



SHIPS IN OPERATION

Survey Requirements

JULY 2011

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FOREWORD

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The Rules lay down technical and procedural requirements related to obtaining and retaining a Class Certificate. It is used as a contractual document and includes both requirements and acceptance criteria.

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CHANGES

General

The present edition of the rules includes amendments and additions approved by the Executive Committee as of June 2011 and supersedes the January 2011 edition of the same chapter.

The rule changes come into force as described below.

Text affected by the main rule changes is highlighted in red colour in the electronic pdf version. However, where the changes involve a whole chapter, section or sub-section, only the title may be in red colour.

This chapter is valid until superseded by a revised chapter.

Main changes coming into force 1 July 2011

- **Sec.1 General Requirements**
 - Class notation **RATE-A** has been deleted from Table A1.
 - A403: Deleted text: “with extent equivalent to a main class annual survey”.
- **Sec.7 Optional Class Notation Surveys – Continued**
 - Deleted class notation **RATE-A**.

Main changes coming into force 1 January 2012

- **Sec.1 General Requirements**
 - new item B102 concerning removal of casings, ceilings or linings and loose insulation in order to arrange access for examination of plating and framing
 - amended item B205 related to thickness measurements of structures with ship afloat.
- **Sec.2 Annual Surveys**
 - amended item B104 for examination and testing of doors in ship's bow, sides and stern
 - new item B106 for verification of marking of towing and mooring equipment with any restriction associated with safe operation.
- **Sec.3 Intermediate Surveys**
 - new item B108 regarding internal examination of selected cargo spaces for specific ship types with age > 10 years.
- **Sec.4 Renewal Surveys**
 - amended item B106 regarding the examination and calibration of anchoring equipment during bottom surveys in dry dock for ships where dry-docking is not required as part of renewal survey
 - new item B108 for survey of doors in ship's bow, sides and stern
 - amended item B111 applicable for examination of spaces with requirement to removal of insulation in order to examine condition of coating at selected locations behind insulation
 - amended item B116 with requirement to examination and possible dismantling of bulkhead shaft seals
 - amended item B117 for testing of boundaries of ballast tanks including holds adapted for carriage of ballast, tanks within machinery spaces for fuel oil, lub. oil and fresh water and other integral tanks, fuel tanks within cargo area
 - amended item B124 for examination of shipboard fittings used for mooring and normal towing of the ship and their supporting structures
 - amended item B125 for examination of emergency towing arrangement equipment
 - new item B126 for examination of crane pedestals and derrick masts
 - amended definition in tables for thickness measurements of relevant air pipes to day tanks required to be thickness measured.
 - the requirement for non-destructive examination of type C tanks is changed from “at the second, the fourth and thereafter at each renewal survey” to “at every other special survey” to bring the requirement in accordance with IACS UR Z16 Rev.3.
 - general update in accordance with IACS UR Z16 Rev.3.
- **Sec.8 Alternative Survey Arrangements**
 - B204 additional requirements for ships on the survey scheme.

Corrections and Clarifications

In addition to the above stated rule requirements, a number of corrections and clarifications have been made to the existing rule text.

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SECTION 1 GENERAL REQUIREMENTS

A. General

A 100 Definitions

101 *Passenger ship:*

A ship which carries more than 12 passengers.

Passenger is every person other than:

- the master and the members of the crew
- other persons employed or engaged in any capacity on board a ship on the business of that ship
- a child under one year of age.

102 *General dry cargo ship subject to Extended Hull Survey Requirements (EHSR):*

A seagoing self-propelled dry cargo ship of 500 gross tonnage and above carrying solid cargoes, not including the following ships:

- bulk carriers with class notation **ESP** (Enhanced Survey Programme)
- dedicated container carriers
- multipurpose cargo ships specially arranged to carry forestry products (except timber and log carriers), in addition normally arranged to carry containers and other unitized cargoes and bulk parcels, normally designed with box-shaped open-hatch holds with double bottom and double skin for the complete cargo area
- ro-ro cargo ships
- refrigerated cargo ships
- dedicated wood chip carriers
- dedicated cement carriers
- livestock carriers
- deck cargo ships (designed to carry cargo exclusively above deck without any access for cargo below deck).

Guidance note:

For ships subject to EHSR a Memo for owner (MO) will be recorded.

---e-n-d---of---G-u-i-d-a-n-c-e---n-o-t-e---

103 *Bulk carrier:*

A ship intended primarily to carry dry cargo in bulk.

Bulk carriers are in general designed with a single deck and hatchways for cargo loading/ unloading, and with cargo holds on a double bottom. The cargo loading/ unloading may be by shipboard lift on/ lift off equipment. Cargo unloading may also be by special shipboard equipment (conveyor belts) for self-discharging. Alternatively cargo loading/ unloading may be by specialised shore-based equipment.

Single skin bulk carriers are in general designed with full breadth cargo holds with top side and lower side (hopper) spaces (for water ballast, or void spaces).

Double skin bulk carriers are in general designed with cargo holds between double sides or separate longitudinal bulkheads, with the side spaces for water ballast or void spaces.

Combination carriers are bulk carriers designed with additional facilities for alternative (but not simultaneous) carriage of hazardous bulk liquid cargoes, e.g. ore/ oil carrier.

104 *Oil tanker:*

A ship intended primarily to carry crude oil and hazardous oil products in bulk (as listed in MARPOL, annex I).

Oil tankers are in general designed with a single deck, and with integral tanks. The cargo loading/ unloading is by way of shipboard and shore-based pumping and piping equipment.

Single hull oil tankers are normally designed with cargo tanks immediately inside the bottom and side shell. Double bottom or double side spaces (for water ballast, or void spaces) may occur.

Double hull oil tankers are designed with cargo tanks separated from the environment by double bottom/ double side spaces (for water ballast, or void spaces).

105 *Chemical tanker:*

A ship intended to carry hazardous liquid chemicals in bulk (as listed in IBC Code, Chapter 17).

Chemical tankers are in general designed with a single deck, and with integral or independent tanks. The cargo

loading/ unloading is by way of shore- and/ or ship-based pumping and piping equipment.

Chemical tankers may be designed with single or double hull between the cargo tanks and the environment.

106 *Gas tanker:*

A ship intended to carry liquefied natural or petroleum gases in bulk.

Gas tankers are in general designed with integral tanks and/ or high/ low pressure independent tanks. The cargo loading/ unloading is by way of shore- and/ or ship-based pumping and piping equipment.

Gas tankers may be designed with or without a secondary barrier between the cargo and the environment.

107 *Overall examination:*

Examination intended to report on the overall condition of the hull structure and determine the extent of additional close-up examinations.

108 *Close-up examination:*

Examination where the details of structural components are within the close visual inspection range of the surveyor, i.e. normally within reach of hand.

109 *Spaces:*

Separate compartments within the hull and superstructures, including independent cargo tanks in the cargo area, not including deckhouses.

110 *Representative tanks:*

Those tanks which are expected to reflect the condition of other tanks of similar type and service and with similar corrosion prevention systems. When selecting representative tanks account shall be taken of the service and repair history on board and identifiable critical and/or suspect areas.

111 *Ballast tank:*

Tank used primarily for salt water ballast.

For ships with class notation **ESP** a ballast tank is a tank used solely for salt water ballast.

For bulk carriers with class notation **ESP** a space used for both cargo and salt water ballast will be treated as a ballast tank if substantial corrosion has been found in that space.

For tankers with class notation **ESP** a combined cargo/ ballast tank used for carriage of cargo or salt water ballast as a routine part of the ship's operation shall be treated as a ballast tank. Cargo tanks in which water ballast might be carried only in exceptional cases per MARPOL 73/78 Annex I Reg.18(3) shall be treated as cargo tanks.

112 *Integral tank:*

Integral tank form a part of the ship's hull and are influenced in the same manner and by the same loads which stress the adjacent hull structure.

113 *Independent tank:*

Self-supporting tank which does not form part of the ship's hull. An independent tank is built and installed in such a way that the influence on the tank by the hull's deformation and stresses is minimised. An independent tank does not contribute to the hull strength.

Independent gravity tank is a tank with design vapour pressure not exceeding 0.7 bar.

Pressure vessel is a tank with design gas or vapour pressure exceeding 0.7 bar.

For definition of tank type **a3** and **a4** (chemical tankers) see Pt.5 Ch.4 Sec.1 A300.

For definition of tank type **A**, **B** and **C** (liquefied gas tankers) see Pt.5 Ch.5 Sec.1 D.

114 *Transverse section:*

Section which includes all longitudinal members such as plating, longitudinals and girders at the deck, side, bottom, inner bottom and hopper side plating, longitudinal bulkhead and bottom plating in top wing tanks, as applicable.

For transversely framed ships and for the purpose of survey requirements, a transverse section includes adjacent frames and their end connections forward and aft of the transverse section.

115 *Suspect areas:*

Areas showing substantial corrosion and/or are considered by the surveyor to be prone to rapid wastage.

116 *Critical structural areas:*

Areas that have been identified from calculations to require monitoring or from the service history of the subject ship or from similar or sister ships to be sensitive to cracking, buckling or corrosion which would impair the structural integrity of the ship.

117 Substantial corrosion:

Extent of corrosion such that assessment of corrosion pattern indicates a wastage in excess of 75% of allowable margins, but within acceptable limits.

For oil tankers and bulk carriers built according to IACS Common Structural Rules, see Pt.8 Ch.1 and 2, substantial corrosion is an extent of corrosion such that the assessment of the corrosion pattern indicates a measured thickness between the minimum acceptable limit + 0.5 mm and the minimum acceptable limit.

(IACS UR Z7, Z7.1, 7.2, Z10.1, Z10.2, Z10.3, Z10.4, Z10.5)

118 Corrosion prevention system:

Normally a full hard protective coating, usually to be epoxy coating or equivalent.

Other coating systems, which are neither soft nor semi-hard coatings, may be accepted provided they are applied and maintained in compliance with the manufacturer's specification.

However, as for semi-hard coatings, these coatings, if already applied, will not be accepted from the next renewal or intermediate survey commenced on or after 1 July 2010, whichever comes first, with respect to waiving the annual internal examination of the ballast tanks.

(IACS UR Z7, Z7.1, Z7.2, Z10.1, Z10.2, Z10.3, Z10.4, Z10.5)

119 Coating conditions:

"GOOD"	Condition with only minor spot rusting.
"FAIR"	Condition with local breakdown at edges of stiffeners and weld connections and/or light rusting over 20% or more of areas under consideration, but less than as defined for POOR condition.
"POOR"	Condition with general breakdown of coating over 20% or more of areas or hard scale at 10% or more of areas under consideration.

120 Prompt and thorough repair:

A permanent repair completed at the time of survey to the satisfaction of the surveyor, therein removing the need for the imposition of any associated condition of class.

121 Cargo Area:

Comprises the following parts of the ship:

- all cargo holds
- all cargo tanks, slop tanks and cargo/ ballast pump rooms
- fuel tanks, cofferdams, ballast tanks and void spaces adjacent to cargo holds, cargo tanks or slop tanks
- deck areas throughout the entire length and breadth of the part of the ship over the above mentioned spaces.

122 Machinery Area:

Comprises the following parts of the ship:

- engine rooms with machinery for propulsion and electrical power generation, including adjacent rooms with visual contact with the machinery
- all spaces containing boilers, other oil fired units and oil fuel units
- all other spaces containing steam and internal combustion engines, generators and major electrical machinery, oil filling stations, refrigerating, stabilizing, ventilation and air conditioning machinery, and similar spaces
- trunks to the above spaces.

123 Concurrent surveys:

Surveys required to be *concurrently completed* shall have the same date of completion.

A survey required to be *carried out in conjunction with* or

carried out as part of another survey shall be completed on or before the completion of the other survey, however, within the time window for that survey.

124 Survey schedule terms:

- Survey interval
- Due date
- Time window ($W_B + W_A$)
 - W_B = Time before due date
 - W_A = Time after due date

as illustrated in Fig. 1

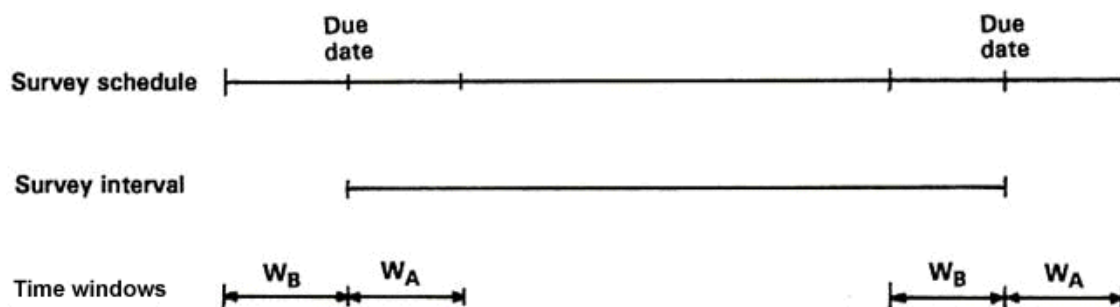


Fig. 1
Survey schedule

125 Sighting survey: A survey to confirm that the relevant construction or the equipment is in a satisfactory condition and, as far as can be judged, will remain so until the postponed survey has been carried out.

126 Significant repair: A repair where machinery is completely dismantled and re-assembled. Significant repairs will, furthermore, be cases of repairs after serious damage to machinery.

For boilers, significant repair includes all work affecting the integrity of the pressurized parts (pressure envelope) of the boiler; i.e. any steel work and/or welding on boiler shells, furnaces, drums, headers, down-comers, tubes and tube plates.

127 “Exceptional circumstances” means unavailability of dry-docking facilities; unavailability of repair facilities; unavailability of essential materials, equipment or spare parts; or delays incurred by action taken to avoid severe weather conditions.

128 Definitions in Pt.4 Ch.7 Sec.1 B: These definitions also apply to Pt.7.

A 200 Periodical surveys

201 All ships shall be subjected to periodical surveys in accordance with requirements of this chapter in order to confirm that the hull, machinery, equipment and systems remain in satisfactory condition and in compliance with approval or accepted standards.

202 Special consideration may be given in application of relevant sections of Pt.7 Ch.1 for commercial ships owned or chartered by governments, which are utilized in support of military operations or service.

(IACS UR Z3, Z7, Z18, Z21)

203 Periodical surveys will belong to one of the following categories according to the level of survey requirements:

- annual survey
- intermediate survey
- complete survey.

The survey required in conjunction with issuance of a new class certificate is denoted:

- renewal survey.

The following specific surveys may be scheduled according to one or more of the above categories:

- bottom survey
- propeller shaft survey
- propeller connection survey
- propulsion thruster survey
- boiler survey (including steam generator survey)
- thermal oil heater survey
- survey of optional class notations (voluntary class notations).

204 Periodical surveys shall be carried out at prescribed intervals and within applicable time windows.

A survey may be split in different parts, commenced and progressed within the time window provided all the requirements of the survey are completed by the end of the time window.

Surveys for which Survey Windows (and thereby commencement) do not apply are:

- Boiler Survey
- Thermal Oil Heater Survey.

The main class intermediate survey can not serve as commencement of the next renewal survey.

For concurrent surveys, the time window may be limited by that of the other survey.

205 The due date of a periodical survey will be established depending upon the survey interval, measured from one of the following events, whichever is relevant:

- date of class assignment
- date of commissioning
- due date of the previous corresponding survey
- date of completion of the previous corresponding survey
- date of completion of a major conversion.

A survey may be commenced prior to the defined time window at owner's request. In such a case the due date of subsequent surveys will be adjusted accordingly.

206 For certain ships the survey intervals may be reduced, e.g. for ships with new or novel design or for systems or items exposed to abnormal rate of wear or failure.

207 The scope of survey may be extended when compliance with applicable rules can not be satisfactorily confirmed based on extent of surveys as given, or when the surveyor suspects that the ship is not maintained or handled in accordance with the basis for retention of class.

A 300 Survey of special equipment and systems installed

301 Ships built for a special service, with installed equipment or systems related to an optional class notation, may be subject to additional survey requirements irrespective of the optional class notation being assigned.

302 Survey requirements exclusively applicable for optional class notation assigned are given in Sec.6 and Sec.7.

A 400 Postponement of periodical surveys

401 Except for annual and intermediate surveys for main class, the Society may accept to postpone periodical surveys upon special consideration in each separate case.

Postponement of main class renewal survey, boiler survey and bottom survey may be considered only in exceptional circumstances.

402 Postponement of main class renewal survey, boiler survey and bottom survey shall not exceed 3 months. Postponement of periodical surveys will not affect the survey's next due date.

403 Postponement of the renewal survey may be granted only upon the owner's written request.

Such a request shall be received by the Society well in advance of the expiry date of the classification certificate.

A postponement of the renewal survey shall normally be based on satisfactory result from a sighting survey.

404 For ships with class notation **Naval**, **Naval Support**, **Naval Support (...)** or **Naval Landing Craft** the Society may, upon request, accept to postpone the renewal period for maximum 12 months.

A postponement shall normally be based on satisfactory result from a sighting survey.

The next due date will be based on the new due date after postponement of the survey(s) or the date of completion of the survey(s), whichever comes first.

A 500 Survey of ships out of commission

501 Ships which have been out of commission, e.g. laid up, for a period of at least 12 months, shall be surveyed and tested before re-entering service. The extent of the surveys and tests will be considered in each case depending upon:

- the time the ship has been out of commission
- the maintenance and preservative measures taken during lay-up
- the extent of surveys carried out during the time out of commission.

As a minimum, a sea trial for function testing of the machinery installation shall be carried out.

All overdue surveys shall be completed prior to re-entering service.

502 During lay-up, ships shall be subjected to annual survey. The extent of the annual survey will be reduced compared to main class annual survey, but shall cover watertight integrity, bilge system, fire hazard and equipment in use.

A 600 Survey schedules

601 Annual survey schedule is as follows:

- The due date in general corresponds to the anniversary date of the class assignment or the expiry of the previous classification certificate if different.
- The survey shall normally be carried out within a time window of 3 months on either side of the due date.
- In case a main class annual survey is commenced prior to the defined time window, the survey must be completed not more than 6 months after the date of commencement. In such cases the anniversary dates for the subsequent annual surveys will be advanced, corresponding to a date not later than 3 months after the commencement of the annual survey just carried out.
- An additional main class annual survey may be required when the anniversary date has been advanced.

602 Intermediate survey schedule is as follows:

- The due date corresponds to the date 2.5 years before the expiry date of the classification certificate.
- The survey shall normally be carried out within a time window of 9 months on either side of the due date.
- The main class intermediate survey shall be completed concurrently with the second or third main class annual survey in each period of the classification certificate.
- The same surveys and thickness measurements of tanks or spaces can not be credited towards both intermediate and renewal survey. Ships that are re-commissioned after being laid-up may be specially considered.

603 Complete surveys are denoted:

- Complete survey (2.5 years), or
- Complete survey (5 years), or
- Complete survey (15 years).

Complete survey schedule is as follows:

- The due date corresponds to 2.5 years, 5 years or 15 years interval.
- The survey shall normally be carried out within a time window of 9 months before and 6 months after the due date.
- Survey required to be concurrent with the renewal survey shall be completed no later than at the completion of the renewal survey.

604 Renewal survey schedule is as follows:

- The due date is set at 5 years interval and corresponds to the expiry date of the classification certificate.
- The survey shall normally be completed within a time window of 3 months before the due date.
- The survey may be commenced at the fourth annual survey or between the fourth and fifth annual surveys.
- In case the survey is commenced more than 15 months before the expiry date of the classification certificate, the due date of the survey will be advanced to a date not later than 15 months after the commencement.
- The renewal survey shall be completed concurrently with the last main class annual survey in each period of the classification certificate.
- The same surveys and thickness measurements of tanks or spaces can not be credited towards both intermediate and renewal survey. Ships that are re-commissioned after being laid-up may be specially considered.

605 Bottom survey schedule is as follows:

- a) The due date is set at intervals in accordance with the following:
 - two bottom surveys are required during each five-year period of the classification certificate
 - the interval between any two successive bottom surveys is in no case to exceed 36 months.
- b) The survey shall be carried out on or before the due date. Time window is not applicable.
- c) One bottom survey shall be carried out in conjunction with the renewal survey, i.e. not more than 15 months prior to the expiry date of the classification certificate.
- d) One bottom survey shall be carried out in conjunction with the main class intermediate survey in the following cases:
 - bulk carriers and tankers with class notation **ESP** when exceeding 10 years of age
 - general cargo ships subject to EHSR when exceeding 15 years of age.

For ships operating in fresh water and for certain harbour or non-self-propelled craft bottom survey intervals greater than that given above may be accepted.

Special consideration may be given in application of relevant bottom survey requirements for commercial vessels owned or chartered by Governments, which are utilized in support of military operations or service.

Guidance note:

The Passenger Ship Safety Certificate, issued on behalf of (or by) a flag state, requires the bottom survey to be carried out annually.

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606 Propeller shaft survey is scheduled according to complete survey (5 years) for:

- propeller shaft with continuous corrosion resistant metallic liner or
- propeller shaft with specially approved protection arrangement or
- propeller shaft of corrosion resistant material or
- propeller shaft with approved oil sealing glands.

For propeller shaft arrangement not approved in accordance with the above, the propeller shaft survey is scheduled according to complete survey (2.5 years).

Propeller shaft survey shall normally be carried out in conjunction with bottom survey in dry dock.

For ships with class notation **TMON** the propeller shaft survey does not have a scheduled survey interval.

607 Propeller connection survey is scheduled according to complete survey (5 years) for:

- keyed propeller connections.

Propeller connection survey is scheduled according to complete survey (15 years) for:

- keyless propeller connections
- flanged propeller connections.

The propeller connection survey shall normally be carried out in conjunction with bottom survey in dry dock.

For ships with class notation **TMON** the propeller connection survey is applicable.

608 Survey of geared and podded thrusters for propulsion, and all **DYNPOS** class notations (hereafter simply collectively denoted **DYNPOS**), are scheduled according to complete survey (5 year). Podded thrusters shall also have an annual survey. See Sec.5 E.

It is generally recommended that the propulsion thruster survey is carried out in conjunction with bottom survey.

When the propulsion thruster survey requires the ship to be out of the water the survey shall be carried out in conjunction with bottom survey in dry dock.

