service Suppliers involved in inspection, performance testing and maintenance of Automatic Identification Systems (AIS).The Service Supplier is to be familiar with the equipment with which it will be involved, such as being a service agent for the equipment manufacturer

6.2 Reference documents – The supplier shall have access to the following documents:

- SOLAS 1974 as amended
- IMO Res. A.789(19): Specification on the survey and certification functions of recognised organisations acting on behalf of the administration
- MSC/Circ.1040/Rev.1 – Guidelines on Annual Testing of 406 MHZ Satellite EPIRBs
- MSC.1/Circ.1252 – Guidelines on Annual Testing of the Automatic Identification System (AIS)
- SN/Circ.227, SN/Circ.227/Corr.1 and 245 – Guidelines for the Installation of a Shipborne Automatic Identification System (AIS) and amendments thereto
- ITU Radio Regulations
- IMO Performance Standards for the equipment for which the Service Supplier is approved
- Flag State Administration requirements
- Relevant parts, if any, of CCS Rules and Guidelines

6.3 Supervisor – The supervisor shall have a minimum two years education from a technical school, experience as inspector, and should preferably hold a General Operator's Certificate (GOC) or a GMDSS Radioelectronic Certificate (REC), recognised by the ITU, to operate or test radio transmitters. He should be aware of any local conditions for radio signal propagation, of regional radio stations and their facilities, and of the GMDSS infrastructure.

6.4 Radio inspector – The inspector carrying out the inspection shall have passed the internal training of the supplier in Radiotelephony, GMDSS, and initial and renewal surveys, as applicable. The inspector shall also have at least one year's technical school training or as alternative hold evidence that he followed a technical course approved by the relevant Administration, at least one year's experience as an assistant radio inspector and should preferably hold an appropriate National Radio Operators Certificate, recognised by the ITU, such as a GMDSS General Operator's Certificate (GOC) or a GMDSS Radioelectronic Certificate (REC). He should be aware of any local conditions for radio signal propagation, of regional radio stations and their facilities, and of the GMDSS infrastructure.

6.5 Equipment and facilities

6.5.1 The supplier shall have the major and auxiliary equipment required for correctly performing the inspection. A record of the equipment used shall be kept. The record shall contain information on manufacturer and type of equipment, and a log of maintenance and calibrations.

6.5.2 A standard which is relevant to the radio equipment to be tested shall be available for the

equipment and shall be cited in the inspection report.

6.5.3 For equipment employing software in conjunction with the testing/examination, this software shall be fully described and verified.

6.6 Minimum required instruments:

- Equipment for measuring frequency, voltage, current and resistance
- Equipment for measuring output and reflect effect on VHF and MF/HF
- Equipment for measuring modulation on MF/HF and VHF (AM, FM, PM)
- Acid tester for checking specific gravity of lead batteries
- Tester for checking of correct output from Free-Float Satellite EPIRB
- Equipment for testing the performance of Automatic Identification Systems (AIS)

6.7 Procedures and instructions – The supplier shall have documented procedures and instructions for how to carry out testing and examination of radio equipment. Procedures and instructions for operating each item of the testing/inspection equipment shall also be kept and be available at all times.

7. Firms engaged in inspections **and maintenance of self contained breathing apparatus**

7.1 Extent of Engagement - inspections and maintenance of self-contained breathing apparatus, Emergency Escape Breathing Devices (EEBD)

7.2 Extent of Approval

- The supplier shall document and demonstrate that it has knowledge of the equipment and systems sufficient to carry out the inspections and testing of self-contained breathing apparatus to identify standards and to make the necessary evaluation of the condition of the equipment
- In demonstrating professional knowledge, Service Suppliers are to have an understanding of the operational requirements involved with self-contained breathing apparatus and how these are to be maintained
- Additionally, Service Suppliers are to demonstrate the necessary safety requirements applicable to such equipment

7.3 Procedures

- Service Suppliers are to have documented procedures and instructions on how to carry out the servicing of the equipment and/or system. These are to either contain or make reference to the Manufacturer's servicing manuals, servicing bulletins, instructions and training manuals, as appropriate
- Additionally they are to make reference to any requirements (e.g. what markings should be appended to the equipment/system) and how they should be applied

7.4 Reference Documents - The Service Supplier is to have access to the following documents:

- Manufacturers' servicing manuals, servicing bulletins, instructions and training manuals, as appropriate
- Type Approval certificates showing any conditions which may be appropriate during the servicing and/or maintenance of self-contained breathing apparatus

7.5 Equipment and Facilities

7.5.1 General Requirements

- If Service Suppliers undertake shore-based inspecting and maintenance, they should maintain and implement procedures for workshop cleanliness, ventilation and arrangement, with due cognisance of the spares and pressurised bottles being stored, to

ensure safe and effective working procedures

- Service Suppliers undertaking inspecting and maintenance of equipment and systems onboard are to provide the appropriate facilities to either complete the work onboard or remove the necessary items to their workshops

7.5.2 Equipment

- Sufficient and appropriate spares and tools are to be available for repair, maintenance and servicing of self-contained breathing apparatus in accordance with the requirements of the Manufacturers
- These are to include, as required by the self-contained breathing apparatus equipment and/or systems:
- Various scales to weigh items
- Means to hydrostatically pressure test components/systems/storage bottles
- Flow meters; and
- Pressure gauges or manometers
- Equipment for checking air quality
- Recharging facilities for breathing apparatus

8. Firms engaged in examination of Ro-Ro ships bow, stern, side and inner doors

8.1 Extent of engagement - inspection of securing and locking devices, hydraulic operating system, electric control system for the hydraulics, electric indicator systems, and supporting, securing and locking devices and tightness testing.

8.2 The supplier is to be certified to the most current version of ISO 9000 series.

8.3 Supervision - In addition to 5.2.3, the requirement to have had a minimum of two years experience as operator/technician/inspector within the activity, a Supervisor is to have a minimum two years related education from a technical school.

8.4 Training of personnel - Operators carrying out Non-Destructive Examination (NDE) are to be qualified to a recognised National or International Standard for the methods used.

8.5 Reference documents - The supplier shall have access to the following reference documents:

- IMO - International Convention on the Safety of Life at Sea (SOLAS) 74/78, as amended
- ISO 9002:1994 - Quality systems - Model for quality assurance in production, installation and servicing
- UR Z24 - Survey Requirements for Shell and Inner Doors of Ro-Ro ships, or its equivalent, by CCS

8.6 Required Equipment

8.6.1 For Inspection of Supporting Securing and Locking Devices, Hinges and Bearings:

- Equipment for measuring clearances (i.e. feeler gauges, vernier calipers, micrometers).
- Non-destructive examination (i.e. dye penetrant, magnetic particle inspection)

8.6.2 For Tightness Testing:

- Ultrasonic leak detector or equivalent

8.6.3 For Inspection of Hydraulic Operating System:

- Pressure gauges
- Particle counter for analysing the quality of hydraulic fluid

8.6.4 For Inspection of Electric Control System and Indication System:

- Digital multi-meter
- Earth fault detector

8.7 Procedures and Instructions

8.7.1 The supplier shall have access to drawings and documents, including the Operating and Inspection Manual.

8.7.2 The supplier shall have access to the service history of the doors.

8.7.3 The supplier should use, complete and sign a checklist which has been found acceptable by CCS.

9. Firms engaged in annual performance testing of Voyage Data Recorders (VDR) and simplified Voyage Data Recorders (S-VDR)

9.1 Extent of engagement – Testing and servicing of Voyage Data Recorders (VDR) and Simplified Voyage Data Recorders (S-VDR) in accordance with SOLAS Chapter V Regulation 18.8 and IMO - MSC.1/Circular.1222 - Guidelines on Annual Testing of Voyage Data Recorders (VDR) and Simplified Voyage Data Recorders (S-VDR), as applicable.

9.2 Extent of Approval

9.2.1 The supplier shall provide evidence that he has been authorised or licensed by the equipment's manufacturer to service the particular makes and models of equipment for which approval is sought.

9.2.2 Where the Service Supplier is also the Manufacturer of the Voyage Data Recorder (VDR) or Simplified Voyage Data Recorder (S-VDR) and has elected to apply IMO - MSC.1/Circular.1222 - Guidelines on Annual Testing of Voyage Data Recorders (VDR) and Simplified Voyage Data Recorders (S-VDR) in its entirety for the purpose of acting as a Service Supplier engaged in annual performance testing, the following is to apply:

- The Manufacturer is responsible for appointing Manufacturer's Authorised Service Stations to carry out annual performance testing
- The Manufacturer is required to be an Approved Service Supplier and is to satisfy the requirements for Service Suppliers engaged in annual performance testing of Voyage Data Recorders (VDR) and Simplified Voyage Data Recorders (S-VDR), as applicable
- The Manufacturer's Authorised Service Station is not required to be an Approved Service Supplier
- The Manufacturer is to demonstrate that IMO - MSC.1/Circular.1222 - Guidelines on Annual Testing of Voyage Data Recorders (VDR) and Simplified Voyage Data Recorders (S-VDR) is applied in its entirety

9.3 Procedures

9.3.1 The Service Supplier shall have documented procedures and instructions.

9.3.2 Where the Service Supplier is also the Manufacturer of the Voyage Data Recorder (VDR) or Simplified Voyage Data Recorder (S-VDR) and has selected to apply IMO - MSC.1/Circular.1222 - Guidelines on Annual Testing of Voyage Data Recorders (VDR) and Simplified Voyage Data Recorders (S-VDR) in its entirety for the purpose of acting as a Service Supplier engaged in annual performance testing, the following is to apply:

- The Manufacturer is to have documented procedures for the assessment and authorisation of Manufacturer's Authorised Service Stations who carry out annual performance testing
- The Manufacturer is to have documented procedures for the review of Manufacturer's

Authorised Service Stations annual performance test reports, analysis of the Voyage Data Recorder (VDR) and Simplified Voyage Data Recorder (S-VDR) 12 hour log and the issue of annual performance test certificates to the Owner/Operator

- The Manufacturer is to maintain a list of Manufacturer's Authorised Service Stations that can be accessed (by any available means, e.g. via a nominated contact point or from the Manufacturer's website) upon request

9.4 Reference Documents

9.4.1 The Service Supplier is to have access to the following documents:

- IMO - International Convention on the Safety of Life at Sea (SOLAS), 74/78, Ch V, Reg 18.8. – Approval, surveys and performance standards of navigational systems and equipment and voyage data recorder
- IMO - MSC.1/Circular.1222 - Guidelines on Annual Testing of Voyage Data Recorders (VDR) and Simplified Voyage Data Recorders (S-VDR) - (11 December 2006)
- IMO - Resolution A.861(20) (adopted on 27 November 1997) as amended by IMO Resolution MSC.214(81) and revised by IMO Resolution MSC.333(90) - Performance Standards for Shipborne Voyage Data Recorders (VDRs) -
- IMO - Resolution MSC.163(78) - Performance Standards for Shipborne Simplified Voyage Data Recorders (S-VDRs) - (adopted on 17 May 2004), as amended by IMO Resolution 214(81)

9.4.2 The Service Supplier is to have access to applicable industry performance standards, e.g.:

- IEC 61996 - Maritime navigation and radiocommunication equipment and systems - Shipborne voyage data recorder (VDR)
- IEC 61996–2 - Maritime navigation and radio communication equipment and systems – Shipborne voyage data recorder (VDR) – Part 2: Simplified voyage data recorded (S-VDR) – Performance requirements, method of testing and required test results

9.4.3 The Service Supplier is also to have access to any documentation specified in the authorisation or license from the equipment manufacturer.