609 Boiler and steam drum/steam separator survey schedule is as follows:

- The due date is set at intervals in accordance with the following:
 - Two boiler surveys are required during each five-year period of the classification certificate.
 - The interval between any two successive boiler surveys is in no case to exceed 36 months.

During each boiler internal survey, the adjustment of the safety valves will be assessed by a DNV surveyor.
(IACS UR Z18)

- The survey shall be carried out on or before the due date. Time window is not applicable.
- One boiler survey shall be carried out in conjunction with the renewal survey, i.e. not more than 15 months prior to the expiry date of the classification certificate.

Ships more than 8 years old and retaining the original fitting of a single unit, the main boiler shall be surveyed annually (full scope) and within the annual survey schedule.

610 Thermal oil heater survey schedule:

- Survey schedule as in 609.

611 Optional class notation surveys are scheduled in accordance with Table A1.

Class notations associated with equipment, systems and features which are fully or partly covered by the main class surveys are listed in Table A2.

Table A1 Survey schedules for optional class notations			
<i>Class notation</i>	<i>Survey type</i>	<i>Survey of</i>	<i>Remarks</i>
Fire Fighter I or Fire Fighter II or Fire Fighter III or Fire Fighter Capability	Complete survey (2.5 years)	Fire fighting installation	To be carried out in conjunction with the main class intermediate survey and the renewal survey. Extent: Sec.6 A.
Well Stimulation Vessel	Annual survey	Well stimulation installation	To be carried out in conjunction with the main class annual survey and the renewal survey. Extent: Sec.6 B.
	Complete survey (5 years)		
OILREC	Complete survey (2.5 years)	Reception system for recovered oil	To be carried out in conjunction with the main class intermediate survey and the renewal survey. Extent: Sec.6 C.
Reefer or RM or RM(Container) or KMC or CA or CA (port.)	Annual survey	Plant for refrigerated cargoes	To be carried out in conjunction with the main class annual survey and completed concurrently with the renewal survey. Extent: Sec.6 D.
	Complete survey (5 years)		
DG-P or DG-B	Complete survey (5 years)	Arrangement for carriage of dangerous goods	To be carried out in conjunction with the renewal survey. Extent: Sec.6 E.
Crane Vessel or Crane Barge or CRANE	Annual survey	Crane	To be carried out in conjunction with the main class annual survey and completed concurrently with the renewal survey. Extent: Sec.6 F.
	Complete survey (5 years)		
Cable Laying Vessel	Annual survey	Cable laying installation	To be carried out in conjunction with the main class annual survey and completed concurrently with the renewal survey. Extent: Sec.6 G.
	Complete survey (5 years)		
HELDK	Complete survey (5 years)	Helicopter deck	To be completed concurrently with the renewal survey. Extent: Sec.6 H.
Diving system-SURFACE Diving system-SAT DSV-SURFACE DSV-SAT	Annual survey	Diving system (See also Pt.5 Ch.16)	To be carried out in conjunction with the main class annual and intermediate surveys and the renewal survey. Extent: Sec.6 I.
	Intermediate survey		
	Complete survey (5 years)		
DEICE or DEICE-C	Annual survey	De-icing or anti-icing system	To be carried out in conjunction with the main class annual survey. Extent: Sec.6 J.
F-A or F-M or F-C or F-AM or F-AC or F-MC or F-AMC	Complete survey (2.5 years)	Additional fire protection arrangement	To be carried out in conjunction with the main class intermediate survey and the renewal survey. Extent: Sec.6 K.
DYNPOS-AUTS or DYNPOS-AUT or DYNPOS-AUTR or DYNPOS-AUTRO or DPS 0 or DPS 1 or DPS 2 or DPS 3	Annual survey	Dynamic positioning system	To be carried out in conjunction with the main class annual survey and the renewal survey. Extent: Sec.6 L.
	Complete survey (5 years)		
DYNPOS-ER	Annual survey	Dynamic positioning system	To be carried out in conjunction with the main class intermediate survey and the renewal survey. Extent: Sec.7 L.
	Complete survey (5 years)		

Table A1 Survey schedules for optional class notations (Continued)			
<i>Class notation</i>	<i>Survey type</i>	<i>Survey of</i>	<i>Remarks</i>
NAUT-OC (previous notation W1-OC) or NAUT-AW (previous notation W1) or NAUT-OC-Q or NAUT-AW-Q or NAUT-OSV(A) or NAUT-OSV(T)	Annual survey Complete survey (5 years)	Bridge design	To be carried out in conjunction with the main class annual survey and the renewal survey. Extent: Sec.6 M.
NAV-O	Complete survey (5 years)	Bridge design on seagoing ships	To be carried out in conjunction with the statutory survey. Extent: Sec.6 M.
HMON(...)	Annual survey	Hull monitoring system	To be carried out in conjunction with the main class annual survey. Extent: Sec.6 N.
VCS-1B or VCS-2B	Complete survey (5 years)	Vapour control system	To be carried out in conjunction with the main class annual survey and the renewal survey. Extent: Sec.6 O.
CLEAN or CLEAN DESIGN	Annual survey	Environment class	To be carried out in conjunction with the main class annual survey. Extent: Sec.6 P.
TMON	Annual survey	Tailshaft monitoring	To be carried out in conjunction with the main class annual survey. Extent: Sec.6 Q.
FUEL (...)	Annual survey Complete survey (5 years)	Fuel treatment and condition system	To be carried out in conjunction with the main class annual survey and the renewal survey. Extent: Sec.6 R.
LCS-DC	Annual survey	Loading computers for damage control	To be carried out in conjunction with the main class annual survey. Extent: Sec.6 S.
RC-1 or RC-2 or RC-3	Complete survey (5 years)	Arrangement for carriage of refrigerated containers	To be carried out in conjunction with the renewal survey. Extent: Sec.6 T.
VIBR	Complete survey (5 years)	Vibration class	To be carried out in conjunction with the renewal survey. Extent: Sec.6 U.
BWM-E () or BWM-EP () or BWM-T	Annual survey	Ballast water management	To be carried out in conjunction with the main class annual survey. Extent: Sec.6 V.
AP-1(a%)(+) or AP-2(a%)(+) or AP-3(a%)(+)	Complete survey (2.5 years)	Alternative propulsion	To be carried out in conjunction with the main class intermediate survey or the renewal survey. Extent: Sec.6 W.
WINTERIZED BASIC WINTERIZED COLD (t₁, t₂) WINTERIZED ARCTIC (t₁, t₂)	Annual survey	Winterized vessels	To be carried out in conjunction with the main class annual survey. Extent: Sec.6 X.

Table A1 Survey schedules for optional class notations (Continued)			
<i>Class notation</i>	<i>Survey type</i>	<i>Survey of</i>	<i>Remarks</i>
E0 or ECO	Annual survey	Periodically unattended machinery space and Machinery centralised operation	To be carried out in conjunction with the main class annual survey. Extent: Sec.6 Y.
	Complete survey (5 years)		
Naval, or Naval Support (....)	Annual survey	Arrangement, systems and equipment for naval ships	To be carried out in conjunction with the main class annual survey and the renewal survey. Extent: Sec.7 A.
	Complete survey (5 years)		
NAUTICUS (Operation)	None	None	Enhanced exchange of information between the owner and the Society, as part of the periodical survey schemes. Additional/ separate surveys are not applicable. Extent: Sec.7 B.
SPS	Annual survey	Installed equipment, systems and features for special purpose ships carrying special personnel who are neither crew members nor passengers.	Generally covered by the main class survey. Extent: Sec.7 C.
EC	Annual survey	Equipment and construction for easy cleaning	To be carried out in conjunction with the main class annual survey. Extent: Sec.7 D.
EL-2	Annual survey	Equipment and construction for easy loading	To be carried out in conjunction with the main class annual survey. Extent: Sec.7 D.
NAUT-NAVY	Annual survey	Naval ships	To be carried out in conjunction with the main class annual survey. Extent: Sec.7 E.
NBC-1 NBC-2	Annual survey	Systems intended to protect naval surface vessels from nuclear, biological and chemical threats	To be carried out in conjunction with the main class annual or renewal survey. Extent: Sec.7 F.
	Complete survey (5 years)		
SILENT-A SILENT-S SILENT-F SILENT-R SILENT-E	Complete measurement survey (5 years)	Underwater noise level emission	To be carried out in conjunction with the renewal survey. Extent: Sec.7 G.
ESV-DP[HIL] ESV-TAM[HIL]	Annual survey	HIL survey DP-control system	Refer to Sec.7 H.
	Complete survey	DP-control system HIL testing	
Anchor Handling Towing AHTS Tug	Annual survey	Anchor handling and towing equipment	To be carried out in conjunction with the main class annual survey. Extent: Sec.7 I.
SBM	Annual audit	Safety and environmental protection (SEP) management system	Intermediate audit applicable only after the company has been granted such status. The company may apply for intermediate audit after the first annual audit. When granted, the intermediate audit will replace the annual audit. See Ch.3 Sec.1 D402.
	Intermediate audit		
	Renewal audit		

Table A2 Class notations fully or partly covered by main class surveys		
<i>Class notation</i>	<i>Survey of</i>	<i>Remarks</i>
Container Carrier or CONTAINER	Arrangement and equipment for carriage of container cargo	Covered by the renewal survey.
Car Carrier	Arrangement and equipment for carriage of cars	Covered by the main class annual survey.
MCDK	Movable car deck arrangement	Covered by the main class annual survey.
PET	Arrangement for carriage of motor vehicles with fuel in their tanks	Covered by the main class annual survey.
INERT	Inert gas plant	Covered by the main class annual and renewal surveys.
PST	Protected slop tank	Covered by the main class annual survey.
BOW LOADING	Bow loading arrangement	Covered by the main class annual survey.
LFL or LFL*	Arrangements for carriage of low flashpoint liquids	Covered by the main class annual and renewal surveys.
Pusher or Pusher/Barge Unit	Arrangement for pushing and being pushed	Covered by the renewal survey.
Reefer or RM or RM(Container) or KMC or CA or CA (port.)	Plant for refrigerated cargoes	Partly covered by the main class annual survey. Extent not covered by main class surveys: Sec.6 D.
RO/RO	Arrangement for roll on/ roll off cargo handling	Covered by the main class annual survey.
Tanker for Potable Water	Arrangement and equipment for carriage of potable water	Covered by the renewal survey.
CCO	Centralised cargo control	Covered by the renewal survey.
VCS-1 or VCS-2 or VCS-3	Vapour control system	Partly covered by the main class annual and renewal surveys. Extent not covered by main class surveys: Sec.6 O
GAS FUELLED	Gas fuelled engine installation	Covered by the main class annual and intermediate surveys, and the renewal survey.
FC-POWER or FC-SAFETY	Fuel cell installations	Covered by the main class annual and intermediate surveys, and the renewal survey.
OPP-F	Oil pollution prevention measures for fuel oil systems	Covered by the renewal survey.

B. Hull and Equipment

B 100 Conditions for survey and access to structures

101 In preparation for survey and to allow for a thorough examination, all spaces and areas shall be cleaned including removal from surfaces of all loose accumulated corrosion scale. In tanks where soft coating has been applied, representative areas and those areas where it is obvious that further close-up examination is required shall be cleaned free of soft coating.

Guidance note:

Spaces should be sufficiently clean and free from water, scale, dirt, oil residues etc. to reveal corrosion, deformation, fractures, damage, or other structural deterioration. However, those areas of structure whose renewal has already been decided need only be cleaned and descaled to the extent necessary to determine the limits of the renewed areas. For more detailed information with regard to a tank where soft coatings have been applied, see IACS Recommendation No. 44.

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102 Casings, ceilings or linings, and loose insulation, where fitted, shall be removed, as required by the surveyor, for examination of plating and framing. Compositions on plating shall be examined and sounded, but need not be disturbed if found adhering satisfactorily to the plating.

In drydock or on a slipway, the ship shall be placed on blocks of sufficient height and with the necessary staging to permit the examination of elements such as shell plating including bottom and bow plating, stern frame and rudder, sea chests and valves, propeller, etc. (IACS UR Z3.3.2.1)

103 All spaces shall be made safe for access, i.e. gas freed, ventilated and illuminated, and prepared for the surveyor to examine the structure in a safe and practical way. One or more of the following means for access, acceptable to the surveyor, shall be provided:

- permanent staging and passages through structures
- temporary staging and passages through structures
- lifts and moveable platforms
- hydraulic arm vehicles such as conventional cherry pickers
- boats or rafts
- portable ladder
- other equivalent means.

For close-up examination of the cargo hold shell frames of bulk carriers, the following additional requirements apply:

- a) boats or rafts may be accepted provided the structural capacity of the hold is sufficient to withstand static loads at all levels of water
- b) for bulk carriers less than 100 000 dwt:
 - portable ladder for examination of lower section of a shell frame including bracket may be accepted, provided the ladder is not more than 5 m in length
- c) for bulk carriers 100 000 dwt and above:
 - portable ladder is not accepted
 - hydraulic arm vehicle such as conventional cherry picker is limited to examination of lower and middle parts of hold frames at renewal survey no. 2 and subsequent intermediate and renewal surveys.

Notwithstanding the above requirements, the use of portable ladder fitted with a mechanical device to secure the upper end of the ladder is acceptable for the close-up examination of lower section of a shell frame including bracket required at annual surveys.

104 Rafts or boats alone may be allowed for survey of the under deck areas for tanks or spaces, if the depth of the webs is 1.5 m or less.

If the depth of the webs is more than 1.5 m, rafts or boats alone may be allowed only:

- a) when the coating of the under deck structure is in GOOD condition and there is no evidence of wastage or
- b) if a permanent means of access is provided in each bay to allow safe entry and exit. This means:
 - access direct from the deck via a vertical ladder and a small platform fitted approximately 2 m below the deck in each bay or
 - access to deck from a longitudinal permanent platform having ladders to deck in each end of the tank. The platform shall, for the full length of the tank, be arranged in level with, or above, the maximum water level needed for rafting of under deck structure. For this purpose, the ullage corresponding to the maximum water level shall be assumed not more than 3 m from the deck plate measured at the midspan of deck transverses and in the middle length of the tank.

If neither of the above conditions are met, then staging or “other equivalent means” of access shall be provided for the survey of the under deck areas.

The use of rafts or boats alone does not preclude the use of boats or rafts to move about within a tank during a survey.

Guidance note:

Reference is made to IACS Recommendation No. 39 - Guidelines for the use of Boats or Rafts for Close-up surveys.

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Guidance note:

Use of remote inspection technique methods to facilitate the required internal examinations, including close-up examinations and thickness measurements, may be specially considered by the Society. The methods applied shall provide the information normally obtained from a survey carried out by the surveyor.

In order to verify the results, confirmatory close-up examinations and thickness measurements at selected locations shall be carried out by the surveyor, not using the remote inspection technique method.

Proposals for use of remote inspection technique methods shall be submitted to the Society for acceptance in advance of the survey.

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105 Prior to commencement of any part of the renewal and intermediate survey, a survey planning meeting

shall be held between the attending surveyor(s), the master of the ship or an appropriately qualified representative appointed by the master or the owner, and, as applicable, the owner's representative in attendance and the thickness measurement company operator, so as to ensure the safe and efficient conduct of the survey work to be carried out and, where applicable, for the purpose to ascertain that all the arrangements envisaged in the survey programme are in place.

(IACS UR Z10.1, Z10.2, Z10.3, Z10.4, Z10.5)

B 200 Survey extent

201 The survey consists of examination, measurements and testing as required for different survey categories with the aim to ensure that the hull structure, hull equipment and piping are in satisfactory condition with respect to corrosion, deformation, fractures, damage or other structural deterioration.

202 When examination or overall examination is required the structure or object is visually examined from a significant distance. In such cases the general maintenance, the condition of protective coating, rust deposits, leakages and structural detachments and damage may be observed and the surveyor may extend the survey as considered necessary.

203 When close-up examination is specified by the rules or required by the surveyor the structure or object is visually examined from a distance normally within reach of hand.

The surveyor may extend the close-up examination as deemed necessary taking into account the maintenance of the spaces under survey, the condition of the corrosion prevention system and where spaces have structural arrangements or details which have suffered defects in similar spaces or on similar ships according to available information.

Thickness measurements, for general assessment and recording of corrosion pattern, shall be taken of those structural members subject to close-up examination as specified by the requirements relevant for the survey or as given in 204.

204 The surveyor may require thickness measurements in any portion of the structure where signs of wastage are evident or in areas where wastage is normally found.

The surveyor may extend the scope of the thickness measurements if considered necessary.

205 When thickness measurements are specified by the rules or required by the surveyor the measurements shall be carried out to an extent sufficient to determine both general and local corrosion levels.

Unless carried out by the surveyor himself, thickness measurements shall be carried out by a qualified company approved by the Society and witnessed by a surveyor. This requires the surveyor to be on board, while the measurements are taken, to the extent necessary to control the process.

Where it is required to carry out thickness measurements of structures subject to close-up examination, these measurements shall be carried out simultaneously with the close-up examination.

Thickness measurements carried out afloat may be accepted provided they are accompanied by a diving report. However, thickness measurements carried out from outside shall normally be limited to areas with restricted access from inside. The diver shall be qualified in thickness measurement and the procedure confirmed on-site, as decided by the surveyor.

For vessels which require dry docking as part of intermediate and/or renewal surveys, thickness measurements carried out afloat will require confirmatory thickness measurements at time of dry docking as decided by the surveyor.

The surveyor shall review the final thickness measurement report and countersign the cover page.

206 Where substantial corrosion, as defined in A, is found, additional thickness measurements shall be taken to confirm the extent of substantial corrosion.

The additional measurements shall be taken in patterns corresponding to tables given in Sec.4 D, depending on ship type.

These additional thickness measurements shall be carried out before the survey is considered as completed.

207 The examination may be extended also in cases when:

- information is available of defects suffered on similar structure or details in similar tanks/holds or on similar ships
- the structure under survey has been approved with reduced scantlings due to an approved corrosion control system.

B 300 Special consideration

301 For areas in spaces where hard protective coatings are found to be in GOOD condition, the extent of close-up examination and thickness measurements may be specially considered.

Special consideration as used in this context is taken to mean, as a minimum, that sufficient close-up

examination and thickness measurements are carried out to confirm the actual average condition of the structure under the protective coating.

B 400 Repair of structural damage or deterioration

401 A prompt and thorough repair as defined in A, shall be carried out of any damage in association with wastage over the allowable limits (including buckling, grooving, detachment or fracture), or extensive areas of wastage over the allowable limits, which affects or, in the opinion of the surveyor, will affect the ship's structural, watertight or weathertight integrity. Areas to be considered include:

- bottom structure and bottom plating
- side structure and side plating
- deck structure and deck plating
- inner bottom structure and inner bottom plating
- watertight and oiltight bulkheads
- inner side structure and inner side plating
- hatch covers and hatch coamings
- air pipes on the exposed decks including heads and weld connection between air pipes and deck plating
- vent piping systems including ventilators and closing devices
- bunker piping systems.

402 For locations where adequate repair facilities are not available, consideration may be given to allow the ship to proceed directly to a repair facility. This may require discharging the cargo and or temporary repairs for the intended voyage.

403 Additionally, when a survey results in the identification of corrosion or structural defects, either of which, in the opinion of the surveyor, will impair the ship's fitness for continued service, remedial measures shall be implemented before the ship continues in service.

B 500 Survey programme for ships subject to Enhanced Survey Programme (class notation ESP)

501 The owner in co-operation with the Society shall work out a specific survey programme prior to the commencement of:

- any renewal survey
- any intermediate survey for ships over 10 years of age.

The survey programme shall be in a written format. The survey shall not commence until the survey programme has been agreed.

The survey programme at intermediate survey may consist of the survey programme at the previous renewal survey supplemented by the executive hull summary of that survey and later relevant survey reports.

The survey programme shall be worked out taking into account any amendments to the survey requirements implemented after the last renewal survey carried out.

502 The following documentation shall be collected and consulted with a view to selecting tanks, holds, areas and structural elements to be examined:

- survey status and basic ship information
- documentation on board as described in 600
- main structural plans, including information regarding use of high strength steel, stainless steel and clad steel
- inspections by the owner's personnel during the last 3 years with reference to structural deterioration in general, leakages in tank boundaries and piping and condition of the coating and corrosion protection system, relevant previous survey or inspection reports from the Society and the owner
- cargo and ballast history for the last 3 years, typical cargoes and carriage of cargo under heated conditions
- description and history of the coating and corrosion protection system, if any
- information regarding the relevant maintenance level during operation including port state control reports of inspection containing hull related deficiencies, Safety Management System non-conformities relating to hull maintenance, including the associated corrective action(s)
- information and other relevant data regarding conversion or modification of the ship's tanks and holds.

503 The submitted survey programme shall account for and comply with, as a minimum, the requirements for close-up examination, thickness measurements and tank testing as given for the relevant ship type.

504 The submitted survey programme is, in addition to the requirements given in 603, to include relevant information including at least:

- basic ship information and particulars
- main structural plans including information on the use of high strength steel, stainless steel and clad steel
- plan of tanks and holds

- list of tanks and holds with information on use, corrosion prevention and condition of corrosion prevention
- condition for survey such as cleaning of tanks and holds, gas freeing, ventilation, lighting, etc.
- provisions and methods for access to structures
- equipment for survey
- nomination of tanks, holds and areas for close-up examination
- nomination of sections for thickness measurements
- nomination of tanks to be tested
- damage experience related to the ship in question and, as applicable, for similar ships.

505 The extent of survey as described in the survey programme may be extended as found necessary by the Society based on the results of the survey.

B 600 Documentation on board ships subject to Enhanced Survey Programme (class notation ESP)

601 The owner shall supply and maintain on board documentation as specified in 602 and 603. The documentation shall be kept on board for the lifetime of the ship and shall be readily available for the surveyor.

602 A survey report file consisting of:

- reports of structural surveys
- executive hull summary
- thickness measurements reports
- survey programme,

shall be available on board. The survey report file shall be available also in the owner's and the Society's offices.

603 The following additional documentation shall be available on board:

- a) main structural plans of cargo and ballast holds or tanks
- b) previous repair history
- c) cargo and ballast history
- d) extent of use of inert gas plant and tank cleaning procedures
- e) records of inspections and actions by ship's personnel with reference to:
 - structural deterioration in general
 - leakage in bulkheads and piping
 - condition of coating or corrosion prevention, if any
 - any other information that will help to identify critical structural areas and/or suspect areas requiring inspection.