9.5 Equipment and Facilities - In addition, the Service Supplier shall have equipment as specified in the authorisation or license from the equipment Manufacturer.

9.6 Reporting - Test Report

9.6.1 The Service Supplier shall issue a certificate of compliance as specified in the International Convention on Safety of Life at Sea (SOLAS 1974), as amended, Ch V, Reg 18.8.

9.6.2 Annual Performance Test of VDR and S-VDR should be recorded in the form of the model test report given in the Appendix to MSC.1/Circular.1222, signed and stamped by the Service Supplier and attached to the annual performance test certificate.

9.6.3 Where the Service Supplier is also the Manufacturer of the Voyage Data Recorder (VDR) or Simplified Voyage Data Recorder (S-VDR) and has selected to apply IMO - MSC.1/Circular.1222 - Guidelines on Annual Testing of Voyage Data Recorders (VDR) and Simplified Voyage Data Recorders (S-VDR) in its entirety for the purpose of acting as a Service Supplier engaged in annual performance testing, the Manufacturer is to make arrangements for the following:

- Review of the Manufacturer's Authorised Service Station annual performance test report
- Analysis of the recorder's 12 hour log

- Checking of the master record/database for the recorder

9.6.4 Issue of the annual performance test certificate to the Owner/Operator within 45 days of completion of the annual performance test.

10. Firms engaged in inspections **of low location lighting systems using photo luminescent materials and evacuation guidance systems used as an alternative to low-location lighting systems**

10.1 Extent of engagement – Luminance measurements on board ships of low location lighting systems using photo luminescent materials.

10.2 Operators – The operator is to have the following qualifications:

- Have adequate knowledge of the applicable international requirements (namely SOLAS reg. II-2/13.3.2.5, IMO Res. A.752(18) - Guidelines for the Evaluation, Testing and Application of Low-Location Lighting on Passenger Ships, ISO 15370-2010, FSSS Code Chapter 11)
- Be able to document ~~a~~ theoretical and practical training onboard in using equipment specified

10.3 Equipment – The measuring instrument shall incorporate a fast-response photometer head with CIE (International Commission on Illumination) photopic correction and have a measurement range of at least 10^{-4} cd/m^2 to 10 cd/m^2.

10.4 Procedures – Documented work procedures are at least to contain information on inspection preparation, selection and identification of test locations.

10.5 Reporting – The report shall conform to Annex C of ISO 15370-2010.

10.6 Verification – The supplier must have the Surveyor's verification of each separate job, documented in the report by the attending Surveyor's signature.

10.7 Reference Documents

The Service Supplier is to have access to the following documents:

- IMO - International Convention on the Safety of Life at Sea (SOLAS), 74/78 Ch II-2, Pt D, Reg 13.3.2.5 – Marking of escape routes
- IMO – Fire Safety Systems (FSS Code), Ch 11 – Low-location lighting systems
- IMO - Resolution A.752(18) - Guidelines for the Evaluation, Testing and Application of Low-Location Lighting on Passenger Ships - (adopted on 4 November 1993)
- ISO 15370:2010 - Ships and marine technology - Low-location lighting on passenger ships – Arrangement
- MSC/Circ.1168 – Interim guidelines for the testing, approval and maintenance of evacuation guidance systems used as an alternative to low-location lighting systems

11. Firms engaged in sound pressure level measurements of public address and_general alarm systems on board ships

11.1 Extent of engagement – Sound pressure level measurements of public address and general alarm systems on board ships.

11.2 Operators – The operator is to have the following qualifications:

- Have adequate knowledge of the applicable international requirements (SOLAS Reg. III/4 and III/6, LSA CODE Chapter VII/7.2, IMO Code on alarms and indicators, 1995)
- Be able to document ~~a~~ theoretical and practical training onboard in using equipment specified

11.3 Equipment – The measuring instrument shall be an integrating sound level meter with frequency analyser capabilities complying with IEC (International Electrotechnical Commission) 60651 and IEC 61672, type 1 precision class with, at least an A-weighting frequency response curve and 1/3 octave and 1 octave band filters, complying to IEC 61260, as appropriate for the measurements to be carried out. In addition microphones shall be of the random incidence type, complying with IEC 60651.

11.4 Procedures – Documented work procedures are at least to contain information on inspection preparation, calibration, selection and identification of test locations.

11.5 Reporting – The report shall describe, as a minimum, the environmental conditions of the tests and, for each test location, the ambient noise level or the speech interference level, as appropriate for the measurements to be carried out. The report shall conform to any other specific requirement of CCS.

11.6 Verification – The supplier must have the Surveyor's verification of each separate job, documented in the report by his signature.

11.7 Reference documents

The Service Supplier is to have access to the following documents:

- SOLAS 74/78, Ch III, Pt A, Reg 4 – Evaluation, testing and approval of life-saving appliances and arrangements
- SOLAS 74/78, Ch III, Pt B, Reg 6 – Communications
- International Life-Saving Appliance (LSA) Code, Ch VII, Reg 7.2 – General alarm and public address system
- IMO - Code on Alarms and Indicators, 1995 as amended
- IEC 60651 (2001-10) - Sound level meters
- IEC 61672 - Electroacoustics - Sound level meters
- IEC 61260 - Electroacoustics - Octave-band and fractional-octave-band filters

12. Firms engaged in testing of coating systems in accordance with IMO Resolution MSC.215(82) as amended and IACS UI SC223 and/or MSC.288(87) as amended

12.1 Laboratories

12.1.1 Extent of Engagement - Testing of coatings systems according to IMO Resolution MSC.215(82), as corrected by IMO MSC.1/Circ.1381 and amended by IMO Resolution 341(91) and IACS UI SC223 and/or MSC.288(87), as corrected by IMO MSC.1/Circ.1381 and amended by IMO Resolution 341(91).

12.1.2 The laboratory is to provide to CCS the following information:

- A detailed list of the Laboratory test equipment for the coating approval according to the IMO Resolution MSC.215(82) as amended and/or MSC.288(87) as amended.
- A detailed list of reference documents comprising a minimum those referred to in IMO Resolution MSC.215(82) as amended and/or MSC.288(87) as amended for the coating approval.
- Details of test panel preparation, procedure of test panel identification, coating application, test procedures and a sample test report.
- Details of exposure method and site for weathering primed test panels.
- A sample daily or weekly log/form for recording test conditions and observations including unforeseen interruption of the exposure cycle with corrective actions.
- Details of any sub-contracting agreements (if applicable).

- Comparison test report with an approved coating system or laboratory if available.

12.1.3 Reporting – Reference is made to the following IACS Recommendations:

- Rec. 101: IACS Model Report for IMO Resolution MSC.215(82) Annex 1 “Test Procedures for Coating Qualification”
- Rec. 102: IACS Model Report for IMO Resolution MSC.215(82) Annex 1 “Test Procedures for Coating Qualification”, Section 1.7 – Crossover Test

12.1.4 Audit of the test laboratory is to be based on this procedure and the standards listed in the IMO Resolution MSC.215(82) as amended and/or MSC.288(87) as amended for the coating approval.

13. Firms engaged in the servicing and maintenance of lifeboats, launching appliances, on-load release gear and davit-launched liferaft automatic release hooks

13.1 Extent of engagement – Servicing and maintenance of lifeboats, launching appliances, on-load release gear and davit-launched liferaft automatic release hooks.

13.2 Extent of Approval

13.2.1 The contents of this procedure apply equally to manufacturers when they are acting as Service Suppliers.

13.2.2 Any Service Supplier engaged in the thorough examination, operational testing, repair and overhaul of lifeboats, launching appliances, on-load release gear and davit-launched liferaft automatic release hooks carried out in accordance with SOLAS regulation III/20 should be qualified in these operations for each make and type of equipment for which they provide the service, and provide manufacturers documentary evidence that they have been so authorized or they are certified in accordance with an established system for training and authorization in accordance with MSC.1/Circ.1277, as amended.

13.2.3 In cases where an equipment manufacturer is no longer in business or no longer provides technical support, Service Suppliers may be authorised for the equipment on the basis of prior authorization for the equipment and/or long term experience and demonstrated expertise as an authorized service provider.

13.3 Qualifications and Training of Personnel

Service Suppliers should be trained and qualified in the operations for which they are authorised, for each make and type of equipment for which they provide the service. Such training and qualification should include, as a minimum:

13.3.1 Employment and documentation of personnel certified in accordance with a recognized national, international or industry standard as applicable, or an equipment manufacturer’s established certification program. In either case, the certification program should be based on the guidelines in the appendix for each make and type of equipment for which service is to be provided.

13.3.2 The education and training for initial certification of personnel should be documented and address, as a minimum:

- Causes of lifeboat accidents
- Relevant rules and regulations, including International Conventions
- Design and construction of lifeboats, including on-load release gear and launching appliances
- Education and practical training in the procedures specified in annex 1 of

MSC.1/Circ.1206/Rev.1 for which certification is sought

- Detailed procedures for thorough examination, operational testing, repair and overhaul of lifeboats, launching appliances and on-load release gear, as applicable; and
- Procedures for issuing a report of service and statement of fitness for purpose based on MSC.1/Circ.1206/Rev.1 (annex 1, paragraph 15)

13.3.3 The education and training for the personnel should include practical technical training on actual inspection and maintenance using the equipment (lifeboats, launching appliances and/or on-load release gear) for which the personnel are to be certified. The technical training should include disassembly, reassembly, correct operation and adjustment of the equipment. Classroom training should be supplemented by field experience in the operations for which certification is sought, under the supervision of an experienced senior certified person.

13.3.4 At the time of initial certification and at each renewal of certification, the service supplier shall provide documentation to verify personnel's satisfactory completion of a competency assessment using the equipment for which the personnel are certified.

13.3.5 The Service Supplier shall require refresher training as appropriate to renew the certification.

13.4 Reference Documents - The Service Supplier is to have access to the following documents:

- IMO - MSC.1/Circ.1206/Rev.1, as amended, Measures to Prevent Accidents with Lifeboats
- IMO – MSC.1/Circ.1277, as amended, Interim Recommendation on Conditions for Authorization of Service Providers for Lifeboats, Launching Appliances and On-Load Release Gear
- IMO – Resolution A.689(17), recommendation on testing of life-saving appliances and, for life-saving appliances installed on board on or after 1 July 1999, Resolution MSC.81(70), revised recommendation on testing of life-saving appliances
- For servicing and repair work involving disassembly or adjustment of on-load release mechanisms, availability of the equipment manufacturer's specifications and instructions
- Type Approval certificate showing any conditions that may be appropriate during the servicing and/or maintenance of lifeboats, launching appliances and on-load release gear

13.5 Equipment and Facilities - The Service Supplier is to have access to the following:

- Sufficient tools, and in particular any specialized tools specified in the equipment manufacturer's instructions, including portable tools as needed for work to be carried out on board ship
- Access to sufficient materials, spare parts and accessories as specified by the equipment manufacturer for repairing lifeboats, launching appliances and on-load release gear, as applicable
- For servicing and repair work involving disassembly or adjustment of on-load release mechanisms, availability of genuine replacement parts as specified or supplied by the equipment manufacturer

13.6 Reporting - The report should conform to the requirements of MSC.1/Circ.1206/Rev.1 (annex 1, paragraph 15). When repairs, thorough examinations and annual servicing are completed, a statement confirming that the lifeboat arrangements remain fit for purpose should be promptly

issued by the Service Supplier.