C. Machinery and Systems

C 100 Maintenance and preparation for survey

101 Every ship shall have implemented a maintenance system. The maintenance system shall ensure that:

- inspections and maintenance are carried out at defined intervals
- any non-conformity is reported with its possible cause, if known
- appropriate corrective action is taken
- records of these activities are maintained.

The machinery and systems subject to class shall be maintained in accordance with the maintenance system implemented. For machinery components to be included, see Sec.4 Table E1.

102 In preparation for survey and to allow for a thorough examination, machinery components and related spaces shall be cleaned, including removal from surfaces of loose accumulated corrosion scale, mud and oil-residues. The spaces and components of attention shall have proper access including dismantling as necessary.

C 200 Shaft alignment

201 For propulsion systems where shaft alignment calculations have been required, the alignment shall be confirmed by suitable measurements when the system has been dismantled and or when external forces (e.g. grounding, welding work) may have influenced the alignment.

The measurements shall be carried out with the ship afloat and be presented to the surveyor

Systems which require shaft alignment are specified in Pt.4 Ch.4 Sec.1 A403, F400.

C 300 Replacement of machinery components

301 When machinery components are renewed, such components should in general be delivered in accordance with requirements as per valid rules at the time of newbuilding.

Guidance note:

- 1) If the relevant rule requires an NV certificate for the actual part, then the design and the survey, as relevant, should be in accordance with the applicable rule requirement.
Applicable for diesel engines: The actual part should be produced by a manufacturer authorised by the engine designer or the designer's licensee.
- 2) If the relevant rule requires a Work certificate for the actual part:
 - when design approval is required, the certificate should confirm compliance with the relevant parts (e.g. NDT, material, dimensions, etc.) of the approved drawings and specifications
 - when no design approval is required (i.e. drawings and specifications submitted for information only), the required certificate should confirm compliance with the applicable rule requirements (e.g. pressure testing, NDT, etc.).

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Applicable for diesel engines: If the part is produced by a manufacturer not authorised by the engine designer or the designer's licensee, the Society may carry out inspections according to Pt.4 Ch.3 Sec.1 Table C1 and issue a report confirming this. However, this inspection report will not cover design approval and testing as a part of the engine. It is the operator's responsibility to evaluate and take the necessary precautions to see that the parts are fit for their intended use.

C 400 Machinery verification

401 If significant repairs are carried out to main or auxiliary machinery, or steering gear, a dock and/or sea trial shall be carried out as required by the attending surveyor.

C 500 Gas turbine installations

501 The society accepts that complete gas turbine units, or modules, are taken ashore for complete overhaul by. original engine manufacturer (OEM) or OEM approved company. It is the responsibility of the owner to involve the Society in the overhaul work at the OEM or OEM approved company.

502 Complete replacement turbines shall be certified. The company performing the work shall be either the OEM, or OEM-approved. Attendance of surveyor during overhaul as considered necessary.

Sea trial/ installation test to be performed to the attending surveyor's satisfaction.

503 Documented history regarding maintenance scope, and it's relevance to running hours and preservation during storage for the unit installed shall be available for examination.

504 Maintenance of gas turbine rotating components, or components in the gas path, shall be carried out using only original spare parts, or spare parts accepted by the OEM.

505 Maintenance carried out in the form of module replacement (e.g. hot section change-out), shall utilise replacement modules that are of identical design and construction, and either possess the appropriate certification by the Society (i.e. originate in another engine certified by the Society used for a similar application), or are new and produced in accordance with type approved design and under a valid manufacturing survey arrangement (MSA). Modules with other origins will normally not be accepted.

C 600 Boiler installations

601 For all vessels with boilers, the boiler water quality shall be maintained to the standard required by the equipment manufacturer.

602 The boiler water shall be monitored/ tested at least once in every 24 hours daily for main boilers and at least every 48 hours for auxiliary boilers.

603 Records of boiler water management shall be available onboard containing the following parameters:

- water consumption
- chemicals consumption
- chloride content
- phosphate and oxygen measuring parameters
- pH value
- frequency and duration of “surface scumming” (if fitted) and bottom “blow downs”
- conductivity when included in the water treatment program utilised.

604 Procedures for boiler water management for boilers temporarily out of service shall be in place. The boiler shall be placed in either dry or wet condition when out of service for a prolonged period of time (Full voyage, ship idle in port, ship laid-up).

C 700 Survey of special components

701 Components or elements of the propulsion system, such as:

- vibration dampers
- elastic couplings
- speed governor or quick passing through device.

which may change characteristics during the lifetime and hence influence the torsional behaviour of the system, shall be maintained and inspected as approved by the Society or as recommended by the manufacturer.

As an alternative to opening up for inspection, measurements may be carried out to confirm the correct dynamic conditions. The torsional vibration measurements shall be carried out and reported to the Society. The results shall be compared with the approved limits (torsional vibration calculations).

If an elastic coupling is replaced by another type, new torsional vibration calculations shall be submitted for approval.

SECTION 2 ANNUAL SURVEYS EXTENT – MAIN CLASS

A. General Requirements

A 100 General

101 Annual survey is a general survey of the hull and equipment, machinery and systems to confirm that the ship complies with the relevant rule requirements and is in satisfactorily maintained condition.

102 For chemical tankers and liquefied gas tankers the annual survey of components and systems for cargo handling and cargo containment is preferably to be carried out during a loading or discharging operation. Access to cargo tanks or inerted hold spaces, necessitating gas-freeing/aerating will normally not be required.

A 200 Review of documentation, operational instruments, signboards and markings

201 If a loading instrument or loading computer system is available onboard it shall be verified that the system has a valid certificate.

It shall be documented that an annual check of the loading instrument/computer by running one of the test conditions has been carried out. If not, the surveyor shall verify the running of the test condition onboard.

202 Approved loading and stability information shall be verified available onboard.

This information shall be the same as required when the ship was assigned class with the Society or at a later conversion of the ship, in accordance with the rule requirements applicable in each case.

203 Manual with instructions for operation and/ or maintenance shall be verified for:

- doors in ship's bow (outer and inner), sides and stern
- combination ships
- inert gas system
- oil discharge monitoring system
- crude oil washing system
- vapour emission control system
- protected slop tanks in combination ships, (including ships with class notation **PST**)
- offshore bow loading arrangement, (including ships with class notation **BOW LOADING**)
- liquefied gas tankers
- arrangement for carriage of low flashpoint liquids, (including ships with class notation **LFL**)
- gas fuelled engine installations, (including ships with class notation **GAS FUELLED**)
- fuel cell installations (including ships with class notation **FC-POWER** or **FC-SAFETY**).

204 List of required signboards or notice plates shall be verified for:

- doors in ship's bow (outer and inner), sides and stern
- steering gear operating instruction posters, on the bridge and in the steering gear compartment
- carriage of motor vehicles with fuel in their tanks in enclosed spaces, (including ships with class notation **PET**)
- combination ships
- protected slop tanks in combination ships, (including ships with class notation **PST**)
- liquefied gas tankers
- arrangement for carriage of low flashpoint liquids, (including ships with class notation **LFL**)
- gas fuelled engine installations, (including ships with class notation **GAS FUELLED**)
- fuel cell installations (including ships with class notation **FC-POWER** or **FC-SAFETY**).

205 It shall be verified that records of inspections and maintenance in accordance with the implemented maintenance system for machinery are kept available onboard.

206 For ships which have been granted alternative survey arrangement(s) the following apply:

For survey arrangement Hull Continuous or Machinery Continuous, satisfactory completion of survey items due in the previous period shall be verified.

For survey arrangement Hull PMS, Machinery PMS or Machinery CM the documentation of the approved system shall be reviewed and evaluated.

This implies that the following shall be verified:

- satisfactory performance
- continuation of the conditions and acceptance criteria for the approval
- assessment of handling onboard

- satisfactory completion of records of the required inspections and maintenance over the previous period, including description of corrective actions taken in response of occurred deficiencies.

If found necessary by the surveyor, examination and testing, including opening of machinery, may be required. Based on a satisfactory result, the validity of the survey arrangement will be extended until the next annual survey.

207 For ships with class notation **ESP**, the surveyor shall examine the documentation onboard as specified in Sec.1 B600, and its contents as a basis for the hull survey.

208 For liquefied gas tankers the survey shall include:

- examination of the log books with regard to the condition of the cargo containment and the correct functioning of the cargo handling systems. The running hours per day of the reliquefaction plants or the boil-off rate and the inert gas consumption shall be considered in order to check that no irregularities in performance have occurred
- verification of instruction and information material such as cargo handling plans, cargo instrumentation maintenance manual, filling limit information, cooling down procedures etc. as being onboard.

209 For ships that shall comply with SOLAS Reg. IX/2, irrespective of the issuing authority for the Safety Management Certificate (SMC), the surveyor will complete a list of evidence of possible safety management system failures recorded on the occasion of the annual survey. The list will be submitted with the annual survey report.

B. Hull and Equipment

B 100 General - all ships

101 The survey shall cover examination of:

- a) weather decks and ship side plating above water line
- b) anchoring equipment, see 102
- c) openings and closing appliances for cargo holds or tanks:
 - hatch covers and coamings on exposed weatherdecks, see 103
 - cargo tank openings, see 105
- d) other openings and closing appliances:
 - doors in ship's bow, sides and stern, see 104
 - ventilator and air pipes, see 105
 - watertight doors and penetrations in watertight bulkheads
 - exposed machinery casing and skylights
 - ventilation ducts for engine and boiler rooms
 - windows, deadlights and side scuttles.
- e) scuppers, discharges and valves with hull attachments
- f) freeing ports and shutters
- g) fittings and hull supporting structures, as far as practicable, for stowage, securing and supporting of:
 - timber deck cargoes
 - containers
 - movable car deck pontoons
- h) piping arrangements on deck, see 105
- i) means of protection of crew, such as guard rails, bulwark, gangways and lifelines
- j) towing and mooring equipment, see 106
- k) emergency towing arrangements, see 107
- l) spaces:
 - ballast tanks, see 108
 - suspect areas, see 109
 - thickness measurements taken or extended when substantial corrosion recorded or found, see 110
 - fire doors and fire dampers in ventilation ducts
 - means of escape, see 111

m) special installations:

- plants for refrigerated cargoes, see 112
- inert gas plants, see 105

n) verification of electrical bonding to the hull of pipelines and independent tanks, as applicable.

102 For the anchoring equipment the survey shall include examination of windlasses, brakes, securing and chain stoppers, with special attention to condition and wear of brake linings.

Function test may be required if deemed necessary by the surveyor.

103 For hatch covers and coamings the survey shall include:

- a) examination of mechanically operated steel covers
- b) examination of portable steel pontoons, portable wooden covers and portable beams
- c) examination of hatch coaming plating and their stiffeners
- d) examination of closing, sealing and securing devices
- e) testing at random of the operation of mechanically operated hatch covers including:
 - stowage and securing in open condition
 - proper fit and efficiency of sealing in closed condition
 - hydraulic and power components, wires, chains and link drives.

Confirmation shall be obtained that no unapproved changes have been made to the hatch covers, hatch coamings and their securing and sealing devices since the last survey.

104 For doors in ship's bow (outer and inner), sides and stern, the survey shall include:

a) examination of:

- structural arrangement of doors, ramps and hinging arms
- shell structure surrounding door openings
- hinges with bearings, thrust bearings (side-hinged doors), sealing arrangement, drainage arrangement, electrical equipment and hydraulic system for opening and closing of doors and operation of cleats, supports and locking devices
- close-up examination of cleats, support and locking devices
- space between outer and inner bow doors.

b) testing of the operation of doors during a complete opening and closing operation.

Non-destructive testing and thickness measurements may be required. Clearances of hinges, closing devices, bearings and thrust bearings shall be measured, where no dismantling is required. Where the function test is not satisfactory, dismantling may be required to measure the clearances, in such cases examination of hinge pins and bearings together with NDT of the hinge pins shall be carried out.

c) testing of indicators and audible alarms including mode selection function “harbour/sea voyage”.

Guidance note:

The indicator system shall show by visual indication if any of the doors are not fully closed and not fully locked, and by audible alarms if securing devices become open or locking devices become unsecured.

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Verification of fail-to-safe performance for indicator and alarm systems on the navigation bridge.

Sensors shall be examined for proper condition and protection from water, ice formation and mechanical damage.

d) testing of television surveillance systems.

e) testing of water leakage detection system.

f) testing for effectiveness of sealing arrangement by hose testing or equivalent.

Guidance note:

If the visual examination and function test have shown satisfactory results, testing of side and stern doors on cargo ships need not be carried out unless considered necessary by the surveyor.

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g) testing of drainage system for the space between the bow door and ramp, or where no ramp is fitted, between the bow door and inner door.

In cases where the examination of doors has been carried out by a company approved by the Society, the extent of survey may be limited at the discretion of the surveyor. However, the survey shall, as a minimum, include:

- examination of structural arrangement of doors including surrounding structures and space between outer and inner bow doors
- testing of complete opening and closing operation.

105 All piping on deck shall be overall examined.

Special attention shall be paid to:

- ventilators and air pipes with coamings and closing appliances
- weld connection between air pipes and deck plating and to air pipe heads installed on the exposed deck
- flame screens on vents to all bunker tanks.

Pressure testing and thickness measurements of any piping system may be required if found necessary by the surveyor.

For tankers the survey shall include examination of:

- cargo tank openings with pressure/ vacuum valves
- venting/ gas freeing arrangements including masts and risers with flame screens/ flame arrestors
- provisions for drainage of cargo tank vent lines.

For gas tankers the survey shall include verification of:

- sealing of cargo tank relief valves. The certificate with relief valves' opening and closing pressures shall be confirmed to be onboard.

For ships with inert gas plant (including ships with class notation **INERT**), the inert gas piping shall be examined with special attention to gas or effluent leakage.

For ships with bow loading arrangement (including ships with class notation **BOW LOADING**), the examination shall include inert gas purge pipes.

For ships with gas detection system, the examination shall include verification of integrity of the suction lines between suction points and analysing units.

106 The towing and mooring equipment shall *be verified* properly marked with any restriction associated with its safe operation.

Guidance note:

Applicable to ships of 500 GT and above, the keels of which are laid on or after 1 January 2007.

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107 Emergency towing arrangements shall be examined as far as practicable. Aft towing arrangement shall be confirmed as pre-rigged and forward chafing gear shall be confirmed as stowed in such a way that it can be rapidly connected to the strongpoint. Where light is provided on pick-up gear marker buoy, proper functioning shall be confirmed.

Guidance note:

Emergency towing arrangements are required on oil tankers, chemical tankers and gas carriers of 20 000 tonnes deadweight and above in accordance with IMO resolution MSC.35(63)

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108 Ballast tanks recorded for annual examination at previous survey, shall be overall examined.

Close-up examination including thickness measurements shall be carried out for areas with general breakdown of the protective coating, where extensive corrosion exists, and otherwise as found necessary by the surveyor.

109 Suspect areas recorded for annual examination at previous survey shall be close-up examined.

110 Areas recorded for annual examination as a consequence of substantial corrosion found at previous survey, or where substantial corrosion is found at the survey being carried out, shall have thickness measurements taken or extended.

The following tables shall be used:

- | | |
|------------------|---|
| Sec.4 Table D1.2 | in general as guidance, |
| Sec.4 Table D3.3 | for single skin bulk carriers, |
| Sec.4 Table D4.3 | for double skin bulk carriers, |
| Sec.4 Table D5.3 | for single hull oil tankers and single hull chemical tankers, |
| Sec.4 Table D6.3 | for double hull oil tankers and double hull chemical tankers. |

Areas found with substantial corrosion, which are not repaired and have not been previously identified, shall

be recorded for thickness measurements at subsequent annual surveys.

Note: This requirement is not applicable to cargo tanks of oil and chemical tankers.

111 Means of escape from passenger and crew spaces to lifeboat embarkation deck shall be verified in order and according to the as built plans.

Crew spaces include restricted spaces such as engine room, boiler room, shaft tunnel and Ro-Ro cargo spaces. For ships with bow loading arrangement (including ships with class notation **BOW LOADING**), emergency escape routes from bow control station shall be verified in order.

112 For ships with plant for refrigerated cargoes (including ships with class notation **Reefer** or **RM** or **RM(Container)** or **KMC** or **CA** or **CA (port.)**), the survey shall include examination of:

- ducts, hatches and doors with regard to escape possibilities and prevention of personnel being trapped within chambers, air cooler rooms etc.
- the chambers with attention on internal lining and that the chambers are free from odour
- scuppers, bilges with rose boxes, and piping (suction, sounding and drain) together with drip pans.

113 For ships with class notation **MCDK**, the survey shall include:

- examination of pontoon conditions
- examination of supporting fittings and suspension / pillars
- examination of lifting arrangement (wires, sheaves etc. if applicable)
- examination of stowing arrangements in cargo hold
- examination of pontoon racks on deck including lashing arrangements
- examination of drainage arrangements in pontoon stowage areas
- testing at random of movable car deck hoisting arrangement.

B 200 General dry cargo ships subject to Extended Hull Survey Requirements (EHSR) – additional requirements

201 For hatch covers and coamings the survey shall include:

- close-up examination of hatch coaming plating and their stiffeners
- close-up examination of hatch cover plating where mechanically operated steel hatch covers are fitted

202 For ships 10 to 15 years of age the survey shall include overall examination of one forward and one aft cargo hold and their associated 'tween deck spaces.

203 For ships over 15 years of age the survey shall include:

- overall examination of all cargo holds and 'tween deck spaces
- close-up examination in a forward cargo hold and one other selected cargo hold, of approximately lower 1/3 length of the side frames, including the frame end attachment and the adjacent shell plating to a sufficient extent, minimum 25% of frames
- all piping and penetrations in cargo holds, including over-board piping.

Where the close-up examination reveals need for remedial measures, the survey shall be extended to include close-up examination of all side frames and adjacent shell plating of the relevant cargo holds and associated 'tween deck spaces, as well as close-up examination of sufficient extent of all remaining cargo holds and 'tween deck spaces.

B 300 Dry bulk cargo ships subject to Enhanced Survey Programme (class notation ESP) – additional requirements

301 For hatch covers and coamings the survey shall include:

- close-up examination of hatch coaming plating with panel stiffeners and brackets
- close-up examination of hatch cover plating and stiffener attachments that may be accessible in the open position where mechanically operated steel hatch covers are fitted
- close-up examination of removable hatch cover steel pontoon plating.

302 For mechanically operated hatch covers, hatch cover sets which are wholly or partly within the forward 25% of the ship's length and at least one additional set shall be surveyed open, closed and in operation to the full extent on each direction, such that all sets on the ship are surveyed at least once in every 5-year period including:

- stowage and securing in open condition
- proper fit and efficiency of sealing in closed condition
- operational testing of hydraulic and power components, wires, chains and link drives
- examination of the fastening of all peripheral and cross joint cleats or other securing devices in closed

condition.

If there are indications of difficulty in operating and securing hatch covers, additional sets shall be tested in operation as deemed necessary by the surveyor.

303 For single skin bulk carriers over 10 years of age the survey shall include:

- overall examination of all cargo holds
- close-up examination in the forward cargo hold, of approximately lower 1/3 length of the side frames, including the frame end attachment and the adjacent shell plating to a sufficient extent, minimum 25% of frames
- examination of all piping and penetrations in cargo holds, including overboard piping.

304 For single skin bulk carriers over 15 years of age, in addition to the requirements in 303, the survey shall include:

- close-up examination of one other selected cargo hold to the same extent as required for the forward cargo hold

305 Where the close-up examination required in 303 and 304 reveals need for remedial measures, the survey shall be extended to include close-up examination of all side frames and adjacent shell plating of the relevant cargo hold, as well as close-up examination of sufficient extent of all remaining cargo holds.

306 For double skin bulk carriers 10 to 15 years of age the survey shall include:

- overall examination of two selected cargo holds
- examination of all piping and penetrations in selected cargo holds, including overboard piping.

307 For double skin bulk carriers over 15 years of age the survey shall include:

- overall examination of all cargo holds
- examination of all piping and penetrations in cargo holds, including overboard piping.

308 For single skin bulk carriers built with an insufficient number of transverse watertight bulkheads to satisfy the requirements for damage stability as given in Ch.2 Sec.1 C the survey in the forward cargo hold shall be extended as follows:

For ships exceeding 10 years of age:

- close-up examination of the side frames, including the frame upper and lower end attachments and the adjacent shell plating to a sufficient extent, minimum 25% of frames
- where the close-up examination reveals need for remedial measures, the survey shall be extended to include close-up examination of all side frames and adjacent shell plating

For ships exceeding 15 years of age the survey shall be extended to include close-up examination of all side frames and adjacent shell plating of the forward cargo hold.

Thickness measurements shall be carried out to an extent sufficient to determine both general and local corrosion levels at areas subject to close-up examination.

The thickness measurements may be dispensed with provided the surveyor is satisfied by the close-up examination that there is no structural diminution and the protective coating where fitted remains effective.

B 400 Oil and chemical tankers subject to Enhanced Survey Programme (class notation ESP) – additional requirements

401 Wheelhouse doors and windows, side scuttles and windows in superstructure and deckhouse bulkheads facing the cargo area and possible bow or stern loading and unloading arrangements shall be examined for gas and vapour tightness.

402 Segregation between cargo and segregated ballast system shall be confirmed.

For chemical tankers, removable pipe lengths or other approved equipment necessary for cargo segregation shall be overall examined.

403 Pump rooms shall be examined with special attention to:

- piping with pumps
- bulkheads for signs of oil leakage or fractures and, in particular, the sealing arrangements of all penetrations of cargo pump room bulkheads
- access ladders.

404 For combination ships with protected slop tanks, (including ships with class notation **PST**), the following shall be examined:

- closing arrangement for hatches and other slop tank openings
- blanking arrangement for slop tank pipes.

B 500 Liquefied gas tankers – additional requirements

501 The cargo handling piping and cargo process piping, shall be examined, with special attention to insulation on piping.

502 The sealing arrangements for tanks or tank domes penetrating decks or tank covers shall be examined.

503 Portable and or fixed drip trays or insulation for deck protection in the event of cargo leakage shall be examined.

504 Wheelhouse doors and windows, side scuttles and windows in superstructure and deckhouse bulkheads facing the cargo area and possible bow or stern loading and unloading arrangements shall be examined for gas and vapour tightness.

The closing devices for all air intakes and openings into accommodation spaces, service spaces, machinery area, control stations and approved openings in superstructures and deckhouses facing the cargo area or bow and stern loading/unloading arrangements, shall be examined.

505 Gastight bulkheads with possible shaft sealing shall be examined.

506 Correct functioning of any arrangements for heating of structural hull steel shall be verified. Access to the heated cofferdams etc. is normally not required.

C. Machinery and Systems

C 100 General - all ships

101 The survey shall cover:

- a) examination of spaces, see 102
- b) external examination of boilers steam drums and steam generators, see 107
- c) external examination of pressure vessels
- d) verification of integrity/ function of:
 - jacketed high pressure fuel injection piping system
 - shielding of flammable oil piping system
 - insulation of hot surfaces exceeding 220°C
 - oil burning equipment on boilers, hot water heaters, incinerators and inert gas generators.
- e) steering gear, see 103
- f) fire extinguishing systems, see 104
- g) electrical installations, see 105
- h) gas fuelled engine and boiler installations, see 115
- i) fuel cell installations, see 116
- j) gas turbines, see 117
- k) examination of remote operation for quick closing/stop of fuel-valves, fuel/transfer-pumps and ventilation fans. Spot testing of functions to be carried out
- l) examination of bilge systems, bilge level alarms and remote operation
- m) testing of communication systems from bridge to machinery and steering gear spaces
- n) equipment and systems related to carriage of special cargoes:
 - refrigerated cargo, see 111
 - inert gas plants, see 112
 - protected slop tanks, see 113
 - volatile organic compound (VOC) recovery plants
 - low flashpoint liquids, see 114
 - motor vehicles with fuel in their tanks, see 118
 - examination of cargo systems in ships intended for supply service to offshore installations
 - examination and tightness testing of cement and dry mud cargo piping situated within the engine room
- o) control and monitoring system of main and auxiliary machinery including boilers, thermal oil heaters, oil burning equipment and equipment for periodically unattended machinery space and machinery centralised

operated, see 109

- p) emergency systems for passenger ships, see 110.
- q) water ingress detection system and their alarms, for ships with single cargo hold and for bulk carriers, see 119.
- r) the control and means for draining and ballast pumping forward of the collision bulkhead, for bulk carriers, see 119.

102 Machinery area and spaces in the cargo area entered in connection with cargo handling shall be examined with respect to general cleanliness and maintenance and with special attention to the fire and explosion hazards in general.

103 For the main and auxiliary steering system the survey shall include:

- external examination of the steering gear arrangement and hydraulic piping and handrails, non-slip surfaces and oil storage tank with piping
- examination of oil filters (to be opened up for inspection)
- test of power units and rudder actuators, or actuating system for azimuth gears
- test of alarms
- test of all modes of local and remote steering control systems for main and auxiliary steering gears including rudder angle indicating systems communication between bridge and steering gear compartment
- test of emergency steering control
- verification of relaying heading information (compass readings)
- test of alternative power supply, if required for vessel.

104 For fire extinguishing systems the survey shall include:

- testing of the water fire fighting system i.e. fire pumps, fire mains, hydrants and hoses as deemed necessary
- verification of the international shore connection
- verification of the non-portable and portable fire extinguishers and portable foam applicators
- examination of the fireman's outfit
- examination of the fixed fire extinguishing systems.

For ships with valid SOLAS Passenger Ship Safety Certificate or Cargo Ship Safety Equipment Certificates, the above tests may be reduced or omitted.

105 For electrical installations the survey shall include:

- examination of main source of electrical power with respect to general condition, fire hazard and personnel safety, i.e. generators, main switchboards, distribution boards, control gear, consumers, chargers and battery/UPS systems
- test of automatic start and connection to the switchboard of the stand-by generator set by initiating shut-down of the running diesel generator causing black-out. During this test, the emergency generator shall be disabled and the emergency switchboard shall be disconnected.
- examination of cable installations with respect to general condition, support and physical protection
- examination of emergency source of electrical power with respect to general condition, fire hazard, personnel safety and function, i.e. generator, emergency switchboard, emergency distribution boards, control gear, chargers, emergency consumers and battery/ UPS systems
- check if any modifications are done in the electrical system
- test of emergency power system, i.e. manual and automatic connection of generator/batteries to emergency switchboards, alternative systems
- examination of cables and equipment in gas dangerous spaces and zones with respect to general condition and spark/explosion hazard.

106 The following surveys shall be carried out in conjunction with the renewal survey:

- Boiler survey (boilers, superheaters, economizers and air Preheaters or steam heated steam generators) see Sec.5 F.

107 Boilers, steam drums and steam generators are subject to an external examination, where the following will be assessed by a DNV surveyor:

- installation free of leakages (Steam/water/exhaust gases)
- operational test of safety valve by use of the relieving gear
- testing of safety and protective devices
- functioning of soot blowing arrangements (if fitted)
- monitoring / testing of the boiler water carried out at least once in every 24 hours daily for main boilers and at least every 48 hours for auxiliary boilers
- boiler water quality maintained to the standard required by the equipment manufacturer / the supplier of the

boiler water treatment programme in use

- procedures for boiler water management for boilers temporarily out of service in place. Boiler to be placed in either dry or wet lay-up when out of service for a prolonged period of time (Full voyage, ship idle in port, ships laid-up).

For exhaust gas heated economizers, verification of function of the safety valves may be carried out by the Chief Engineer at sea. This test shall be recorded in the log book prior to survey for review by the attending surveyor.

108 Thermal oil installations are subject to an external examination, where the following will be assessed by a DNV surveyor:

- installation free of leakage
- functioning of temperature control arrangement
- integrity of mounted fire extinguishing system
- no blockage in fire extinguishing / drenching water drainage
- low flow alarm and emergency stop functions in order
- thermal oil analysis not older than 3 months available.

If the laboratory analysis reveals, either:

- chemical degrading of oil in circulation
- contamination by low flashpoint petrochemical products
- contamination by carbon particles,

corrective measures shall be initiated by owner and subsequently assessed by a DNV surveyor.

109 The survey shall cover control and monitoring systems for main and auxiliary machinery including:

- propulsion machinery
- electric power generation and distribution
- steam generation
- thermal oil heating
- oil or gas burning equipment on incinerators, inert gas generators and hot water heaters.

The survey shall include

- emergency lighting in engine room
- communication systems
- fire alarm and fire protection systems.

For all systems, the survey shall include inspection of the installation with regard to electrical and mechanical condition, labels, signboards etc.

For control and monitoring systems, the survey shall include:

- alarm functions
- safety functions
- remote control functions
- automatic control functions
- control panels and local indicating instruments
- verification of change handling process for control and monitoring systems, see Table C2.

For ships with notation **E0** or **ECO**, refer to Sec.6 Y.

110 For passenger ships the arrangement for emergency and transitional source of power shall be tested.

111 For ships with reefer plant or controlled atmosphere installations (including ships with class notation **Reefer** or **RM** or **RM(Container)** or **KMC** or **CA** or **CA (port.)**), the survey shall include:

- examination of system for tightness
- examination of the safety measures such as:
 - gas tight machinery room bulkheads
 - separate ventilation system
 - catastrophe ventilation or sprinkler arrangement
 - escape arrangements for process areas and continuously manned cargo chambers
 - protection of fans and other rotating machinery
 - alarms and emergency stop buttons
 - refrigerant leakage detectors
- tests of electrical installation's insulation resistance to the extent found necessary by the surveyor.

112 For ships with inert gas plant (including ships with class notation **INERT**), the survey shall include:

- examination of blowers, scrubber, deck water seal, closed ullage system, pressure/vacuum monitoring system, P/V breaker and non-return valves
- testing of remotely operated or automatically controlled valves, interlocking features of soot blowers, alarms and safety devices as deemed necessary
- examination/testing of oil burning equipment, automation, instrumentation and safety functions on inert gas generator.

113 For combination ships with protected slop tanks, (including ships with class notation **PST**), the following shall be examined:

- gas detection arrangement in cofferdams
- oxygen control equipment.

114 For ships arranged for carriage of low flash point liquids (including ships with class notation **LFL** or **LFL***), the survey shall include:

- examination of pumping and piping systems (cargo, heating, bilge)
- examination of ventilation system
- testing of emergency stop of pumps
- testing of quick release of transfer hose
- testing of tank high level alarms
- examination of portable hydrocarbon gas-measuring apparatus
- examination of portable oxygen-measuring apparatus, if applicable
- examination of gas detection system in cofferdams, if applicable.
- measurement of insulation resistance of electrical cables in the cargo area. The measurements may be omitted provided a record of testing is available showing that measurements have been taken during the last 12 months and that the results are satisfactory.

115 For ships with gas fuelled engine installations, (including ships with class notation **GAS FUELLED**), the survey shall include:

- external examination and function testing of remote operated valves in the gas piping system
- external examination of gas pipe ducts
- testing of instrumentation
- testing of emergency shutdown system, as a minimum by:
 - releasing gas detectors and fire detectors
- checking electrical disconnection in ESD protected engine rooms
- checking safety functions in connection with the ventilation systems in gas engine rooms
- verification of the functioning of ventilation systems
- examination of drip trays in bunker station.

116 For ships with class notation **FC-POWER** or **FC-SAFETY** the survey shall include:

- external examination and function testing of remote operated valves in the FC fuel piping system
- external examination of FC fuel pipe ducts
- testing of instrumentation
- testing of safety system, as a minimum by:
 - releasing gas detectors and fire detectors
 - checking safety functions in connection with the ventilation systems in FC fuel spaces
- verification of the functioning of ventilation systems
- examination of drip trays in bunker station.

117 For ships with gas turbines the survey shall include the extent and criteria specified in Table C1.

The survey items may be covered through inspection or overhaul at a service or maintenance centre provided the requirements given in Sec.1 C500 are adhered to.

Table C1 Gas turbine annual survey			
Survey item	Extent	Acceptance criteria	Remarks

Survey of records	Maintenance record check with reference to running hours	Maintenance activities shall have been carried out in accordance with manufacturer recommendations	Review of maintenance reports
Survey of gas turbine	Visual inspection and boroscope inspections	No indications of wear or degradation, beyond manufacturers acceptance criteria	Boroscope inspection either performed in surveyor presence, or records ¹⁾ of boroscope inspection performed within last month to be available
Monitoring, control and emergency shut-down system	System functionality testing	Software version(s) to be in accordance with certificate. No deviations in functionality	Spot-checks of functionality. May be performed in combination with machinery and safety systems survey, or E0 survey
1) The report shall describe boroscope extent, findings (if any), and conclusions or evaluation. If inspection is performed in surveyor's presence, such a report shall be prepared subsequently, and submitted to the Society			

Table C2 Change-handling process for control and monitoring systems - annual survey ¹⁾	
Survey item	Acceptance criteria
Identification of changes	<p>A change-log shall be available and used to keep track of changes since last survey. This applies to all control systems that are required to be provided with a product certificate. If no changes have been done to the control systems since the last survey, the remaining survey item in this table may be omitted.</p> <p>Major changes affecting functionality covered by the class rules shall be submitted to class for approval prior to implementation onboard, refer to Pt.4 Ch.9 Sec.1 A300.</p> <p>Guidance note:</p> <p>Major changes affecting functionality covered by class rules are changes which alter the functionality for which DNV rules has requirements. Such functionality is normally found in any control, monitoring, alarm or safety system which is required to be provided with DNV product certificate (listed in Pt.4 Ch.9 Sec.1 A202.) Adjustments of parameters such as set points or alarm limits are not considered "major changes". Adding automatic load shedding in a power management system, adding a serial link to the fire central in wheelhouse or adding more causes to shutdown logic are examples of alterations which are considered "major changes".</p> <p style="text-align: center;">---e-n-d---of---G-u-i-d-a-n-c-e---n-o-t-e---</p>
Documentation of the change-handling process	<p>Documentation shall be kept onboard to demonstrate traceability in the change-handling process. The documentation shall be presented for the attending surveyor, and shall contain information related to the following:</p> <ul style="list-style-type: none"> — reason / motive for the change — specification of requirements (new requirements) — internal testing at manufacturer (e.g. reference to test records, simulation) — functional description of new or changed functionality — procedure for implementation — failure analysis, fall-back plan if relevant (effect of failures, how to restore original state) — verification and testing of implementation.
1) Note requirements for alterations of control systems in Pt.4 Ch.9.	

118 For ships carrying motor vehicles with fuel in their tanks in enclosed spaces (including ships with class notation **Car Carrier** or **PET**), the survey shall include:

- examination of automatic fire alarm system in cargo holds
- examination of fixed fire extinguishing system in cargo holds
- examination of portable fire extinguishers in cargo holds and at cargo hold entrances
- examination of ventilation system in cargo holds including remote indicators on bridge.

119 For ships with a single cargo^{*)} hold and for bulk carriers^{**) an examination and test at random of the water ingress detection system and of their alarms shall be carried out.}

For bulk carriers^{**) an examination and test of the control and means for draining and ballast pumping forward of the collision bulkhead included bilges of dry spaces any part of which extends forward of the foremost cargo hold, shall be carried out.}

Guidance note:

- ^{*)} For single hold cargo ships complying with the requirements of SOLAS II-I/23-3 and II-I/25, see Ch.2 Sec.2 D

**) For bulk carriers complying with the requirements of SOLAS XII/12 and XII/13, see Ch.2 Sec.1 E.

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C 200 Oil and chemical tankers – additional requirements

201 The survey shall include:

- examination of deck foam system with attention to physical and chemical condition of foam concentrate
- for alcohol resistant fluorine protein based foam concentrates the annual condition test carried out by service suppliers shall also include a chemical stability tests (with acetone or equivalent) according to IMO MSC.1/Circ. 1312. Foam concentrate approved according IMO MSC.1/Circ. 1312 shall use this standard for periodic testing
- examination of fixed and portable mechanical ventilation systems for cargo handling spaces and other spaces within the cargo area which are normally entered, including pipe tunnels
- examination of cargo, bilge, ballast and stripping pumps
- testing of remote operation and shut-down devices for the cargo system
- examination and testing of gas detection system in cargo pump rooms
- examination of temperature sensors in bulkhead shaft glands bearings for pumps installed in cargo pump rooms
- examination of the pressure/vacuum monitoring arrangement for cargo tanks and vapour return systems.

202 For oil tankers, the survey shall include testing of:

- pressure gauges on cargo/cow discharge lines
- temperature sensors for cargo, tank washing and ballast pumps
- oily water interface detector
- oil discharge monitoring system.

203 For chemical tankers, the survey shall include:

- examination and testing of cargo hoses
- examination and testing of system for cargo tank level gauging
- testing of system for cargo tank overflow control (high and high-high level alarm)
- examination of vapour detection instruments
- testing of system for cargo temperature indication
- testing of leakage alarm in spaces containing independent cargo tanks
- examination and testing of sampling arrangements for cargo heating/cooling system
- examination of arrangement for storage of cargo samples
- examination of arrangements for storage of padding gas, monitoring of ullage spaces and provisions of drying elements on air inlets to cargo tanks
- examination of decontamination showers and eye washes including any provisions to ensure operation under all ambient temperatures
- examination of pump discharge pressure gauges fitted outside the cargo pump rooms
- examination of cargo pump rooms with focus on remote operation of the bilge system, rescue arrangements and distinctive marking of pumps, valves and pipelines in pump room
- examination of installations and equipment required for special cargoes, if applicable
- verification of the arrangement for discharge of contaminated water.

204 For ships with bow loading arrangement (including ships with class notation **BOW LOADING**), the survey shall include:

- opening up and pressure testing of valves and piping if found necessary by the surveyor
- verification that spray-shield and collecting tray in way of connector are in order
- examination and testing of instrumentation, automation and communication equipment in bow control station
- examination and testing as far as possible of the automatic and manual emergency disconnection systems
- examination of protective measures preventing structural elements initiating sparks
- examination of interlock functions for the mooring and loading systems.

205 For ships with vapour processing and recovery plant (including ships with class notation **VCS-3**) the following will be assessed:

- volatile organic compound (VOC) recovery plants. Gas tight bulkheads, piping systems, pressure vessels with mountings and equipment, regulating valves, deck tank safety relief valve sealing, electrical cables and equipment as applicable. Pressure testing and piping thickness measurements will be requested if deemed necessary by the surveyor
- functioning of the boiler and controls, see 106 and 108
- functioning of the hydrocarbon gas detection system
- functioning of the ventilation system
- functioning of air locks, if fitted

- calibration of fixed or portable instruments for measuring oxygen content in the recovered VOC
- confirming that an operation manual for the VOC recovery plant is on board, and updated if new equipment and/or software has been installed
- functioning of alarm and safety systems.

For survey of boiler and controls, see 106 and 108.

C 300 Liquefied gas tankers – additional requirements

301 The survey on deck shall include:

- examination of the venting systems for the cargo tanks, interbarrier spaces and hold spaces. The sealing of cargo tank relief valves shall be verified and the certificate with relief valves' opening and closing pressures shall be confirmed to be onboard
- testing of the emergency shut-down valves at shore connections and tanks, without flow in the pipe lines. It shall be verified that operation of the emergency shut-down system will cause the cargo pumps and compressors to stop.

302 Ventilation systems for cargo handling spaces and other spaces within the cargo area which are normally entered, shall be examined and tested as necessary.

303 The survey of cargo compressor room and other spaces for cargo handling shall include:

- examination of cargo handling machinery, including cargo heat exchangers, vaporisers, pumps, compressors. To the extent possible the examination shall be carried out during operation
- testing of the gas detection equipment
- verification of dry air installations including the means for prevention of backflow of cargo vapour to gas-safe spaces
- visual examination of the arrangements for burning methane boil-off as far as practicable.

304 The instrumentation of the following cargo installations shall be verified in good working order:

- automatic control, alarm and safety systems related to the pressure in cargo tanks, interbarrier spaces and hold spaces
- systems for cargo tank level gauging, including high level alarm and high level shut-off
- systems for temperature indication of the cargo, the cargo containment system, the hull and the cargo piping system
- systems for leakage detection of interbarrier spaces and hold spaces
- automatic control, alarm and safety systems in connection with cargo compressors and cargo pumps.

One or more of the following survey methods are applicable:

- visual external examination
- comparing of read-outs from different indicators
- consideration of read-outs with regard to the actual cargo and/or actual conditions
- examination of maintenance records with reference to the cargo plant instrumentation maintenance manual.

305 The following shall be surveyed and tested as applicable:

- cargo hoses
- decontamination showers and eyewashes.

306 For membrane containment systems normal operation of the nitrogen control system for insulation and interbarrier spaces shall be confirmed to the surveyor by the master.

SECTION 3 INTERMEDIATE SURVEYS EXTENT – MAIN CLASS

A. General Requirements

A 100 General

101 Intermediate survey is a survey including visual examinations, measurements and testing as applicable, of the hull and equipment, machinery and systems, in order to confirm that the ship complies with the relevant rule requirements and is in satisfactorily maintained condition.

The required examinations, measurements and testing shall be carried out before the intermediate survey is regarded as completed.

102 Intermediate surveys are required carried out for all seagoing self-propelled ships.

103 For liquefied gas tankers the intermediate survey of cargo handling installations with related automatic control, alarm and safety systems is preferably to be carried out with the ship in a gas-free condition. The extent of the testing required will normally be such that the survey cannot be carried out during a loading or discharging operation.

A 200 Review of documentation, operational instruments, signboards and markings

201 For ships with class notation **ESP**, the surveyor shall examine the documentation onboard as specified in Sec.1 B600, and its contents as a basis for the hull survey.

B. Hull and Equipment

B 100 General - all ships

101 The survey shall cover:

- ballast tanks, see 102, 103, 104, 105 and 106
- cargo compartments, see 108
- extended thickness measurements when substantial corrosion has been found, see 109
- lower portions of the cargo and ballast tanks, see 110.

Suspect areas identified shall be recorded for examination at subsequent annual surveys.

Areas found with substantial corrosion, which are not repaired, shall also be recorded for thickness measurements at subsequent annual surveys.

Note: Annual surveys of suspect areas and areas found with substantial corrosion are not applicable to cargo tanks of oil and chemical tankers.

102 For ships 5 to 10 years of age, an overall examination of representative ballast tanks selected by the surveyor shall be carried out.

If there is no protective coating, soft or semi-hard coating, or POOR coating condition, the examination shall be extended to other ballast tanks of the same type.

103 For ships over 10 years of age, an overall examination of all ballast tanks and tanks used as bilge water holding tanks shall be carried out.

104 The survey extent of void spaces converted from ballast tanks shall be specially considered in relation to the requirements for ballast tanks.

For guidance, reference is made to Sec.4 B.

105 For those tanks subjected to survey according to 102 and 103, including additional tanks specified in 200 to 400, special attention shall be given to:

- cargo piping passing through ballast tanks
- bilge and ballast piping passing through cargo and fuel oil tanks
- air and sounding piping passing through cargo and ballast tanks
- fuel pipes passing through ballast tanks.

106 For those ballast tanks subjected to survey according to 102 and 103, including additional tanks specified in 300 to 400, the survey shall include examination of the condition of corrosion prevention system, where provided.

A ballast tank, except bilge water holding tanks, shall be recorded for examination at subsequent annual surveys where:

- a hard protective coating was not applied from the time of construction, or
- a soft or semi-hard coating has been applied, or
- the hard protective coating is found in POOR condition and it is not renewed.

For double bottom ballast tanks, except for oil and chemical tankers with the notation **ESP**, such recording may be specially considered.

Guidance note:

Initial hard protective coating applied later than at the time of construction may be accepted as equivalent to such coating being applied at the time of construction provided a surveyor has confirmed that the structure was in satisfactory condition when the coating was applied.

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107 For ships over 10 years of age the survey of sewage (black water) tanks and wastewater (gray water) tanks shall include:

- for integral tanks internal examination.
Tanks with hard coating of internal structures recorded in GOOD condition at the previous renewal survey may be specially considered based on a satisfactory external examination.
The internal examination of tanks used in association with sewage treatment may be specially considered based on a satisfactory external examination and provided that an internal inspection has been carried out in accordance with onboard maintenance system during the last 12 months and relevant records are provided and confirmed.
- for independent tanks external examination including the tank supporting structures.
- thickness measurements shall be carried out as deemed necessary.