14. Firms engaged in measurements of Noise level Onboard Ships

14.1 Extent of engagement

Sound pressure level measurements onboard Ship.

14.2 Supervisor

The supervisor shall have a minimum of 2 years of experience as an operator in sound pressure level measurements.

14.3 Operators

The operator is to have the following qualifications:

- Knowledge in the field of noise, sound measurements and handling of measurement equipment
- Adequate knowledge of the applicable international requirements (SOLAS Regulation II-1/3-12, as amended, and IMO Code on noise levels onboard Ships, as amended,)
- At least 1 year's experience, including participation in a minimum of 5 measurement campaigns as an assistant operator
- Training concerning the procedures specified in IMO Code on Noise Levels onboard Ships
- Be able to document theoretical and practical training onboard in using a sound level meter

14.4 Equipment

14.4.1 Sound level meters

Measurement of sound pressure levels shall be carried out using precision integrating sound level meters. Such meters shall be manufactured to IEC 61672-1(2002-05)1, as amended, type/class[1] standard as applicable, or to an equivalent standard acceptable to the Administration[2].

[1] Recommendation for sound level meters.

[2] Sound level meters class/type 1 manufactured according to IEC 651/IEC 804 may be used until 1 July 2016.

14.4.2 Octave filter set

When used alone, or in conjunction with a sound level meter, as appropriate, an octave filter set shall conform to IEC 61260 (1995)[3], as amended, or an equivalent standard acceptable to the Administration.

[3] Octave-band and fractional-octave-band filters

14.4.3 Sound Calibrator

Sound calibrators shall comply with the standard IEC 60942 (2003-01), as amended, and shall be approved by the manufacturer of the sound level meter used.

14.4.4 Calibration

Sound Calibrator and sound level meter shall be verified at least every two years by a national Standard laboratory or a competent laboratory accredited according to ISO 17025 (2005), as amended. A record with a complete description of the equipment used shall be kept, including a calibration log.

14.4.5 Microphone wind screen

A microphone wind screen shall be used when taking readings outside, e.g. on navigating bridge wings or on deck, and below deck where there is any substantial air movement. The wind screen should not affect the measurement level of similar sounds by more than 0.5 dB(A) in "no wind"

conditions.

14.5 Procedures and instructions

14.5.1 The supplier shall have documented procedures and instructions to carry out service of the equipment.

Documented work procedures are at least to contain information on inspection preparation, selection and identification of sound level measurement locations, calibration checks and report preparation.

14.5.2 The supplier shall have access to the following documents:

- SOLAS 1988, as amended (Reg.II-1/3-12)
- Resolution A.468(XII) and IMO Resolution MSC.337(91) code on noise levels on board ships
- Resolution A.343(IX) Recommendation on methods of measuring noise levels at listening posts
- CCSRules and Guidelines

14.6 Reporting

A noise inspection report shall be made for each ship. The report shall comprise information on the noise levels in the various spaces on board. The report shall show the reading at each specified measuring point. The points shall be marked on a general arrangement plan, or on accommodation drawings attached to the report, or shall otherwise be identified.

The format for noise inspection reports is set out in appendix 1 of IMO Code on Noise Levels onboard Ships and may conform to any other specific requirement of CCS (refer to IMO circular MSC.337(91)).

14.7 Verification

The supplier must have the Surveyor's verification of each separate job, documented in the report by his signature.

15. Firms engaged in tightness testing of primary and secondary barriers of gas carriers with membrane cargo containment systems for vessels in service

15.1 Extent of engagement

Firms carrying out the following:

- Global Vacuum Testing of Primary and Secondary Barriers
- Acoustic Emission (AE) Testing
- Thermographic Testing

15.2 Requirements for firms engaged in global testing of primary and secondary barriers

15.2.1 Testing Procedures – Testing is to be carried out in accordance with cargo containment system designer's procedures as approved by CCS.

15.2.2 Authorization - The supplier is to be authorized by the system designer to carry out the testing.

15.2.3 Equipment – Equipment is to be maintained and calibrated in accordance with recognized national or international industrial standards.

15.2.4 Reporting – The report is to contain the following:

- Date of testing
- Identity of test personnel
- Vacuum decay data for each tank

- Summary of test results

15.3 Requirements for firms engaged in acoustic emission (AE) testing

15.3.1 Testing procedures – The supplier is to have documented procedures based upon recognized national or international industrial standards to perform ultrasonic leak test using AE sensors for the secondary barrier of membrane cargo containment systems. The procedures are to include details of personnel responsibilities and qualification, instrumentation, test preparation, test method, signal processing, evaluation and reporting.

Note: The differential pressure during testing should not exceed the containment system designer's limitations.

15.3.2 Supervisor – The responsible supervisor shall be certified to a recognized national or international industrial standard (e.g. Level II, ISO-9712 as amended or SNT-TC-1A as amended) and have one year experience at Level II.

15.3.3 Operators – The operators carrying out the acoustic emission (AE) testing shall be certified to a recognized national or international industrial standard (e.g. Level I, ISO-9712 as amended or SNT-TC-1A as amended) and shall have adequate knowledge of ship structures sufficient to determine sensor placement.

15.3.4 Equipment – Equipment is to be maintained and calibrated in accordance with recognized national or international industrial standards or equipment manufacturer's recommendations.

15.3.5 Evaluation of acoustic emission (AE) testing – Must be carried out by the supervisor or individuals certified to a recognized national or international industrial standard (e.g. Level II, ISO-9712 as amended or SNT-TC-1A as amended) and have one year experience at Level II.