108 For ships over 10 years of age, other than ships engaged in the carriage of dry cargoes only or oil and chemical tankers with class notation ESP or liquefied gas tankers, the survey shall include overall examination of cargo compartments selected by the surveyor.

109 For dry cargo ships over 15 years of age the survey shall include an overall examination of cargo compartments selected by the surveyor.

110 Areas where substantial corrosion is found at the survey being carried out, shall have thickness measurements extended.

The following tables shall be used:

- | | |
|------------------|---|
| Sec.4 Table D1.2 | in general as guidance, |
| Sec.4 Table D3.3 | for single skin bulk carriers, |
| Sec.4 Table D4.3 | for double skin bulk carriers, ore carriers, |
| Sec.4 Table D5.3 | for single hull oil tankers, single hull chemical tankers and ore carriers, |
| Sec.4 Table D6.3 | for double hull oil tankers and double hull chemical tankers. |

111 For ships with class notation **ESP** overall and close-up examination including thickness measurements, as required for the lower portions of the cargo tanks/holds and ballast tanks, shall be carried out not later than concurrently with the bottom survey when required as part of the intermediate survey and the bottom survey is carried out in dry dock.

Note: Lower portions of the cargo and ballast tanks and cargo holds are considered to be the parts below light ballast water line.

B 200 General dry cargo ships subject to Extended Hull Survey Requirements (EHSR) – additional requirements

201 For ships 5 to 10 years of age the survey shall include overall examination of one forward and one aft cargo hold and their associated 'tween deck spaces.

202 For ships from 10 to 15 years of age the survey shall include overall examination of all cargo hold and 'tween deck spaces.

When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurement shall be carried out.

203 For ships over 15 years of age the survey shall include:

- a) a thorough examination of hatch covers and coamings with closing, sealing and securing devices

- b) testing for satisfactory operation of all mechanically operated hatch covers, including:
 - stowage and securing in open condition
 - proper fit and efficiency of sealing in closed condition
 - operational testing of hydraulic and power components, wires, chains and link drives
- c) testing for effectiveness of sealing arrangement of all hatch covers by hose testing or equivalent
- d) overall examination of all cargo holds, 'tween deck spaces and ballast tanks and in way of all cofferdams, pipe tunnels and void spaces within the cargo area
- e) examination and performance testing of all piping systems within all cargo holds and ballast tanks as well as cofferdams, pipe tunnels and void spaces within the cargo area;
- f) close-up examination as for the previous renewal survey in accordance with Sec.4 Table D2.1
- g) thickness measurement as for the previous renewal survey in accordance with Sec.4 Table D2.2 except main deck plates outside the cargo area (item 1 partly), bottom plates including keel plates outside the cargo area (item 4a partly), plating of sea chests and shell plating in way of overboard discharges (item 4b), superstructure deck plating (item 5), internals in peak tanks (item 6) and air pipes and ventilators (item 7)
- h) a bottom survey in accordance with Sec.5 A.

B 300 Dry bulk cargo ships subject to Enhanced Survey Programme (class notation ESP) – additional requirements

301 For bulk carriers with hybrid cargo hold arrangements, the following shall be applied:

- full breadth cargo holds and associated topside tanks and hopper side tanks are subject to the single skin bulk carrier requirements
- cargo holds of double skin and associated side tanks are subject to the double skin bulk carrier requirements.

302 For ships 5 to 10 years of age the survey shall include:

- a) overall examination of representative ballast tanks selected by the surveyor. The selection shall include fore and aft peak tanks and a number of other tanks, taking into account the total number and type of ballast tanks
- b) overall examination of all cargo holds
- c) close-up examination as follows:
 - for single skin bulk carriers: in the forward cargo hold and one other selected cargo hold, of the transverse bulkheads at the shell plating and side frames, including their upper and lower end attachments and adjacent shell plating to a sufficient extent, minimum 25% of frames.
Where considered necessary by the surveyor as a result of the overall and close-up examination, the survey shall be extended to include close-up examination of all side frames and adjacent shell plating of the relevant cargo hold, as well as close-up examination of sufficient extent of all remaining cargo holds.
 - for double skin bulk carriers: of those areas of structure considered necessary by the surveyor as a result of the overall examination.
 - thickness measurements shall be carried out to an extent sufficient to determine both general and local corrosion levels at areas subject to close-up examination.
The extent of thickness measurement may be specially considered provided the surveyor is satisfied by the close-up examination that there is no structural diminution and the hard protective coatings are found to be in a GOOD condition.

303 For ships over 10 years of age the survey shall include:

- a) a thorough examination of hatch covers and coamings with closing, sealing and securing devices
- b) testing for satisfactory operation of all mechanically operated hatch covers, including:
 - stowage and securing in open condition
 - proper fit and efficiency of sealing in closed condition
 - operational testing of hydraulic and power components, wires, chains and link drives
- c) testing for effectiveness of sealing arrangement of all hatch covers by hose testing or equivalent.
- d) overall examination of all cargo holds and ballast tanks and in way of all cofferdams, pipe tunnels and void spaces within the cargo area
- e) examination and performance testing of all piping systems within all cargo holds and ballast tanks as well as cofferdams, pipe tunnels and void spaces within the cargo area

f) close-up examination as for the previous renewal survey in accordance with:

- Sec.4 Table D3.1 for single skin bulk carriers
- Sec.4 Table D4.1 for double skin bulk carriers
- Sec.4 Table D4.1.1 for ore carriers

g) thickness measurement as for the previous renewal survey in accordance with:

- Sec.4 Table D3.2 for single skin bulk carriers
- Sec.4 Table D4.2 for double skin bulk carriers and ore carriers

Thickness measurements of following structures may be exempted:

- main deck plates outside the cargo area (item 1 partly),
- bottom plates including keel plates outside the cargo area (item 4a partly),
- plating of sea chests and shell plating in way of overboard discharges (item 4b),
- superstructure deck plating (item 5),
- internals in peak tanks (item 6) and
- air pipes and ventilators (item 7)

h) a bottom survey in accordance with Sec.5 A.

304 For single skin bulk carriers required to comply with the retroactive requirements given in Ch.2 Sec.1 F, the survey of the side frames shall include:

- checking that representative thickness measurements in all holds and within each region of the frame, as specified, is documented
- examination to confirm that renewals or sandblasting, coating and reinforcements are carried out as required. Any coating shall be carried out in accordance with the requirements in Pt.5 Ch.2 Sec.5 C500 as far as applicable

Guidance note:

The extent of renewals and sandblasting, coating and reinforcements will be recorded in a Memo to Owner (MO) for future reference.

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- verification that side frames previously sandblasted, coated and reinforced based on the requirements in Pt.5 Ch.2 Sec.5, have been maintained in 'as new' condition.

Guidance note:

'As new' condition in this respect, means that the coating should be without any breakdown and rusting.

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(IACS UR S31)

B 400 Oil and chemical tankers subject to Enhanced Survey Programme (class notation ESP) – additional requirements

401 For single hull oil tankers from 5 to 10 years of age overall examination of all ballast tanks shall be carried out.

402 For ships over 10 years of age the survey shall include:

- overall examination of all cargo tanks and ballast tanks and all pump rooms, cofferdams, pipe tunnels and void spaces within the cargo area
- examination and performance testing of all cargo piping on deck, including crude oil washing (COW) piping, cargo and ballast piping within all cargo tanks and ballast tanks as well as cofferdams, pipe tunnels and void spaces within the cargo area. Special attention shall be given to any ballast piping in cargo tanks and cargo piping in ballast tanks and void spaces. Thickness measurement shall be taken if deemed necessary by the surveyor
- close-up examination as for the previous renewal survey in accordance with:

- Sec.4 Table D5.1 for single hull oil tankers and single hull chemical tankers
- Sec.4 Table D6.1 for double hull oil tankers and double hull chemical tankers

- thickness measurement as for the previous renewal survey in accordance with:

- Sec.4 Table D5.2 for single hull oil tankers and single hull chemical tankers

Sec.4 Table D6.2 for double hull oil tankers and double hull chemical tankers

Thickness measurements of following structures may be exempted:

- main deck plates outside the cargo area (item 1 partly),
- bottom plates including keel plates outside the cargo area (item 4a partly),
- plating of sea chests and shell plating in way of overboard discharges (item 4b),
- superstructure deck plating (item 5),
- internals in peak tanks (item 6) and
- air pipes and ventilators (item 7)

— a bottom survey in accordance with Sec.5 A.

403 A ballast tank shall be recorded for examination at subsequent annual surveys where, in addition to the conditions given in 101 and 106:

— the hard protective coating is found to be less than GOOD condition and is not repaired to the satisfaction of the surveyor.

B 500 Liquefied gas tankers - additional requirements

501 For ships over 10 years of age the survey shall include close-up examination of:

- all web frames and both transverse bulkheads in a representative ballast tank
- the upper part of one web frame in another representative ballast tank
- one transverse bulkhead in another representative ballast tank.

For ships over 15 years of age the survey shall include close-up examination of:

- all web frames and both transverse bulkheads in two representative ballast tanks.

Note: For ships having independent tanks of type C, see Pt.5 Ch.5 Sec.1 D600, with a midship section similar to that of a general cargo ship, the extent of close-up surveys may be specially considered.

C. Machinery and Systems

C 100 General - All ships

101 The survey shall cover:

- electrical installations, see 102
- gas fuelled engine installation, see 103
- fuel cell installations, see 104.

102 Electrical equipment in gas-dangerous spaces and zones shall be examined with respect to:

- corrosion
- flameproof enclosure/ingress
- no unauthorised modification
- correct rating of lamps
- earthing (spot check)
- function testing of pressurised equipment and of associated alarms
- testing of insulation resistance of power circuits (Ex p, Ex e and Ex n). Where proper records of testing are maintained consideration may be given to accepting recent readings (maximum 12 months) by the ship's crew
- insulation monitors with alarms shall be function tested, if installed
- for rooms protected by air locks, interlocking with ventilation of electrical supply to non-explosion protected equipment and de-energising of such equipment in case of ventilation failure shall be examined and function tested as applicable.

Guidance note:

Megger testing in gas dangerous spaces may involve risk of explosion due to sparks. Therefore appropriate procedures for such work should be followed as relevant e.g., "gas free certificate".

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Guidance note:

Reference is made to IACS Rec. No.35 - Inspection and maintenance of electrical equipment installed in hazardous areas.

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103 For ships with gas fuelled engine installations, (including ships with class notation **GAS FUELLED**), the survey shall include:

a) testing of all alarm and shutdown functions for:

- gas compressor
- gas engine.

104 For ships with fuel cell installations, (with class notation **FC-POWER** or **FC-SAFETY**), the survey shall include:

a) testing of all alarm and shutdown functions for:

- FC fuel gas compressor
- Fuel cell installation.

C 200 Oil and chemical tankers – additional requirements

201 For chemical tankers the survey shall include:

- examination of systems for cargo heating and cooling
- checking of spare parts for the mechanical ventilation fans in the cargo area.

202 For chemical tankers over 10 years of age examination of fittings such as valves and instrumentation in way of the representative cargo tanks subject to survey shall be carried out.

203 For ships over 15 years of age heating coils, tank cleaning apparatus and other equipment in cargo tanks, cofferdams and pipe tunnels within the cargo area shall be examined. Heating coils are normally to be pressure tested. Attachments of sacrificial anodes in tanks shall be examined.

C 300 Liquefied gas tankers – additional requirements

301 Spares provided for cargo area mechanical ventilation fans shall be confirmed (not required if double fans provided).

302 The instrumentation of the different cargo installations shall be tested by changing the parameter as applicable and comparing with test instruments. Simulated testing may be accepted for sensors which are not accessible or for sensors located within cargo tanks or inerted hold spaces. The testing shall include testing of alarm and safety functions.

303 For ships having a gas fuel forwarding system, the safety and control equipment and alarm and shut down functions related to the following systems shall be tested:

- gas heating arrangement
- fuel gas compressor and forwarding system
- ventilation arrangement
- protection and flame screens
- gas freeing and purging systems
- manual and automatic shut-down system
- gas detection system
- pilot flame burner or "fuel floor" arrangement, if applicable
- governor stability switching from gas fuel to oil, or vice versa.

SECTION 4 RENEWAL SURVEYS EXTENT – MAIN CLASS

A. General Requirements

A 100 General

101 Renewal survey is a major survey including visual examinations, measurements and testing of the hull and equipment, machinery and systems, in order to confirm that the ship complies with the relevant rule requirements and is in satisfactorily maintained condition.

The required examinations, measurements and tests shall be carried out before the renewal survey is regarded as completed.

102 Possible deficiencies shall normally be rectified before the renewal survey is regarded as completed.

The Society may accept that minor deficiencies, recorded as condition of class, are rectified within a specified time limit, normally not exceeding 3 months after the survey completion date.

103 For liquefied gas tankers the renewal survey of cargo handling installations with related automatic control, alarm and safety systems is preferably to be carried out with the ship in a gas-free condition. The extent of the testing required will normally be such that the survey cannot be carried out during a loading or discharging operation.

A 200 Review of documentation, operational instruments, signboards and markings

201 The draught marks shall be verified in order.

202 For ships with class notation **ESP**, the surveyor shall examine the documentation onboard as specified in Sec.1 B600, and its contents as a basis for the hull survey.

203 For ships equipped for the carriage of containers (including ships with class notation **Container Carrier** or **CONTAINER**), instructions (container securing manual) shall be verified available on board.

Instrument (computer program) for stowing and securing of containers, if furnished, shall be checked with verification of valid certificate and tested for functionality and accuracy.

B. Hull and Equipment

B 100 General - all ships

101 The survey shall cover:

- a) thickness measurements of hull structure, see 105
 - extended thickness measurements when substantial corrosion has been found, see 119
- b) anchoring equipment, see 106
- c) hatch covers and coamings, see 107
- d) doors in ship's bow, sides and stern, see 108
- e) air pipes and ventilators on deck, see 109 and 110
- f) examination of spaces:
 - all spaces, general, see 111
 - watertight integrity of internal bulkheads and decks, see 115
 - tightness of tank boundaries, see 116
 - ballast tanks, see 117
 - engine room structure, see 120
 - piping on deck and in spaces outside the machinery area, see 121
 - sea connections in machinery area, with pipes, valves and filters, see 123
 - coating in tanks for potable water, see 130
 - tanks for low flashpoint liquids, see 132.
- g) ships equipped for the carriage of containers, see 127
- h) ships with movable car decks, see 128
- i) mooring and towing equipment, see 124 and 125
- j) pushing arrangement, see 131

- k) verification of required signboards
- l) loading instrument or loading computer system, if available onboard, shall be tested by using the approved test conditions. Functionality and accuracy shall be verified with respect to strength and stability, whichever is applicable

m) examination of masts with standing rigging and foundations, see 126.

102 A bottom survey shall be carried out in accordance with Sec.5 A, as part of the renewal survey.

103 Internal examination of sea water cross-over tanks shall be carried out during the bottom survey in dry dock.

104 Suspect areas identified shall be recorded for examination at subsequent annual surveys.

Areas found with substantial corrosion, which are not upgraded, shall also be recorded for thickness measurements at subsequent annual surveys.

Note: Annual surveys of suspect areas and areas found with substantial corrosion are not applicable to cargo tanks of oil and chemical tankers.

105 Thickness measurements shall be carried out in accordance with Table D1.1. For passenger ships with superstructure extending over most of the ship length thickness measurements shall be carried out in accordance with Table D1.1.1.

106 Windlass, including piping system and foundations shall be examined.

The anchors and chain cables shall be ranged, examined and the required complement and condition verified. The chain lockers, holdfasts, hawse pipes and chain stoppers shall be examined and drainage arrangement of the chain lockers tested.

At the second and subsequent renewal surveys, chain cables shall be gauged. Any length of chain cable shall be renewed if the mean diameter at any cross-section is worn beyond 12% of its original diameter.

Guidance note:

The mean diameter of a cross-section may be taken as the average of the minimum diameter and the diameter measured perpendicular to this.

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For vessels where a bottom survey in dry dock is not required as part of the renewal survey, the examination of anchors and chain cables, verification of required complement and gauging of chain cables may be carried out during the bottom survey in dry dock.

107 Hatch covers and coamings shall be thoroughly examined. The survey shall include, in addition to the annual survey items:

- a) close-up examination of hatch cover plating and hatch coaming plating.
close-up examination of hatch cover stiffeners and hatch coaming stiffeners at the 3rd and subsequent renewal surveys.
- b) testing for satisfactory operation of all mechanically operated hatch covers, including:
 - stowage and securing in open condition
 - proper fit and efficiency of sealing in closed condition
 - operational testing of hydraulic and power components, wires, chains and link drives
- c) testing for effectiveness of sealing arrangement of all hatch covers by hose testing or equivalent.
- d) thickness measurements of members subject to close-up examination, for general assessment and recording of corrosion pattern are specified in Table D1.1.
Additional thickness measurements are also specified in:
 - Table D2.2 for general dry cargo ships subject to EHSR
 - Table D3.2 for single skin bulk carriers
 - Table D4.2 for double skin bulk carriers.

108 Doors in ship's bow (outer and inner), sides and stern shall be thoroughly examined. The survey shall include, in addition to the annual survey items:

- a) close-up examination for cleats, support and locking devices as follows:
 - cylinder securing pins, supporting brackets, back-up brackets (where fitted) and their welded connections
 - hinge pins, supporting brackets, back-up brackets (where fitted) and their welded connections
 - locking hooks, securing pins, supporting brackets, back-up brackets (where fitted) and their welded connections

- locking pins, supporting brackets, back-up brackets (where fitted) and their welded connections
 - locating and stopper devices and their welded connections.
- b) non-destructive testing and thickness measurements on securing, supporting and locking devices, including welding, to the extent considered necessary by the surveyor
- c) clearances of hinges, bearings and thrust bearings shall be measured. The measurement of clearances for doors on Ro-Ro cargo ships may, where dismantling is needed in order to measure the clearances, normally be limited to representative bearings. If dismantling is carried out, a visual examination of hinge pins and bearings together with non-destructive testing of the hinge pin shall be carried out
- d) all doors shall be tested for effectiveness of sealing arrangement by hose testing or equivalent
- e) the non-return valves of the drainage system shall be dismantled and examined.

109 Thickness measurements of air pipes and ventilators shall be carried out in accordance with Table D1.1, Table D2.2, Table D3.2, Table D4.2, Table D5.2, Table D6.2 or Table D7.2 as relevant.

The measurement report shall be verified and evaluated by the surveyor onboard. Thickness diminution of 25% compared to the thickness required is acceptable.

110 Automatic air pipe heads on exposed decks shall be externally and internally examined.

For all ships except for passenger ships the following apply:

At 1st renewal survey, the examination shall comprise air pipe heads preferably serving ballast tanks as follows:

- one port and one starboard, on the exposed decks within 0.25 L from the forward end
- one port and one starboard, serving spaces aft of 0.25 L from the forward end.

At 2nd renewal survey, the examination shall comprise air pipe heads as follows:

- all within 0.25 L from the forward end
- at least 20% of those serving spaces aft of 0.25 L from the forward end, preferably serving ballast tanks.

From 3rd renewal survey, the examination shall comprise all air pipe heads. Exemption may be considered for air pipe heads where there is substantiated evidence of replacement within the previous five years.

The air pipe heads to be examined according to the above specification, shall be selected by the surveyor when relevant.

The head shall be removed from the air pipe for designs where the inner parts cannot be properly inspected from outside.

Particular attention shall be paid to the condition of the zinc coating in heads constructed from galvanised steel.

According to the results of the examination, the surveyor may require examination of other air pipe heads.

For passenger ships air pipe heads shall be examined as deemed necessary by the surveyor.

(IACS UR Z22)

111 All spaces shall be examined.

An internal overall examination of all spaces, except fuel oil, lube oil and fresh water tanks, shall include all structures, piping systems outside machinery area and sea connections in machinery area, i.e. plating and framing, bilges and drain wells, sounding, venting, pumping and drainage arrangements.

Independent cargo tanks shall be internally examined including mountings and equipment. As far as practicable the outer surface of non-insulated cargo tanks or the outer surface of cargo tank insulation shall be examined including the tank supports with foundations, chocks and keys. Special attention shall be given to the tank and insulation in way of chocks, supports and keys. Partial removal of insulation may be required in order to verify the condition of the tank or the insulation itself if found necessary by the surveyor.

Thickness measurements of the tanks may be required if deemed necessary by the surveyor.

The tightness of the tanks shall be verified with a head of liquid to the overflow or by an appropriate procedure.

Cement and dry mud pressure tanks shall be tested to 1.2 times the working pressure if found necessary by the surveyor.

Additional requirements applicable for ships arranged for carriage of low flash point liquids are given in 132, for chemical tankers and liquefied gas tankers in B400 and B500. For well stimulation installations and vapour control systems, additional requirements are given in Sec.6.

Where provided, the condition of the corrosion prevention system of cargo holds and tanks shall be examined.

In refrigerated cargo spaces the condition of the coating behind the insulation shall be examined at representative locations. The examination may be limited to verification that the protective coating remains effective and that there are no visible structural defects. Where POOR coating condition is found, the examination shall be extended as deemed necessary by the surveyor. If indents, scratches, etc., are detected

during surveys of shell plating from the outside, insulations in way shall be removed as required by the surveyor, for further examination of the plating and adjacent frames.

112 Examination of fuel oil, lube oil and fresh water tanks shall be in accordance with Table B1.

Independent tanks in machinery spaces shall be externally examined including the tank supporting structures.

113 Tanks used as bilge water holding tanks shall be overall examined.

114 For sewage (black water) tanks and wastewater (gray water) tanks the survey shall include:

— For integral tanks internal examination.

For ships not exceeding 10 years of age the internal examination of tanks used in association with sewage treatment may be specially considered based on a satisfactory external examination and provided that an internal inspection has been carried out in accordance with onboard maintenance system during the last 12 months and relevant records are provided and confirmed.

— For independent tanks external examination including the tank supporting structures.

Thickness measurements shall be carried out as deemed necessary.

Table B1 Minimum requirements for internal examination of fuel oil, lube oil and fresh water tanks ^{1) 2) 3)}				
<i>Tank</i>	<i>Age of ship, years</i>			
	<i>0 to 5</i>	<i>5 to 10</i>	<i>10 to 15</i>	<i>above 15</i>
Fuel oil/ diesel oil				
— engine room	None	None	One	One
— cargo area	None	One	Two	Half, minimum two ⁴⁾
Lube oil	None	None	None	One
Fresh water ⁵⁾	None	One	All	All
<p>1) Tanks of integral (structural) type.</p> <p>2) If a selection of tanks are accepted to be examined, then different tanks shall, as far as practicable, be examined at each renewal survey, on a rotational basis.</p> <p>3) Peak tanks (all uses) are subject to internal examination at each renewal survey.</p> <p>4) One deep tank shall be included, if fitted.</p> <p>5) Tanks for clean fresh water, i.e. potable water, boiler water and other holding tanks for clean fresh water. Tanks for mainly contaminated fresh water as waste water (gray water) and sewage (black water) shall be subject to internal examination as given in 114.</p> <p>(IACS UR Z7)</p>				

115 The watertight integrity of internal bulkheads and decks shall be verified.

Special arrangements related to stability such as watertight closing appliances for openings in internal bulkheads and decks, cross-flooding, counter-flooding etc., shall be examined and tested if necessary.

Bulkhead shaft seals shall be verified. Dismantling shall be carried out where necessary to examine condition of the bulkhead seal.

Guidance note:

Documented maintenance may be considered as a base for extent of dismantling.

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116 Testing of structures forming boundaries of double bottom, deep, peak and other tanks, including holds adapted for the carriage of water ballast, shall be in accordance with Table B2. The surveyor may require further testing.

Testing of double bottoms and other spaces not designed for the carriage of liquid may be omitted, provided a satisfactory internal examination together with an examination of the tanktop is carried out.

Independent tanks in machinery spaces shall be tested as deemed necessary.

Table B2 Minimum requirements for testing of tanks		
<i>Tanks ¹⁾ to be tested</i>	<i>Test head or pressure</i>	<i>Remark</i>
Ballast tanks	Top of air pipe	
Cargo holds adapted for carriage of ballast	Near the top of cargo hold hatch coaming	³⁾
Bilge water holding tanks	Top of air pipe	
Fuel oil tanks	Head of liquid to the highest point that liquid will rise under service conditions	^{2), 3)}

Table B2 Minimum requirements for testing of tanks (Continued)		
Lub. Oil tanks	Head of liquid to the highest point that liquid will rise under service conditions	2)
Fresh water tanks	Head of liquid to the highest point that liquid will rise under service conditions	2), 3)
Sewage (black and grey water) tanks	Top of air pipe	As deemed necessary by the surveyor
Tanks containing other liquids	Head of liquid to the highest point that liquid will rise under service conditions	As deemed necessary by the surveyor
Notes: 1) Gravity tanks of integral type 2) Tanks within machinery spaces may be specially considered based on external examination of the tank boundaries and a confirmation from the Master stating that no leakages or other defects have been observed during operation of the vessel. 3) Tanks within the cargo area may be specially considered based on a satisfactory external examination of the tank boundaries and a confirmation from the Master stating that the pressure testing has been carried out according to the requirements with satisfactory results.		

117 For ballast tanks the survey shall include examination of the condition of corrosion prevention system, where provided.

A ballast tank, except bilge water holding tanks, shall be recorded for examination at subsequent annual surveys where:

- a hard protective coating was not applied from the time of construction, or
- a soft or semi-hard coating has been applied, or
- the hard protective coating is found in POOR condition and it is not renewed.

For double bottom ballast tanks, except for oil and chemical tankers with the notation **ESP**, such recording may be specially considered.

Guidance note:

Initial hard protective coating applied later than at the time of construction may be accepted as equivalent to such coating being applied at the time of construction provided a surveyor has confirmed that the structure was in satisfactory condition when the coating was applied.

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118 The survey extent of void spaces converted from ballast tanks shall be specially considered in relation to the requirements for ballast tanks.

The intervals and type and extent of examination of void spaces converted from ballast tanks will be decided by the Society with due consideration of the condition of the corrosion prevention system.

Guidance note:

For tanks/spaces where the hard protective coating is found in GOOD or FAIR condition and without substantial corrosion, examination may be accepted carried out at subsequent renewal surveys only.

For tanks/spaces where the hard protective coating is found in POOR condition or for tanks/spaces without corrosion prevention system as defined in Sec.1 A, examination at subsequent annual surveys in accordance with 117 should be recorded and maintained for a period of at least until the subsequent intermediate or renewal survey, whichever comes first. If the structural condition at this stage, based on a thorough examination including close-up and thickness measurements as deemed necessary, is found without structural deficiencies or substantial corrosion, examination may be accepted carried out at subsequent renewal surveys only.

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119 Areas where substantial corrosion is found at the survey being carried out, shall have thickness measurements extended.

The following tables shall be used:

- Sec.4 Table D1.2 in general as guidance,
- Sec.4 Table D3.3 for single skin bulk carriers,
- Sec.4 Table D4.3 for double skin bulk carriers,
- Sec.4 Table D5.3 for single hull oil tankers and single hull chemical tankers,
- Sec.4 Table D6.3 for double hull oil tankers and double hull chemical tankers.

120 The machinery area shall be examined with particular attention to tank tops, shell plating in way of tank tops, brackets connecting side shell frames and tank tops, and engine room bulkheads in way of tank top and bilge wells.

Where wastage is evident or suspect, thickness measurements shall be carried out.

121 All piping on deck and in spaces outside the machinery area shall be examined.

The examination may require opening up.

Pressure testing and thickness measurements of any piping may be required.

Last overhaul shall be verified for all piping systems.

For piping in spaces outside the machinery area special attention shall be given to:

- cargo piping passing through ballast tanks
- bilge and ballast piping passing through cargo and fuel oil tanks
- air and sounding piping to ballast tanks passing through cargo and ballast tanks
- fuel pipes passing through ballast tanks.

Performance testing shall be carried out for the following systems:

- bilge and ballast
- cargo handling, including crude oil washing (COW)
- steam with temperature below 450°C
- compressed air
- hydraulic, including steering power actuating
- fuel oil.

122 For chemical tankers over 10 years of age selected steel cargo pipes outside cargo tanks and ballast pipes passing through cargo tanks shall be:

- Thickness measured at random or selected pipe lengths to be opened for internal inspection.
For stainless steel cargo pipes, thickness measurements may be waived, however, selected pipe lengths shall be opened for internal examination.
- Pressure tested to the maximum working pressure.

Special attention shall be given to cargo/slop discharge piping through ballast tanks and void spaces.

123 For sea connections in the machinery area special attention shall be given to sea suction, sea water cooling pipes and overboard discharge valves and their connections to shell plating.

124 Shipboard fittings used for mooring and normal towing of the ship and their supporting structures shall be examined.

Guidance note:

Shipboard fittings mean bollards and bitts, fairleads, stand rollers, chocks used for the mooring of the ship and the similar components used for the normal towing of the ship, as well as equipment employed in the mooring of ships at single point moorings such as bow fairlead, bow chain stopper and possible pedestal rollers.

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Towing and mooring arrangements plan shall be verified available on board.

Guidance note:

Applicable to ships of 500 GT and above, contracted for construction from 1 January 2007.

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125 For ships with emergency towing arrangements the pick-up gear, towing pennant and chafing gear shall be examined over the full length for deterioration.

Where pennant line is stored in a watertight condition confirmed maintained, consideration may be given to waiving the requirement to examine the pennant line over the full length.

Strongpoint, fairlead and pedestal roller shall be examined including attachment to the ship.

Guidance note:

Emergency towing arrangements are required on oil tankers, chemical tankers and gas carriers of 20 000 tonnes deadweight and above in accordance with IMO resolution MSC.35(63).

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126 Crane pedestals and derrick masts shall be examined including connection to deck and supporting structures.

Where wastage is evident or suspect, thickness measurements shall be carried out.

127 For ships equipped for the carriage of containers (including ships with class notation **Container Carrier** or **CONTAINER**), the following shall be examined:

- a) Container supporting structures with respect to cracks and deformations:
 - cell guides including supports:
 - container stanchions and racks on deck and in holds
 - support fittings welded to inner bottom, container steps, stanchions etc.
- b) Hatch covers:
 - supports and stoppers with respect to condition and operability:
 - guide rails and supporting frames including connection to hull with respect to cracks and deformations.
- c) Removable (loose) container securing equipment:
 - random examination for damage
 - comparison with certificates kept in ship's files.

128 For ships with movable car decks (including ships with class notation **Car Carrier** or **MCDK**), the survey shall include:

- examination of pontoon conditions
- examination of supporting fittings and suspension / pillars
- examination of lifting arrangement (wires, sheaves etc. if applicable)
- examination of stowing arrangements in cargo hold
- examination of pontoon racks on deck including lashing arrangements
- examination of drainage arrangements in pontoon stowage areas
- testing of movable car deck hoisting arrangement.

129 For examination of structures in passenger ships generally arranged with superstructure extending over most of the ship length, having structures with discontinuities and sides penetrated by many large openings, consisting of several decks and longitudinal bulkheads, special attention to be given to the integrity of main structural members in highly stressed areas including welded connections. Partial removal of ceiling/insulation may be required in order to verify the structural condition.

Guidance note:

The following structural areas are, amongst others, considered to have highly stressed members:

- window openings in shipside in way of high hull girder shear forces
- shipside panels connecting the superstructure with the sideshell at the ends of the superstructure
- longitudinal bulkheads with large openings
- large doors in shipsides
- steps/ knuckles in upper decks
- transverse bulkheads with large openings, generally around quarter lengths of the ship.

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130 For ships arranged for carriage of potable water (including ships with class notation **Tanker for Potable Water**), the coating in cargo tanks shall be examined.

131 For ships with arrangement for pushing or being pushed (including ships with class notation **Pusher** or **Pusher/Barge Unit**), the following shall be examined:

- connecting points and contact areas with supporting structure
- connecting equipment including locking device if any.

132 For ships arranged for carriage of low flash point liquids (including ships with class notation **LFL** or **LFL***), the survey shall include:

- pressure testing (hydrostatic, hydro-pneumatic or otherwise) of all cargo tanks to their MARVS (Maximum Allowable Relief Valve Setting)

133 For ships with gas fuelled engine installation (class notation **GAS FUELLED**), survey of gas fuel storage tanks shall include:

- tanks without access, vacuum isolated: verification that vacuum is maintained with review of voyage records and external examination for cold spots as found necessary
- tanks with access shall be surveyed as given for relevant tank types according to B500
- external examination including the tanks supports with foundations.

134 For ships subject to EHSR or with class notation **ESP** overall and close-up examination including thickness measurements, as required for the lower portions of the cargo tanks/holds and ballast tanks, shall be carried out not later than concurrently with the bottom survey required as part of the renewal survey.

For liquefied gas tankers requirements given above apply to ballast tanks.

Note: Lower portions of the cargo and ballast tanks and cargo holds are considered to be the parts below light ballast water line.

B 200 General dry cargo ships subject to Extended Hull Survey Requirements (EHSR) – additional requirements

201 Close-up examination shall be carried out in accordance with Table D2.1

202 Thickness measurement shall be carried out in accordance with Table D2.2.

Representative thickness measurement to determine both general and local levels of corrosion in the shell frames and their end attachments in all cargo holds and water ballast tanks shall be carried out. Thickness measurement shall also be carried out to determine the corrosion levels on the transverse bulkhead plating. The thickness measurements may be dispensed with provided the surveyor is satisfied by the close-up examination, that there is no structural diminution, and the hard protective coating where applied remains efficient.

203 A bottom survey in dry dock shall be carried out in accordance with Sec.5 A, as part of the renewal survey.

B 300 Dry bulk cargo ships subject to Enhanced Survey Programme (class notation ESP) – additional requirements

301 For bulk carriers with hybrid cargo hold arrangements, the following shall be applied:

- full breadth cargo holds and associated topside tanks and hopper side tanks are subject to the single skin bulk carrier requirements
- cargo holds of double skin and associated side tanks are subject to the double skin bulk carrier requirements.

302 Close-up examination shall be carried out in accordance with:

Sec.4 Table D3.1 for single skin bulk carriers,

Sec.4 Table D4.1 for double skin bulk carriers,

Sec.4 Table D4.1.1 for ore carriers.

303 Thickness measurements shall be carried out in accordance with:

Sec.4 Table D3.2 for single skin bulk carriers.

Representative thickness measurement to determine both general and local levels of corrosion in the shell frames and their end attachments in all cargo holds and in the transverse web frames in all water ballast tanks shall be carried out. Thickness measurement shall also be carried out to determine the corrosion levels on the transverse bulkhead plating. The extent of thickness measurements may be specially considered provided the surveyor is satisfied by the close-up survey, that there is no structural diminution, and the hard protective coating where applied remains efficient.

Sec.4 Table D4.2 for double skin bulk carriers.

Representative thickness measurement to determine both general and local levels of corrosion in the transverse web frames in all water ballast tanks shall be carried out.

Thickness measurement shall also be carried out to determine the corrosion levels on the transverse bulkhead plating. The extent of thickness measurements may be specially considered provided the surveyor is satisfied by the close-up survey, that there is no structural diminution, and the hard protective coating where applied remains efficient.

304 A bottom survey in dry dock shall be carried out in accordance with Sec.5 A, as part of the renewal survey.

305 For single skin bulk carriers subject to compliance with the requirements given in Ch.2 Sec.1 A, additional thickness measurements shall be carried out of the vertically corrugated transverse watertight bulkhead between cargo holds Nos. 1 and 2, as applicable.

For ships built 1996-1998 the thickness measurements at the 2nd renewal survey may be required as part of the initial evaluation for compliance in order to determine the general condition of the structure and to establish the extent of possible steel renewal and or reinforcements of the bulkhead, in accordance with the requirements in Ch.2 Sec.1 A.

The thickness measurements shall be carried out at the levels described below. To adequately assess the scantlings of each individual vertical corrugation, each corrugation flange, web, shedder plate and gusset plate within each of the levels given below shall be thickness measured:

- the mid-breadth of each corrugation flange and web at approximately 200 mm above the top of shedder plates and top of hopper plates
- the middle of each gusset plate, if fitted
- the middle of each shedder plate

- the mid-breadth of each corrugation flange and web at approximately 200 mm below upper stool, if fitted
- the mid-breadth of the corrugation flange and web at about the mid-height of the corrugation
- the mid-breadth of the corrugation flanges and webs below the upper stool, (see Fig.2) if applicable, as deemed necessary by the surveyor.

Where the thickness changes, within the horizontal levels, the thinner plate shall be thickness measured.

(IACS UR S19)

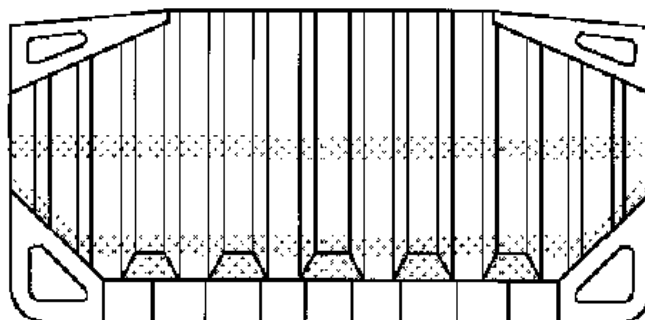


Fig. 1
Hold profile, ships without lower stool

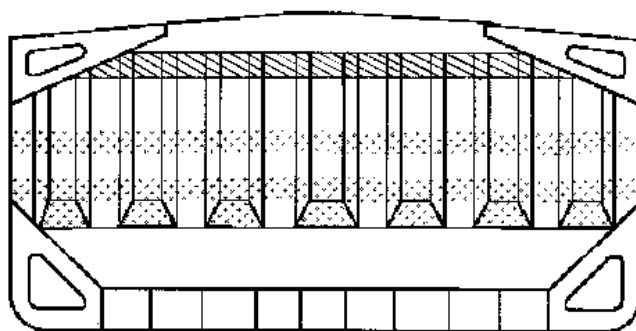


Fig. 2
Hold profile, ships with lower stool

306 For single skin bulk carriers required to comply with the requirements given in Ch.2 Sec.1 F, the survey of the side frames shall include:

- checking that representative thickness measurements in all holds and within each region of the frame, as specified, is documented
- examination to confirm that renewals or sandblasting, coating and reinforcements are carried out as required. Any coating shall be carried out in accordance with the requirements in Pt.5 Ch.2 Sec.5 C500 as far as applicable

Guidance note:

The extent of renewals and sandblasting, coating and reinforcements will be recorded in a Memo to Owner (MO) for future reference.

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- verification that side frames previously sandblasted, coated and reinforced based on the requirements in Pt.5 Ch.2 Sec.5, have been maintained in 'as new' condition

Guidance note:

'As new' condition in this respect, means that the coating should be without any breakdown and rusting.

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(IACS UR S31)

B 400 Oil and chemical tankers subject to Enhanced Survey Programme (class notation ESP) – additional requirements

401 For single hull oil tankers with double bottom or double side spaces (for water ballast, or void spaces), the survey requirements for double hull oil tankers shall be applied in way of the double bottom or the double sides.

402 Close-up examination shall be carried out in accordance with:

Sec.4 Table D5.1 for single hull oil tankers and single hull chemical tankers,

Sec.4 Table D6.1 for double hull oil tankers and double hull chemical tankers.

The survey of stainless steel tanks may be carried out as an overall examination supplemented by close-up examination as deemed necessary by the surveyor.

403 Thickness measurements shall be carried out in accordance with:

Sec.4 Table D5.2 for single hull oil tankers and single hull chemical tankers,

Sec.4 Table D6.2 for double hull oil tankers and double hull chemical tankers.

Thickness measurement of stainless steel hull structure and piping may be waived, except for clad steel plating.

404 A bottom survey in dry dock shall be carried out in accordance with Sec.5 A, as part of the renewal survey.

405 Cargo tank boundaries facing ballast tanks, void spaces, pipe tunnels, pump rooms or cofferdams shall be pressure tested.

All cargo tank bulkheads shall be pressure tested at the 2nd and subsequent renewal surveys.

The pressure shall, in general, correspond to a head of liquid to the highest point that liquid will rise under service conditions.

Pressure testing of cargo tanks may be accepted based on confirmation from the Master, stating that the pressure testing has been carried out according to the requirements, with a satisfactory result.

The testing of boundaries facing double bottom tanks and other spaces not designed for the carriage of liquid may be omitted, provided a satisfactory internal examination together with an examination of the tanktop is carried out.

The surveyor may extend the tank testing as deemed necessary.

406 A ballast tank shall be recorded for examination at subsequent annual surveys where, in addition to the conditions given in 104 and 118:

— the hard protective coating is found to be less than GOOD condition and is not repaired to the satisfaction of the surveyor.

407 For independent cargo tanks in chemical tankers the survey shall include:

— thickness measurement as found necessary by the surveyor

— hydraulically pressure testing of all tanks to their MARVS (Maximum Allowable Relief Valve Setting).
The testing of cargo tanks **type a3** may be omitted if the tanks are found without corrosion and other damage and otherwise found acceptable by the surveyor.

B 500 Liquefied gas tankers – additional requirements

501 Close-up examination shall be carried out in accordance with Table D7.1.

502 Thickness measurement shall be carried out in accordance with Table D7.2.

503 A bottom survey in dry dock shall be carried out in accordance with Sec.5 A, as part of the renewal survey.

504 All cargo tanks are to be examined internally. Special attention shall be given to the cargo tank and insulation in way of chocks, supports and keys. Removal of insulation may be required in order to verify the condition of the tank or the insulation itself if found necessary by the Surveyor.

Where the insulation arrangement is such that it cannot be examined, the surrounding structures of wing tanks, double bottom tanks and cofferdams shall be examined for cold spots when the cargo tanks are in the cold condition (prior to the renewal survey) unless voyage records together with the instrumentation give sufficient evidence of the integrity of the insulation system.

505 Thickness measurements of the cargo tanks may be required if deemed necessary by the surveyor.

506 Non-destructive testing shall supplement cargo tank inspection, with special attention to be given to the integrity of the main structural members, tank shell and highly stressed parts, including welded connections as deemed necessary by the Surveyor. However, this does not mean that non-destructive testing can be dispensed

with totally. The following items are, inter alia, considered as highly stressed parts:

- cargo tank supports and anti-rolling or anti-pitching devices
- web frames or stiffening rings
- swash bulkhead boundaries
- dome and sump connections to tank shell
- foundations for pumps, towers, ladders etc.
- pipe connections.

507 For independent tanks type B, the extent of non-destructive testing shall be as given in a programme specially prepared for the cargo tank design.

508 The tightness of all cargo tanks shall be verified by an appropriate procedure. Provided that the effectiveness of the ship's gas detection equipment has been confirmed, it will be acceptable to utilise this equipment for the tightness test of independent tanks below deck during the first loading of the cargo tanks subsequent to the renewal survey.

509 Where findings of 501 to 508 or an examination of the voyage records raise doubts as to the structural integrity of a cargo tank, a hydraulic or hydro-pneumatic test shall be carried out. For integral tanks and for independent tanks type A and B, the test pressure at top of the tank is not to be less than the MARVS (Maximum Allowable Relief Valve Setting). For cargo tanks type B with MARVS higher than 1.0 bar, a test pressure higher than MARVS will be specially considered. For independent tanks type C the test pressure is not to be less than 1.25 times the MARVS.

510 For membrane containment systems a tightness test of the secondary barrier shall be carried out in accordance with the system designers' procedures as approved by the Society

511 For membrane containment systems with glued secondary barriers the values obtained shall be compared with previous results or results obtained at newbuilding stage. If significant differences are observed for each tank or between tanks, the surveyor shall require an evaluation and additional testing as necessary.

512 At every other special survey all independent cargo tanks type C shall be either:

- hydraulically or hydropneumatically tested to 1.25 times MARVS followed by non-destructive testing in accordance with 506, or
- subjected to a thorough, planned non-destructive testing.

This testing shall be carried out in accordance with a programme specially prepared for the tank design. If a special programme does not exist, the following areas shall be given special attention:

- cargo tank supports and anti-rolling/anti-pitching devices,
- stiffening rings,
- Y-connections between tank shell and a longitudinal bulkhead of bilobe tanks,
- swash bulkhead boundaries
- dome and sump connections to the tank shell,
- foundations for pumps, towers, ladders etc.,
- pipe connections.