15.3.6 Reporting – The report is to contain the following:

- Date of testing
- Supervisor and operator(s) certifications
- Description of time and pressure of each cycle of test
- List and sketch detailing location of possible defects

15.4 Requirements for firms engaged in thermographic testing

15.4.1 Testing Procedures – Testing is to be carried out in accordance with the cargo containment system designer's procedures as approved by CCS.

15.4.2 Authorization - The supplier is to be authorized by the system designer to carry out the testing.

15.4.3 Supervisor – The responsible supervisor shall be certified to a recognised national or international industrial standard (e.g. Level II, ISO-9712 as amended or SNT-TC-1A as amended) with additional certification in infrared/thermal testing. Certification by the supplier is not allowed and must be obtained through an independent certification body.

15.4.4 Operators – The operators carrying out the imaging shall be certified to a recognized national or international industrial standard (e.g. Level I, ISO-9712 as amended or SNT-TC-1A as amended) with additional certification in infrared/thermal testing and shall have adequate knowledge of ship structures sufficient to determine position for each identified image, and of the containment system to understand the basis of the testing. Certification by the supplier is not allowed and must be obtained through an independent certification body.

15.4.5 Equipment – Thermal cameras and sensors are to be in accordance with the system designer's procedures with regards to sensitivity, accuracy and resolution.

Equipment are to be in accordance with recognized standard (IEC, etc.) with regards their safety

characteristics for the use in hazardous areas (in gas explosive atmosphere), maintained and calibrated in accordance with the maker's recommendations.

15.4.6 Evaluation of thermographic images – Must be carried out by the supervisor or individuals certified to a recognized national or international industrial standard (e.g. Level II, ISO-9712 as amended or SNT-TC-1A as amended) with additional certification in infrared/thermal testing. Certification by the supplier is not allowed and must be obtained through an independent certification body.

15.4.7 Reporting – The report is to contain the following:

- Date of testing
- Supervisor and operator(s) certifications
- Differential pressures of all phases
- List and sketch detailing location of thermal indications
- Thermographic images of all phases of testing for thermal indications
- Evaluation of thermal images indicating possible leaks

PART SIX FIRE PROTECTION, DETECTION AND EXTINCTION

CHAPTER 4 INERT GAS SYSTEMS①

Section 1 GENERAL PROVISIONS

4.1.1 General requirements

4.1.1.1 This Chapter applies to the ships fitted with the inert gas systems and nitrogen generator systems.

4.1.1.2 All types of inert gas systems are to comply with the following:

(1) An automatic control capable of producing suitable inert gas under all service conditions is to be fitted.

(2) ~~Materials used in inert gas systems are to be suitable for their intended purpose in accordance with the relevant requirements of *CCS Rules for Materials and Welding*.~~ Periodical surveys are to be in compliance with the relevant requirements of PART ONE of the Rules.

~~(3) All the equipment installed on board is to be tested under working conditions.~~

4.1.2 Class notation

4.1.2.1 Inert gas systems complying with the requirements of this Chapter may be assigned the following class notation:

Inert Gas Systems (IGS)

4.1.3 Plans and documents

4.1.3.1 In addition to the plans and documents required by relevant PARTs of the Rules, the following ones are to be submitted for approval:

(1) Details and arrangement of the inert gas generating plant including all control and monitoring devices;

(2) Arrangement of the inert gas system.

Section 2 INERT GAS SYSTEMS AND NITROGEN GENERATOR SYSTEMS FOR DIFFERENT TYPES OF SHIPS

~~**4.2.1 Inert gas systems on tankers carrying crude oil and petroleum products**~~

~~4.2.1.1 The following requirements apply where an inert gas system based on boiler flue gas and/or oil fired inert gas generators is fitted on board tankers intended for the carriage of crude oil and petroleum products in bulk having a flash point not exceeding 60℃ (closed cup test) and a Reid vapour pressure which is below atmospheric pressure, and other liquid products having a similar fire hazard.~~

~~4.2.1.2 Inert gas systems are to comply with the requirements of Chapter 15 of FSS Code.~~

~~4.2.1.3 In addition to the requirements of Chapter 15 of FSS Code, the following are to be complied with:~~

① The requirements of this Chapter shall apply to ships constructed on or after 1 January 2016.

(1) When two blowers are provided, the total required capacity of the inert gas system is preferably to be divided equally between the two blowers, and in no case is one blower to have a capacity less than 1/3 of the total capacity required.
(2) In particular those parts of scrubbers, blowers, non-return devices, scrubber effluent and other drain pipes which may be subjected to corrosive action of the gases and/or liquids are to be either constructed of corrosion resistant material or lined with rubber, glass fibre, epoxy resin or other equivalent coating material.
(3) The compartment in which any oil fired inert gas generator is situated is to be treated as machinery space of Category A with respect to fire protection.
(4) Arrangements are to be made to vent the inert gas from oil fired inert gas generators to the atmosphere when the inert gas produced is off specification, e.g., during start-up or in the event of equipment failure.
(5) Automatic shut-down of the oil fuel supply to inert gas generators is to be arranged on predetermined limits being reached with respect to low water pressure or low water flow rate to the cooling and scrubbing arrangement and with respect to high gas temperature.
(6) Automatic shut-down of the gas regulating valve is to be arranged with respect to failure of the power supply to the oil fired inert gas generators.

4.2.2 Inert gas systems on chemical tankers

4.2.2.1 The following requirements apply where an inert gas system based on oil fired inert gas generators is fitted on board chemical tankers.

4.2.2.2 The inert gas system is to comply with the requirements of IMO resolution A.567(14).

4.2.2.3 As an alternative to the water seal in the inert gas line on deck, an arrangement consisting of two shut-off valves in series with a venting valve in between may be accepted (double block and bleed). The following conditions apply:
(1) The operation of the valve is to be automatically executed. Signal(s) for opening/closing is (are) to be taken from the process directly, e.g. inert gas flow or differential pressure.
(2) Alarm for faulty operation of the valves is to be provided, e.g. the operation status of “Blower stop” and “supply valve(s) open” is an alarm condition.