At least 10% of the length of the welded connections in each of above mentioned areas shall be tested. This testing shall be carried out internally and externally as applicable.

Insulation shall be removed as necessary for the required non-destructive testing.

513 Secondary barriers shall be examined visually for their effectiveness. For containment systems where access is not possible, the effectiveness of the secondary barrier may be checked by means of pressure/vacuum tests or other relevant methods.

514 For membrane and semi-membrane tank systems inspection and testing shall be carried out in accordance with programmes specially prepared in accordance with an approved method for the actual tank system.

515 If installed, systems for heating of hull structures shall be surveyed and function tested.

516 All pressure relief valves for the cargo tanks shall be opened for examination, adjusted, function tested and sealed. The allowable tolerance on the set pressure is given in Table B2.

Table B2 Cargo tanks - tolerance on set pressure	
Set pressure <i>p</i> (bar)	Tolerance (%)
$0.0 \leq p \leq 1.5$	± 10.0
$1.5 < p < 3.0$	± 6.0
$3.0 \leq p$	± 3.0

If the cargo tanks are equipped with relief valves with non-metallic membranes in the main or pilot valves, such non-metallic membranes shall be replaced with new ones.

517 Pressure/vacuum relief valves, pressure relief hatches and rupture discs on interbarrier spaces and hold spaces shall be examined, if necessary by opening, adjusted and tested depending on their design.

518 The cargo, liquid nitrogen and process piping systems, including valves, actuators, compensators etc. shall be opened for examination as deemed necessary. Insulation shall be removed as deemed necessary to ascertain the condition of the pipes. If the visual examination raises doubt as to the integrity of the pipelines, a pressure test at 1.25 times the MARVS for the pipeline shall be carried out. After reassembly the complete piping system shall be tightness-tested to MARVS.

If the maximum delivery pressure for the piping system is less than the design pressure for the piping system, testing to the pumps' delivery pressure may be accepted. In such cases expansion bellows, selected at random, may be required dismantled for internal survey and pressure tested to their design pressure.

519 The pressure relief valves in the cargo and process piping systems shall be opened, function tested and adjusted to the extent found necessary by the surveyor.

520 The watersides of seawater-cooled heat exchangers, including those for gas operation of propulsion machinery shall be opened for survey, and the heat exchangers shall be pressure tested as found necessary.

521 Cargo pumps, compressors and other machinery, including prime movers, used in connection with cargo handling and gas operation of propulsion machinery shall be surveyed.

522 The following portable equipment shall be surveyed:

- portable gas detectors, oxygen and humidity analysers
- hoses and spool pieces used for segregation of piping systems for cargo, ventilation, inert gas and bilge operation.

523 Water spray systems shall be surveyed and tested for correct functioning.

524 Systems for removal of water or cargo from interbarrier spaces and hold spaces shall be examined and tested as deemed necessary.

525 All gas-tight bulkheads shall be inspected. The effectiveness of gas-tight shaft sealings shall be verified.

C. Machinery and Systems

C 100 General - all ships

101 The survey shall cover:

- a) propulsion system, see 102:
- b) steering and manoeuvring systems, see 103 and 106
- c) auxiliary systems, see 104
- d) boilers and thermal oil heaters, see 105
- e) auxiliary thrusters, see 106
- f) electrical power production systems including power management systems, see 107
- g) electrical installations, see 108
- h) electrical equipment in gas-dangerous spaces and zones, see 109
- i) control and monitoring system of main and auxiliary machinery including equipment for periodically unattended machinery space and machinery centralised operated, see 110
- j) equipment and systems related to carriage of special cargoes:
 - inert gas plants, see 111
 - low flashpoint liquids, see 112
 - potable water, see 113
- k) independent tanks within machinery area, fuel and lubrication oil tanks (non-integral, self-supporting tanks which do not form part of the ship's hull), see 114
- l) gas fuelled engine installations, see 115
- m) fuel cell installations, see 116
- n) gas turbine installations, see 117
- o) water ingress detection system and their alarms, for ships with single cargo hold and for bulk carriers, see

118.

102 The propulsion system shall be tested for proper functioning of the following:

- alarm and safety system
- manual control of machinery
- remote control of propulsion machinery
- automatic control loops
- transfer to stand-by manual control in the engine room in case of power supply failure to the remote control system.

When cancelling of automatic load reduction and or automatic stop of engine are provided, these functions shall be demonstrated to the satisfaction of the surveyor.

The components in the propulsion system shall be examined and tested according to Table E1. Components are also covered by separate surveys:

- Bottom survey - see Sec.5 A
- Propeller shaft survey - see Sec.5 B
- Propulsion connection survey - see Sec.5 C.
- Thrusters for Main Propulsion and Dynpos survey, see Sec.5 D/E
- Boiler survey, including steam generator, see Sec.5 F
- Thermal oil heater, see Sec.5 G.

Water jets are covered by separate survey for High Speed, Light Craft and Naval Surface Craft (HS, LC and NSC).

103 The main and auxiliary steering gear arrangement shall be tested for proper functioning including test of alarm and safety functions.

104 The auxiliary systems shall be tested for proper functioning including test of alarm and safety functions. The components in the auxiliary systems shall be examined and tested according to Table E1.

105 The following surveys shall be carried out in conjunction with the renewal survey:

- Boiler survey (boilers, superheaters, economisers and air preheaters or steam heated steam generator), see Sec.5 F.
- Thermal oil heater survey, see Sec.5 G.

106 Auxiliary thrusters shall be examined and tested as follows:

- Oil analysis of gear house oil and oil for the CP mechanism.
- Examination of gear and bearings through inspection openings or by other means.
- Examination of external piping systems.
- Examination of bearings, gear and shafts and other relevant parts if any indications of abnormalities are observed. Satisfactory maintenance according to manufacturer's recommendations to be documented and considered as a base for extent of possible opening.

Opening to be carried out normally at least every 10 years.

Any opening up of a thruster shall be witnessed by a surveyor of the Society.

- Function testing of sealing arrangements.
- Function testing of lubrication and hydraulic oil system.
- Function testing of CP mechanism.
- Function testing of thruster unit including alarm system.

Guidance note:

It is advised to take oil analysis at regular intervals and always prior to docking in order to ensure that there is no need for opening of the thruster (e.g. water in the oil).

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107 Electrical power production system including power management system and electrical installations shall be tested for proper functioning.

The following tests shall be carried out to the extent deemed necessary by the surveyor:

- generator full load test
- generator parallel operation
- generator protection relays including non-important load trip (if fitted)
- generator remote speed control
- generator synchronising equipment
- power plant interlocking systems

- emergency generator including switchboards
- battery chargers.

108 Safety precautions with respect to shock, fire and explosion and other hazards of the electrical installation shall be examined for switchboards, distribution boards, cable installations, enclosures, converters (e.g. transformers, rectifiers, chargers), battery installations, lighting and heating equipment.

Documentation of “Schedule of batteries” shall be reviewed.

The following tests shall be carried out to the extent deemed necessary by the surveyor to ascertain the proper functioning of the equipment:

- mechanical ventilation of battery rooms or lockers
- navigation lights, with controllers including alarms.

The insulation resistance of the complete installation shall be measured. The results shall be presented to the surveyor.

109 Electrical equipment in gas-dangerous spaces and zones shall be examined with respect to:

- corrosion
- flameproof enclosure/ingress
- no unauthorised modification
- correct rating of lamps
- earthing (spot check)
- function testing of pressurised equipment and of associated alarms
- testing of insulation resistance of power circuits (Ex p, Ex e and Ex n). Where proper records of testing are maintained consideration may be given to accepting recent readings (maximum 12 months) by the ship's crew
- insulation monitors with alarms shall be function tested, if installed
- for rooms protected by air locks, interlocking with ventilation of electrical supply to non-explosion protected equipment and de-energising of such equipment in case of ventilation failure shall be examined and function tested as applicable.

Guidance note:

Megger testing in gas dangerous spaces may involve risk of explosion due to sparks. Therefore appropriate procedures for such work should be followed as relevant e.g., “gas free certificate”.

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Guidance note:

Reference is made to IACS Rec. No.35 - Inspection and maintenance of electrical equipment installed in hazardous areas.

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110 The survey for control and monitoring system of main and auxiliary machinery shall include verification of correct functioning of the following:

- each alarm system
- each safety system
- each fire detector in engine room
- automatic control loops.

For ships with notation **E0** or **ECO**, refer to Sec.6 Y.

111 For ships with inert gas plant (including ships with class notation **INERT**), the scrubber, deck water seal and non-return valves shall be opened up for examination.

Pressure testing may be required if found relevant and necessary by the surveyor.

External examination and performance test shall be carried out for the following components and arrangements:

- deck water seal
- non-return valves
- scrubber cooling water arrangement
- blowers including regulating valve and shut down devices
- pressure/vacuum breaker
- flue gas piping system
- separate inert gas generator
- running test, including check of instruments and automatic equipment.

Opening up and/or pressure testing may be required if found necessary by the surveyor.

Last overhaul to be verified.

It shall be verified that pipe blanking arrangements and portable O₂-analysers are on board and in order.

112 For ships arranged for carriage of low flash point liquids (including ships with class notation **LFL** or **LFL***), the survey shall include examination of heating coils, anodes, tank cleaning apparatus and other equipment in cargo tanks and cofferdams. Heating coils are normally to be pressure tested.

113 For ships arranged for carriage of potable water (including ships with class notation **Tanker for Potable Water**), the following shall be examined:

- instruments for pH and conductivity
- cargo tank vents.

114 Settling tank and daily service tanks for heavy fuel oil and diesel oil as well as lubrication oil circulation tanks assessed with respect to tank cleanliness.

If inspection and cleaning have been carried out by the crew during the last 12 months and relevant log extracts are provided and confirmed, this may be credited as surveyed at the surveyor's discretion.

Opening up of tanks may be required as found necessary by the surveyor.

115 For ships with gas fuelled engine installations, (including ships with class notation **GAS FUELLED**), the survey shall include:

- a) examination of gastight bulkheads with cable and shaft sealing etc. Special attention shall be paid to bulkheads in the electrical motor and or compressor room. Shaft sealing shall be checked for lubrication and possible overheating
- b) testing of gas tanks high level alarm
- c) examination and testing of:
 - gas tanks safety relief valves
 - tank room or secondary barrier space P/V valves and relief hatches, as relevant
 - gas handling machinery and equipment
 - auxiliary systems and equipment for gas installations
 - portable gas detectors and oxygen analyser

116 For ships with fuel cell installations, (class notation **FC- POWER** and **FC-SAFETY**), the survey shall include as relevant:

- a) examination of gastight bulkheads with cable and shaft sealing etc. Shaft sealing shall be checked for lubrication and possible overheating
- b) testing of FC fuel tanks high level alarm
- c) examination and testing of:
 - FC fuel tanks safety relief valves
 - tank room or secondary barrier space P/V valves and relief hatches, as relevant
 - FC fuel handling machinery and equipment
 - auxiliary systems and equipment for fuel cell installations
 - portable gas detectors and oxygen analyser.

117 For ships with gas turbine installations the survey shall include verification of records and major overhaul reports onboard. See Sec.1 C500 for general information on survey of gas turbines.

118 For ships with a single cargo^{*)} hold and for bulk carriers^{**)} an examination and test of the water ingress detection system and of their alarms shall be carried out.

Guidance note:

^{*)} For single hold cargo ships complying with the requirements of SOLAS II-I/23-3 and II-I/25, see Ch.2 Sec.2 D.

^{**)} For bulk carriers complying with the requirements of SOLAS XII/12 and XII/13, see Ch.2 Sec.1 E.

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C 200 Oil and chemical tankers – additional requirements

201 Heating coils, tank cleaning apparatus and other equipment in cargo tanks, cofferdams and pipe tunnels within the cargo area shall be examined. Heating coils are normally to be pressure tested. Attachments of sacrificial anodes in tanks shall be examined.

202 For ships having boilers burning crude oil or slop, examination and testing of control equipment

including monitoring systems and shut down functions related to the following systems shall be carried out:

- ventilation and gas-tightness, fuel supply line and boiler with boiler front lagging
- fuel pumps and heating arrangement
- drain pipe ducts and automatic closing drain traps
- inert and purging systems
- manual and automatic quick closing valves and shut-down systems
- boiler hood ventilation system
- boiler compartment ventilation
- boiler front extinguishing system
- pilot burner arrangement
- gastight bulkhead penetrations
- gas detection system
- fuel heater.

203 For chemical tankers the survey shall include:

- a) examination of systems for cargo heating and cooling
- b) checking of spare parts for the mechanical ventilation fans in the cargo area
- c) verification of the cargo system and equipment required in connection with the vessel's special features notations (e.g. **a1.2, b2.3, c3, f1.2, d2, k**)
- d) testing of the instrumentation of the cargo plants
- e) examination and testing as appropriate of:
 - valves for drop lines, gas return lines and automatic shut-down of loading
 - drip trays and spray shields
 - emergency discharge pumps.
- f) verification of marking of cargo tanks, pumps, pipelines, valves etc.
- g) verification of the arrangement for discharge of contaminated water
- h) the following shall be surveyed and tested:
 - stripping tests of two cargo tanks, time of stripping shall be recorded.

204 For ships with centralised cargo control arrangement (including ships with class notation **CCO**), the survey shall include:

- examination and testing of all remotely controlled operations related to cargo handling and ballasting
- checking of alarms and remote readings according to Pt.6 Ch.6 Sec.2 Table C1
- control of relevant requirements in Pt.4 Ch.9 Sec.4 in the case of computer based systems
- examination and testing of arrangement for emergency stop of cargo pumps from the cargo manifold area
- examination and testing of arrangement in cargo control room for emergency closing of valves in cargo lines
- testing of loading computer for the following functions as applicable:
 - damage stability and strength (by simulating loading conditions)
 - cargo compatibility with tank coating
 - certificate limitations.

205 For ships with vapour processing and recovery plant (including ships with class notation **VCS-3**) the survey shall include a VOC (volatile organic compounds) plant running test.

C 300 Liquefied gas tankers – additional requirements

301 The ventilation systems for spaces in the cargo area shall be examined and function tested.

Confirmation that spares are provided for cargo area mechanical ventilation fans (not required if double fans provided).

302 For rooms protected by air locks, interlocking with ventilation of electrical supply to non-explosion protected equipment and de-energising of such equipment in case of ventilation failure shall be examined and function tested as applicable.

303 The instrumentation of the different cargo installations shall be tested by changing the parameter as applicable and comparing with test instruments. Simulated testing may be accepted for sensors which are not accessible or for sensors located within cargo tanks or inerted hold spaces. The testing shall include testing of alarm and safety functions.

304 For ships having a gas fuel forwarding system, the safety and control equipment and alarm and shut down

functions related to the following systems shall be tested:

- gas heating arrangement
- fuel gas compressor and forwarding system
- ventilation arrangement
- protection and flame screens
- gas freeing and purging systems
- manual and automatic shut-down system
- gas detection system
- pilot flame burner or “fuel floor” arrangement, if applicable
- governor stability switching from gas fuel to oil, or vice versa.

D. Tables of Close-Up Examination and Thickness Measurements

D 100 General - All ships

101 Minimum thickness measurements, all ships are given in Table D1.1 and for passenger ships in Table D1.1.1.

102 Thickness measurements, extent and pattern in way of areas with substantial corrosion, all ships are given in Table D1.2

D 200 General dry cargo ships subject to Extended Hull Survey Requirements (EHSR)

201 Close-up examination, general dry cargo ships are given in Table D2.1

202 Minimum thickness measurements, general dry cargo ships are given in Table D2.2

D 300 Single skin bulk carriers subject to Enhanced Survey Programme (class notation ESP)

301 Close-up examination, single skin bulk carriers are given in Table D3.1

302 Minimum thickness measurement, single skin bulk carriers are given in Table D3.2

303 Thickness measurements, extent and pattern in way of areas with substantial corrosion, single skin bulk carriers are given in Table D3.3

D 400 Double skin bulk carriers subject to Enhanced Survey Programme (class notation ESP)

401 Close-up examination, double skin bulk carriers are given Table D4.1

402 Close-up examination, ore carriers are given Table D4.1.1.

403 Minimum thickness measurement, double skin bulk carriers and ore carriers are given in Table D4.2

404 Thickness measurement, extent and pattern in way of areas of substantial corrosion, double skin bulk carriers are given in Table D4.3

D 500 Single hull oil tankers and single hull chemical tankers subject to Enhanced Survey Programme (class notation ESP)

501 Close-up examination, single hull oil tankers, single hull chemical tankers and ore/oil ships are given in Table D5.1

502 Minimum thickness measurement, single hull oil tankers, single hull chemical tankers and ore/oil ships are given in Table D5.2

503 Thickness measurement, extent and pattern in way of areas of substantial corrosion, single hull oil tankers, single hull chemical tankers and ore/oil ships are given in Table D5.3

D 600 Double hull oil tankers subject to Enhanced Survey Programme (class notation ESP)

601 Close-up examination, double hull oil tankers and double hull chemical tankers are given in Table D6.1

602 Minimum thickness measurement, double hull oil tankers and double hull chemical tankers are given in Table D6.2

603 Thickness measurement, extent and pattern in way of areas of substantial corrosion, double hull oil tankers and double hull chemical tankers are given in Table D6.3

D 700 Liquefied gas tankers

701 Close-up examination, liquefied gas tankers are given Table D7.1.

702 Minimum thickness measurement, liquefied gas tankers are given in Table D7.2.

Table D1.1 Minimum thickness measurements ¹⁾, all ships					
	<i>Area</i>	<i>Renewal survey no. 1 Age ≤ 5 years</i>	<i>Renewal survey no. 2 Age 5 - 10 years</i>	<i>Renewal survey no. 3 Age 10 - 15 years</i>	<i>Renewal survey no. 4 and subsequent Age > 15 years</i>
0	<i>Transverse section(s) in way of cargo area within 0.5 L amidships ²⁾⁴⁾</i>		One section of deck plating only.	Two complete sections - two different spaces. ⁵⁾	Three complete sections. ⁵⁾
1a	<i>Main deck plating ³⁾</i>				All exposed - full length.
1b	<i>Cargo hold hatch covers and coamings</i>			All - plating and stiffeners.	All - plating and stiffeners.
2	<i>Wind- and water strakes</i>				All - full length.
3	<i>Strakes of transverse bulkheads in cargo spaces together with internals in way</i>				All bulkheads - lowest strake and strakes in way of 'tween decks.
4a	<i>Keel plates and bottom plates</i>				All keel plates full length. Additional bottom plates in way of cofferdams, machinery space and aft end of tanks.
4b	<i>Plating of sea chests and shell plating in way of overboard discharges</i>				Plating of sea chests. Shell plating as considered necessary by the attending surveyor.
5	<i>Superstructure deck plating (poop, bridge and forecastle deck)</i>				Representative exposed deck plating.
6	<i>Internals in peak tanks</i>			Forepeak and aftpeak.	Forepeak and aftpeak.
7	<i>Air pipes and ventilators</i>			All - on the fore deck (forward quarter length). All exposed air pipes to fuel and lube oil daily service tanks. Selected air pipes and ventilator coamings aft of the forward quarter.	All - on the fore deck (forward quarter length). All exposed air pipes to fuel and lube oil daily service tanks. Selected air pipes and ventilator coamings aft of the forward quarter.
Notes: 1) Thickness measurement locations should be selected to provide the best representative sampling of areas likely to be most exposed to corrosion, considering cargo and ballast history and arrangement and condition of protective coatings. 2) For ships less than 100 m in length, the number of transverse section required at renewal survey no. 3 and subsequent renewal surveys may be reduced by one (to 1 and 2 respectively). 3) For ships more than 100 m in length, at renewal survey no. 3, thickness measurements of exposed deck plating within 0.5 L may be required. 4) Transverse sections shall be chosen where the largest reductions are suspected to occur or are revealed from deck plating measurements. 5) At least one section shall include a ballast tank, as far as applicable.					
<i>Source.: IACS UR Z7 TABLE I</i>					

Table D1.1.1 Minimum thickness measurements ¹⁾, passenger ships with superstructure extending over most of the ship length

	Area	Renewal survey no. 1 Age ≤ 5 years	Renewal survey no. 2 Age 5 - 10 years	Renewal survey no. 3 Age 10 - 15 years	Renewal survey no. 4 and subsequent Age > 15 years
0	Transverse section(s) within 0.5 L amidships ²⁾³⁾		.	Two sections of hull plating (keel, bottom & bilge, side) up to the bulkhead deck.	Three sections of hull plating (keel, bottom & bilge, side) up to the bulkhead deck.
1a	Tank top plating ⁴⁾		Selected plating within machinery and boiler spaces.	Selected plating within machinery and boiler spaces.	Selected plating within machinery and boiler spaces.
1b	Car decks plating			Selected plating.	All plating.
2	Wind- and water strakes				All - full length.
3	Strakes of transverse bulkheads in machinery and cargo spaces as applicable together with internals in way				All bulkheads - lowest strake.
4a	Keel plates and bottom plates				All keel plates full length. Additional bottom plates in way of cofferdams, machinery space and aft end of tanks.
4b	Plating of sea chests and shell plating in way of overboard discharges				Plating of sea chests. Shell plating as considered necessary by the attending surveyor.
5	Superstructure deck plating			Representative exposed deck plating.	Representative exposed deck plating.
6	Internals in peak tanks			Forepeak and aft peak.	Forepeak and aft peak.

Notes:

- 1) Thickness measurement locations should be selected to provide the best representative sampling of areas likely to be most exposed to corrosion, considering ballast history and arrangement and condition of protective coatings.
- 2) For ships less than 100 m in length, the number of transverse section required at renewal survey no. 3 and subsequent renewal surveys may be reduced by one (to 1 and 2 respectively).
- 3) Transverse sections shall be chosen where the largest reductions are suspected to occur and shall normally include ballast tanks, as far as applicable.
- 4) Special attention shall be given to areas within spaces where water may accumulate, i.e. in way of boilers, water makers, spaces with sewage treatment plants, areas around penetrations for steam pipes and areas showing signs of water leakage.