4.2.2.4 In addition to the requirements detailed in resolution A.567(14), the requirements for inert gas systems, contained in paragraphs 4.2.1.3(1) to (3), are to be complied with.

4.2.3 Nitrogen generator systems

4.2.3.1 The following requirements are specific only to the gas generator system and apply where inert gas is produced by separating air into its component gases by passing compressed air through a bundle of hollow fibres, semi-permeable membranes or adsorber materials.

4.2.3.2 Where such systems are provided in place of the boiler flue gas or oil fired inert gas generators referred to in 4.2.1 and 4.2.2 of this Section, the following requirements of 2.3.1.3.1, 2.3.1.3.2, 2.3.1.5, 2.3.2, 2.4.2, 2.4.3.1.6, 2.4.3.1.8, 2.4.3.1.9, 2.4.3.3, 2.4.3.4, 2.4.4 of Chapter 15 of FSS Code and SOLAS Reg.II-2/4.5.3.4.2, 4.5.6.3, 11.6.3.4 or equivalent requirements of resolution A.567(14) remain applicable for the piping arrangements, alarms and instrumentation downstream of the gas generator.

4.2.3.3 A nitrogen generator consists of a feed air treatment system and any number of membrane or adsorber modules in parallel necessary to meet the required capacity which is to be

~~at least 125% of the maximum discharge capacity of the ship expressed as a volume.~~

~~4.2.3.4 The air compressor and the nitrogen generator may be installed in the engine room or in a separate compartment. A separate compartment is to be treated as one of "other machinery spaces" with respect to fire protection.~~

~~4.2.3.5 Where a separate compartment is provided, it is to be positioned outside the cargo area and is to be fitted with an independent mechanical extraction ventilation system providing 6 air changes per hour. A low oxygen alarm is to be fitted as well.~~

~~The compartment is to have no direct access to accommodation spaces, service spaces and control stations.~~

~~4.2.3.6 The nitrogen generator is to be capable of delivering high purity nitrogen with O2 content not exceeding 5% by volume. The system is to be fitted with automatic means to discharge "off-spec" gas to the atmosphere during start-up and abnormal operation.~~

~~4.2.3.7 The system is to be provided with two air compressors. The total required capacity of the system is preferably to be divided equally between the two compressors, and in no case is one compressor to have a capacity less than 1/3 of the total capacity required.~~

~~Only one air compressor may be accepted provided that sufficient spares for the air compressor and its prime mover are carried on board to enable their failure to be rectified by the ship's crew.~~

~~4.2.3.8 A feed air treatment system is to be fitted to remove free water, particles and traces of oil from the compressed air, and to preserve the specification temperature.~~

~~4.2.3.9 Where fitted, a nitrogen receiver/buffer tank may be installed in a dedicated compartment or in the separate compartment containing the air compressor and the generator or may be located in the cargo area. Where the nitrogen receiver/buffer tank is installed in an enclosed space, the access is to be arranged only from the open deck and the access door is to open outwards. Continuous ventilation and alarm are to be fitted as required in 4.2.3.5 of this Section.~~

~~4.2.3.10 The oxygen-enriched air from the nitrogen generator and the nitrogen-product enriched gas from the protective devices of the nitrogen receiver are to be discharged to a safe location on the open deck.~~

~~4.2.3.11 In order to permit maintenance, means of isolation are to be fitted between the generator and the receiver.~~

~~4.2.3.12 At least two non-return devices are to be fitted in the inert gas supply main, one of which is to be of the double block and bleed arrangement. The second non-return device is to be equipped with positive means of closure.~~

~~4.2.3.13 Instrumentation is to be provided for continuously indicating the temperature and pressure of air:~~

~~at the discharge side of the compressor;~~

~~at the entrance side of the nitrogen generator.~~

~~4.2.3.14 Instrumentation is to be fitted for continuously indicating and recording the oxygen content of the inert gas downstream of the nitrogen generator when inert gas is being supplied.~~

~~4.2.3.15 The instrumentation referred to in 4.2.3.14 of this Section is to be placed in the cargo control room where provided. But where no cargo control room is provided, they are to be placed in a position easily accessible to the officer in charge of cargo operations.~~

~~4.2.3.16 Audible and visual alarms are to be provided to indicate:~~

~~(1) low feed-air pressure from compressor as referred to in 4.2.3.13(1) of this Section;~~

~~(2) high air temperature as referred to in 4.2.3.13(1) of this Section;~~
~~(3) high condensate level at automatic drain of water separator as referred to in 4.2.3.8 of this Section;~~
~~(4) failure of electrical heater, if fitted;~~
~~(5) oxygen content in excess of that required in 4.2.3.6 of this Section;~~
~~(6) failure of power supply to the instrumentation as referred to in 4.2.3.14 of this Section.~~
~~4.2.3.17 Automatic shut-down of the system is to be arranged upon alarm conditions as required in 4.2.3.16(1) to (5) of this Section.~~
~~4.2.3.18 The alarms required in 4.2.3.16(1) to (6) of this Section are to be fitted in the machinery space and cargo control room, where provided, but in each case in such a position that they are immediately received by responsible members of the crew.~~

~~4.2.4 Nitrogen/inert gas systems fitted for purposes other than inerting required in SOLAS Reg.II-2/4.5.5.1.1~~

~~4.2.4.1 This Section applies to systems fitted on oil tankers of less than 20,000 DWT, gas tankers or chemical tankers.~~
~~4.2.4.2 The requirements of 4.2.3 of this Section apply except 4.2.3.1, 4.2.3.2, 4.2.3.3 and 4.2.3.7 of this Section.~~
~~4.2.4.3 Where the connections to the cargo tanks, to the hold spaces or to cargo piping are not permanent, the non-return devices required in 4.2.3.12 of this Section may be substituted by two non-return valves.~~

4.2.1 Requirements for All Systems on Tankers, including Chemical Tankers, to which SOLAS regulation II-2/4.5.5.1 applies

4.2.1.1 An inert gas system complying with the applicable requirements of Ch. 15 of the FSS Code, as amended by MSC.367 (93), is to be fitted on tankers to which SOLAS regulation II-2/4.5.5.1 applies. In applying the applicable requirements of Ch. 15 of the FSS Code, any use of the word "Administration" therein is to be considered as meaning our Classification Society. The inert gas system is to be operated in accordance with SOLAS regulation II-2/16.3.3, as amended by MSC.365(93). In applying SOLAS regulation II-2/16.3.3.2, paragraph 2.2.1.2.4 of Ch. 15 of the FSS Code is to be complied with.

4.2.2 Additional Requirements for Nitrogen Generator Systems on Tankers, including Chemical Tankers, to which SOLAS regulation II-2/4.5.5.1 applies

4.2.2.1 The following requirements apply where a nitrogen generator system is fitted on board as required by SOLAS regulation II-2/4.5.5.1. For the purpose, the inert gas is to be produced by separating air into its component gases by passing compressed air through a bundle of hollow fibres, semi-permeable membranes or adsorber materials.
4.2.2.2 In addition to the applicable requirements of Ch. 15 of the FSS Code, as amended by MSC.367(93), the nitrogen generator system is to comply with SOLAS regulations II-2/4.5.3.4.2, 4.5.6.3 and 11.6.3.4.
4.2.2.3 A nitrogen generator is to consist of a feed air treatment system and any number of membrane or adsorber modules in parallel necessary to meet paragraph 2.2.1.2.4 of Ch.15 of the FSS Code, as amended by MSC.367(93).

4.2.2.4 The nitrogen generator is to be capable of delivering high purity nitrogen in accordance with paragraph 2.2.1.2.5 of Ch.15 of the FSS Code, as amended by MSC.367(93). In addition to paragraph 2.2.2.4 of Ch.15 of the FSS Code, as amended by MSC.367(93), the system is to be fitted with automatic means to discharge "off-spec" gas to the atmosphere during start-up and abnormal operation.

4.2.2.5 The system is to be provided with one or more compressors to generate enough positive pressure to be capable of delivering the total volume of gas required by 2.2.1.2 of the FSS Code, as amended by MSC.367(93). Where two compressors are provided, the total required capacity of the system is preferably to be divided equally between the two compressors, and in no case is one compressor to have a capacity less than 1/3 of the total capacity required.

4.2.2.6 The feed air treatment system fitted to remove free water, particles and traces of oil from the compressed air as required by 2.4.1.2 of Ch.15 of the FSS Code, as amended by MSC.367(93), is also to preserve the specification temperature.

4.2.2.7 The oxygen-enriched air from the nitrogen generator and the nitrogen-product enriched gas from the protective devices of the nitrogen receiver are to be discharged to a safe location on the open deck.

"safe location" needs to address the two types of discharges separately:

(1) oxygen-enriched air from the nitrogen generator - safe locations on the open deck are:

① outside of hazardous area;

② not within 3m of areas traversed by personnel;

③ not within 6m of air intakes for machinery (engines and boilers) and all ventilation inlets.

(2) nitrogen-product enriched gas from the protective devices of the nitrogen receiver - safe locations on the open deck are:

① not within 3m of areas traversed by personnel;

② not within 6m of air intakes for machinery (engines and boilers) and all ventilation inlets/outlets.

4.2.2.8 In order to permit maintenance, means of isolation are to be fitted between the generator and the receiver.

4.2.3 Nitrogen /Inert Gas Systems Fitted for Purposes other than Inerting Required by SOLAS Reg. II-2/4.5.5.1 and 4.5.5.2

4.2.3.1 This section applies to systems fitted on oil tankers, gas tankers or chemical tankers to which SOLAS regulations II-2/4.5.5.1 and 4.5.5.2 do not apply.

4.2.3.2 Paragraphs 2.2.2.2, 2.2.2.4, 2.2.4.2, 2.2.4.3, 2.2.4.5.1.1, 2.2.4.5.1.2, 2.2.4.5.4, 2.4.1.1, 2.4.1.2, 2.4.1.3, 2.4.1.4, 2.4.2.1 and 2.4.2.2 of Ch.15 of the FSS Code, as amended by MSC.367(93), as applicable apply to the systems.

4.2.3.3 The other requirements of 4.2.2 of this Section apply except 4.2.2.1, 4.2.2.2, 4.2.2.3 and 4.2.2.5 of this Section.

4.2.3.4 Materials used in inert gas systems are to be suitable for their intended purpose in accordance with the relevant requirements of CCS Rules for Materials and Welding.

4.2.3.5 All the equipment installed on board is to be tested under working conditions.

4.2.3.6 The two non-return devices as required by paragraph 2.2.3.1.1 of Ch.15 of the FSS Code, as amended by MSC.367(93) are to be fitted in the inert gas main. The non-return devices are to comply with 2.2.3.1.2 and 2.2.3.1.3 of Ch.15 of the FSS Code, as amended by MSC.367(93);

however, where the connections to the cargo tanks, to the hold spaces or to cargo piping are not permanent, the non-return devices required by paragraph 2.2.3.1.1 of Ch.15 of the FSS Code, as amended by MSC.367(93) may be substituted by two non-return valves.

Section 3 EXAMINATION AND TESTING

4.3.1 General requirements

4.3.1.1 The devices and equipment required by this Chapter are, after having been installed on board, to be tested under working conditions to confirm their performance.