Table D1.2 Thickness measurements, extent and pattern in way of areas with substantial corrosion, all ships

	Area / Structural member	Extent of measurement	Pattern of measurement
	Plating	Suspect area and adjacent plates	5 points over 1 m ²
	Stiffeners	Suspect area	3 points in line across web 3 points in line across flange

Source.: IACS UR Z7 TABLE II

Table D2.1 Close-up examination, general dry cargo ships					
	<i>Area</i>	<i>Renewal survey no. 1 Age ≤ 5 years</i>	<i>Renewal survey no. 2 Age 5 - 10 years</i>	<i>Renewal survey no. 3 Age 10 - 15 years</i>	<i>Renewal survey no. 4 and subsequent Age > 15 years</i>
<i>1a</i>	<i>Cargo hold hatch covers and coamings - plating and stiffeners.</i>	All	All	All	All
<i>1b</i>	<i>Deck plating and underdeck structures inside line of hatch openings between cargo hold hatches.</i>		Selected areas	All	All
<i>2</i>	<i>Cargo hold transverse shell frames.</i>	Selected frames in one forward and one aft cargo hold/ 'tween deck space.	Selected frames in all cargo holds/ 'tween deck spaces.	All frames in the forward lower cargo hold and 25% of frames in each of the remaining cargo holds/ 'tween deck spaces including upper and lower end attachments and adjacent shell plating.	All frames in all cargo holds/ 'tween deck spaces including upper and lower end attachments and adjacent shell plating.
<i>3a</i>	<i>Cargo hold transverse bulkheads ¹⁾ - plating, stiffeners and girders.</i>	One	One in each hold.	All	All
<i>3b</i>	<i>Ballast tanks transverse bulkheads, including stiffening system.</i>		Forward and aft bulkhead in one side tank.	All	All
<i>4a</i>	<i>Ballast tanks transverse web frames with associated plating and framing.</i>		One in two representative tanks of each type within the cargo area ²⁾ .	All - in all ballast tanks	All - in all ballast tanks
<i>4b</i>	<i>Inner bottom plating.</i>		Selected areas	All	All
Notes:					
1) Close-up examination of cargo hold transverse bulkheads to be carried out at the following levels:					
— Immediately above the inner bottom and immediately above the 'tween decks, as applicable.					
— About mid-height of the bulkheads for holds without 'tween deck.					
— Immediately below the main deck and immediately below the 'tween deck, as applicable.					
2) Ballast tank types within the cargo area: top side tank, double side tank, hopper side tank, double bottom tank.					
<i>Source.: IACS UR Z7 TABLE I</i>					

Table D2.2 Minimum thickness measurements¹⁾, general dry cargo ships					
	<i>Area</i>	<i>Renewal survey no. 1 Age ≤ 5 years</i>	<i>Renewal survey no. 2 Age 5 - 10 years</i>	<i>Renewal survey no. 3 Age 10 - 15 years</i>	<i>Renewal survey no. 4 and subsequent Age > 15 years</i>
0a	<i>Transverse section(s) in way of cargo area within 0.5L amidships ²⁾³⁾.</i>		One section of deck plating only.	Two complete sections - two different cargo spaces. ⁴⁾	Three complete sections. ⁴⁾
0b	<i>Structural members subject to close-up examination according to Table D2.1.</i>	Measurements, for general assessment and recording of corrosion pattern.	Measurements, for general assessment and recording of corrosion pattern.	Measurements, for general assessment and recording of corrosion pattern.	Measurements, for general assessment and recording of corrosion pattern.
1	<i>Main deck plating</i>			All - outside line of cargo hatch openings within the cargo area.	All - outside line of cargo hatch openings within the cargo area. All exposed - outside the cargo area.
2	<i>Wind- and water strakes.</i>			All - within the cargo area. Selected outside the cargo area.	All - full length.
3	<i>Transverse bulkheads</i>	See item 0b	See item 0b	See item 0b	See item 0b
4a	<i>Keel plates and bottom plates.</i>				All keel plates full length. All bottom plates, including lower turn of bilge, within the cargo area. Additional bottom plates in way of cofferdams, machinery space and aft end of tanks.
4b	<i>Sea chests and shell plating in way of overboard discharges.</i>				Plating of sea chests. Shell plating as considered necessary by the attending surveyor.
4c	<i>Duct keel or pipe tunnel.</i>				Plating and internals.
5	<i>Superstructure deck plating (poop, bridge and forecastle deck).</i>				Representative exposed deck plating.
6	<i>Internals in peak tanks.</i>			Forepeak and aftpeak.	Forepeak and aftpeak.
7	<i>Air pipes and ventilators</i>			All - on the fore deck (forward quarter length). All exposed air pipes to fuel and lube oil daily service tanks. Selected air pipes and ventilator coamings aft of the forward quarter.	All - on the fore deck (forward quarter length). All exposed air pipes to fuel and lube oil daily service tanks. Selected air pipes and ventilator coamings aft of the forward quarter.
Note: 1) Thickness measurement locations should be selected to provide the best representative sampling of areas likely to be most exposed to corrosion, considering cargo and ballast history and arrangement and condition of protective coatings. 2) For ships less than 100 m in length, the number of transverse section required at renewal survey no. 3 may be reduced to one (1), and the number of transverse sections at subsequent renewal surveys may be reduced to two (2). 3) Transverse sections shall be chosen where the largest reductions are suspected to occur or are revealed from deck plating measurements. 4) At least one section shall include a ballast tank, as far as applicable.					
<i>Source.: IACS UR Z7.1 TABLE II</i>					

Table D3.1 Close-up examination, single skin bulk carriers

	Area	Renewal survey no. 1 Age ≤ 5 years	Renewal survey no. 2 Age 5 - 10 years	Renewal survey no. 3 Age 10 - 15 years	Renewal survey no. 4 and subsequent Age > 15 years
1a	Cargo hold hatch covers and coamings - plating and stiffeners.	All	All	All	All
1b	Deck plating and underdeck structures inside line of hatch openings between cargo hold hatches.		All	All	All
2	Cargo hold transverse shell frames.	25% of frames in the forward cargo hold at representative positions. Selected frames in remaining cargo holds.	All frames in the forward cargo hold and 25% of frames in each of the remaining cargo holds, including upper and lower end attachments and adjacent shell plating. For bulk carriers 100 000 dwt and above, all shell frames in the forward cargo hold and 50% of shell frames in each of the remaining cargo holds, including upper and lower end attachments and adjacent shell plating.	All frames in the forward and one other selected cargo hold and 50% of frames in each of the remaining cargo holds, including upper and lower end attachments and adjacent shell plating.	All frames in all cargo holds, including upper and lower end attachments and adjacent shell plating.
3a	Cargo hold transverse bulkheads ¹⁾ - plating, stiffeners and girders, including internal structures of upper and lower stools, where fitted.	Two selected bulkheads.	All	All	All
3b	Ballast tanks transverse bulkheads, including stiffening system.		Forward and aft bulkhead in one side tank.	All	All
4a	Ballast tanks transverse web frames with associated plating and longitudinals.	One in two representative tanks of each type within the cargo area ²⁾ .	One in each tank within the cargo area ²⁾ .	All - in all ballast tanks	All - in all ballast tanks

Notes:

1) Close-up examination of cargo hold transverse bulkheads to be carried out at the following levels:

Level (a) Immediately above the inner bottom and immediately above the line of gussets (if fitted) and shedders for ships without lower stool.

Level (b) Immediately above and below the lower stool shelf plate (for those ships fitted with lower stools), and immediately above the line of the shedder plates.

Level (c) About mid-height of the bulkhead.

Level (d) Immediately below the upper deck plating and immediately adjacent to the upper wing tank, and immediately below the upper stool shelf plate for those ships fitted with upper stools, or immediately below the topside tanks.

2) Ballast tank types within the cargo area: top side tank, hopper side tank, double bottom tank.

Source.: IACS UR Z10.2 TABLE I

Table D3.2 Minimum thickness measurements¹⁾, single skin bulk carriers					
	<i>Area</i>	<i>Renewal survey no. 1 Age ≤ 5 years</i>	<i>Renewal survey no. 2 Age 5 - 10 years</i>	<i>Renewal survey no. 3 Age 10 - 15 years</i>	<i>Renewal survey no. 4 and subsequent Age > 15 years</i>
0a	<i>Transverse sections within the cargo area. ²⁾</i>		Two sections of deck plating only - outside line of cargo hatch openings - at least one within 0.5 L amidships. ³⁾	Two complete sections - outside line of cargo hatch openings - at least one within 0.5 L amidships. ³⁾	Three complete sections - outside line of cargo hatch openings - at least one within 0.5 L amidships. ³⁾
0b	<i>Structural members subject to close-up examination according to Table D3.1.</i>	Measurements, for general assessment and recording of corrosion pattern.	Measurements, for general assessment and recording of corrosion pattern.	Measurements, for general assessment and recording of corrosion pattern.	Measurements, for general assessment and recording of corrosion pattern.
1	<i>Main deck plating</i>			All - outside line of cargo hatch openings within the cargo area.	All - outside line of cargo hatch openings within the cargo area. All exposed - outside the cargo area.
2	<i>Wind- and water strakes.</i>		In way of the transverse sections considered in item 0a. Selected outside the cargo area.	All - within the cargo area. Selected outside the cargo area.	All - full length.
3	<i>Transverse bulkheads</i>	See item 0b	See item 0b	See item 0b	See item 0b
4a	<i>Keel plates and bottom plates.</i>				All keel plates full length. All bottom plates, including lower turn of bilge, within the cargo area. Additional bottom plates in way of cofferdams, machinery space and aft end of tanks.
4b	<i>Sea chests and shell plating in way of overboard discharges.</i>				Plating of sea chests. Shell plating as considered necessary by the attending surveyor.
5	<i>Superstructure deck plating (poop, bridge and forecastle deck).</i>				Representative exposed deck plating.
6	<i>Internals in peak tanks.</i>			Forepeak and aftpeak.	Forepeak and aftpeak.
7	<i>Air pipes and ventilators</i>			All - on the fore deck (forward quarter length). All exposed air pipes to fuel and lube oil daily service tanks. Selected air pipes and ventilator coamings aft of the forward quarter.	All - on the fore deck (forward quarter length). All exposed air pipes to fuel and lube oil daily service tanks. Selected air pipes and ventilator coamings aft of the forward quarter.

Table D3.2 Minimum thickness measurements¹⁾, single skin bulk carriers (Continued)					
	<i>Area</i>	<i>Renewal survey no. 1 Age ≤ 5 years</i>	<i>Renewal survey no. 2 Age 5 - 10 years</i>	<i>Renewal survey no. 3 Age 10 - 15 years</i>	<i>Renewal survey no. 4 and subsequent Age > 15 years</i>
8	<i>Vertically corrugated transverse watertight bulkhead between cargo hold Nos. 1 and 2 - Ships subject to compliance with the requirements given in Ch.2 Sec.1 A.</i>		Additional requirements as given in B305	Additional requirements as given in B305	Additional requirements as given in B305
9	<i>Side shell frames and brackets - Ships subject to compliance with the requirements given in Ch.2 Sec.1 F.</i>		Additional requirements as given in B306	Additional requirements as given in B306	Additional requirements as given in B306
Note: 1) Thickness measurement locations should be selected to provide the best representative sampling of areas likely to be most exposed to corrosion, considering cargo and ballast history and arrangement and condition of protective coatings. 2) Transverse sections shall be chosen where the largest reductions are suspected to occur or are revealed from deck plating measurements. 3) At least one section shall include a ballast tank, as far as applicable.					
<i>Source.: IACS UR Z10.2 TABLE II</i>					

Table D3.3 Thickness measurements, extent and pattern in way of areas with substantial corrosion, single skin bulk carriers				
	<i>Area / Structural member</i>		<i>Extent of measurement</i>	<i>Pattern of measurement</i>
<i>1a</i>	<i>Main deck structures</i>	<i>Deck plating.</i>	Suspect plate(s) and four adjacent plates.	5 points over 1 m ² of plating.
		<i>Deck longitudinals.</i>	Three longitudinals in way of suspect area.	5 points both web and flange over 1 m length.
		<i>Web frames or transverses.</i>	Suspect plate(s)	5 points over 1 m ² of plating.
<i>1b</i>	<i>Deck cross strips</i>	<i>Plating.</i>	Suspect plate(s).	5 points between stiffeners over 1 m length.
		<i>Underdeck stiffeners.</i>	Transverse members.	5 points at each end and midspan.
			Longitudinal members.	5 points on both web and flange.
<i>1c</i>	<i>Hatch covers and coamings</i>	<i>Hatch covers.</i>	Three locations on each side and end skirts.	5 points at each location.
			Two outboard strakes longitudinal bands. One centerline strake longitudinal band.	5 points each band.
		<i>Hatch coamings.</i>	One transverse band at lower 1/3 of each end. One transverse band at upper 2/3 of each end.	5 points each band.
			One longitudinal band at lower 1/3 of each side. One longitudinal band at upper 2/3 of each side.	5 points each band.

Table D3.3 Thickness measurements, extent and pattern in way of areas with substantial corrosion, single skin bulk carriers (Continued)				
	Area / Structural member		Extent of measurement	Pattern of measurement
1d	Top side ballast tanks.	Watertight transverse bulkhead.	Lower 1/3 of bulkhead.	5 points over 1 m ² of plating.
			Upper 2/3 of bulkhead.	5 points over 1 m ² of plating.
			Stiffeners.	5 points over 1 m length.
		Swash transverse bulkhead.	Lower 1/3 of 2 representative bulkheads.	5 points over 1 m ² of plating.
			Upper 2/3 of 2 representative bulkheads.	5 points over 1 m ² of plating.
			Stiffeners.	5 points over 1 m length.
		Sloping tank bottom.	Three representative bays at lower 1/3 of tank.	5 points over 1 m ² of plating.
			Three representative bays at upper 2/3 of tank.	5 points over 1 m ² of plating.
			Longitudinals, suspect and adjacent.	5 points both web and flange over 1 m length.
2	Single side structures.	Side shell plating.	Suspect plate(s) and all adjacent plates.	5 points each panel between longitudinals.
		Side shell frames.	Suspect frame(s) and each adjacent frame.	5 points across both web and flange at each end and midspan. 5 points within 25 mm of welded attachment to both shell and lower slope plate.
3	Transverse bulkhead structures in cargo holds.	Lower stool.	Transverse band within 25 mm of welded connection to inner bottom.	5 points between stiffeners over 1 m length.
			Transverse band within 25 mm of welded connection to shelf plate.	5 points between stiffeners over 1 m length.
		Bulkhead.	Transverse band at approximately mid height	5 points over 1 m ² of plating.
			Transverse band adjacent to upper deck or shelf plate of upper stool, whichever is applicable.	5 points over 1 m ² of plating.
4	Double bottom and hopper structures.	Bottom, inner bottom and hopper structures plating.	Suspect plate(s) and all adjacent plates.	5 points each panel between longitudinals over 1 m length.
		Bottom, inner bottom and hopper structures longitudinals.	Three longitudinals where plates measured.	3 points in line across web. 3 points in line across flange.
		Longitudinal girders or transverse floors.	Suspect plate(s)	5 points over 1 m ² of plating.
		Watertight bulkheads (WT floors)	Plating lower 1/3 of tank.	5 points over 1 m ² of plating.
			Plating upper 2/3 of tank.	5 points alternate plates over 1 m ² of plating.
		Web frames	Suspect plate(s)	5 points over 1 m ² of plating.
Source.: IACS UR Z10.2 TABLEVIII				

Table D4.1 Close-up examination, double skin bulk carriers					
	<i>Area</i>	<i>Renewal survey no. 1 Age ≤ 5 years</i>	<i>Renewal survey no. 2 Age 5 - 10 years</i>	<i>Renewal survey no. 3 Age 10 - 15 years</i>	<i>Renewal survey no. 4 and subsequent Age > 15 years</i>
<i>1a</i>	<i>Cargo hold hatch covers and coamings - plating and stiffeners.</i>	All	All	All	All
<i>1b</i>	<i>Deck plating and underdeck structures inside line of hatch openings between cargo hold hatches.</i>		All	All	All
<i>2a</i>	<i>Ordinary transverse frames ¹⁾ in double side tanks.</i>		25% of frames in the foremost double side tank.	25% of frames in all double side tanks.	All frames in all double side tanks.
<i>2b</i>	<i>Ballast tanks transverse web frames with associated plating and longitudinals.</i>	One in two representative tanks of each type within the cargo area - to include the foremost top side and double side tank on both sides ³⁾ .	One in each tank within the cargo area ³⁾	All - in all ballast tanks	All - in all ballast tanks
<i>3a</i>	<i>Cargo hold transverse bulkheads ¹⁾ - plating, stiffeners and girders, including internal structures of upper and lower stools, where fitted.</i>	Two selected bulkheads	One in each hold	All	All
<i>3b</i>	<i>Ballast tanks transverse bulkheads, including stiffening system.</i>		Forward and aft bulkheads in a transverse section including top side, hopper side and double side ballast tanks.	All	All
<i>4</i>	<i>Double bottom structures</i>	As covered by item 2b and 3b.	As covered by item 2b and 3b.	As covered by item 2b and 3b.	As covered by item 2b and 3b.
Notes: 1) Ordinary transverse frames are vertical stiffeners on ship side and longitudinal bulkhead between deck, possible stringers and double bottom. 2) Close-up examination of cargo hold transverse bulkheads to be carried out at the following levels: Level (a) Immediately above the inner bottom and immediately above the line of gussets (if fitted) and shedders for ships without lower stool. Level (b) Immediately above and below the lower stool shelf plate (for those ships fitted with lower stools), and immediately above the line of the shedder plates. Level (c) About mid-height of the bulkhead. Level (d) Immediately below the upper deck plating and immediately adjacent to the upper wing tank, and immediately below the upper stool shelf plate for those ships fitted with upper stools, or immediately below the topside tanks. 3) Ballast tank types within the cargo area: top side tank, double side tank, hopper side tank, double bottom tank.					
<i>Source.: IACS UR Z10.5 TABLE I</i>					

Table D4.1.1 Close-up examination, ore carriers

	Area	Renewal survey no. 1 Age ≤ 5 years	Renewal survey no. 2 Age 5 - 10 years	Renewal survey no. 3 and subsequent Age > 10 years
1	Deck transverse including adjacent deck structural members.		One - in all ballast tanks not covered by item 2.	
1a	Cargo hold hatch covers and coamings - plating and stiffeners.	All.	All.	All.
1b	Deck plating and under deck structures inside line of hatch openings between cargo hold hatches.		All.	All.
2	Transverse web frame rings including adjacent structural members.	One - in a ballast wing tank.	All - in a ballast wing tank.	All - in all ballast tanks. One in each wing void space. Additional - as considered necessary by the surveyor.
3	Transverse bulkheads including girder system and adjacent structural members.	One, lower part - in a ballast tank.	Both - in a ballast wing tank. One, lower part - in each remaining ballast tank.	All - in all ballast tanks.
3a	Cargo hold transverse bulkheads ¹⁾ - plating, stiffeners and girders, including internal structures of upper and lower stools, where fitted.	Two selected bulkheads.	One in each hold.	All.

Notes:

- 1) Close-up examination of cargo hold transverse bulkheads to be carried out at the following levels:
- Level (a) Immediately above the inner bottom and immediately above the line of gussets (if fitted) and shedders for ships without lower stool.
- Level (b) Immediately above and below the lower stool shelf plate (for those ships fitted with lower stools), and immediately above the line of the shedder plates.
- Level (c) About mid-height of the bulkhead.
- Level (d) Immediately below the upper deck plating and immediately adjacent to the upper wing tank, and immediately below the upper stool shelf plate for those ships fitted with upper stools, or immediately below the topside tanks.

Source.: IACS UR Z10.1 TABLE I and IACS UR Z10.5 TABLE I, as applicable

Table D4.2 Minimum thickness measurements¹⁾, double skin bulk carriers and ore carriers					
	<i>Area</i>	<i>Renewal survey no. 1 Age ≤ 5 years</i>	<i>Renewal survey no. 2 Age 5 - 10 years</i>	<i>Renewal survey no. 3 Age 10 - 15 years</i>	<i>Renewal survey no. 4 and subsequent Age > 15 years</i>
0a	<i>Transverse sections within the cargo area. ²⁾</i>		Two section of deck plating only - outside line of cargo hatch openings - at least one within 0.5 L amidships. ³⁾	Two complete sections - outside line of cargo hatch openings - at least one within 0.5 L amidships. ³⁾	Three complete sections - outside line of cargo hatch openings - at least one within 0.5 L amidships. ³⁾
0b	<i>Structural members subject to close-up examination according to Table D4.1 and Table D4.1.1.</i>	Measurements, for general assessment and recording of corrosion pattern.	Measurements, for general assessment and recording of corrosion pattern.	Measurements, for general assessment and recording of corrosion pattern.	Measurements, for general assessment and recording of corrosion pattern.
1	<i>Main deck plating</i>			All - outside line of cargo hatch openings, within the cargo area.	All - outside line of cargo hatch openings, within the cargo area. All exposed - outside cargo area.
2	<i>Wind- and water strakes.</i>		In the transverse sections considered in item 0a. Selected outside the cargo area.	All - within the cargo area. Selected outside the cargo area.	All - full length.
3	<i>Transverse bulkheads</i>	See item 0b	See item 0b	See item 0b	See item 0b
4a	<i>Keel plates and bottom plates.</i>				All keel plates full length. All bottom plates, including lower turn of bilge, within the cargo area. Additional bottom plates in way of cofferdams, machinery space and aft end of tanks.
4b	<i>Sea chests and shell plating in way of overboard discharges.</i>				Plating of sea chests. Shell plating as considered necessary by the attending surveyor.
5	<i>Superstructure deck plating (poop, bridge and forecastle deck).</i>				Representative exposed deck plating.
6	<i>Internals in peak tanks.</i>			Forepeak and aftpeak.	Forepeak and aftpeak.
7	<i>Air pipes and ventilators</i>			All - on the fore deck (forward quarter length). All exposed air pipes to fuel and lube oil daily service tanks. Selected air pipes and ventilator coamings aft of the forward quarter.	All - on the fore deck (forward quarter length). All exposed air pipes to fuel and lube oil daily service tanks. Selected air pipes and ventilator coamings aft of the forward quarter.
Note: 1) Thickness measurement locations should be selected to provide the best representative sampling of areas likely to be most exposed to corrosion, considering cargo and ballast history and arrangement and condition of protective coatings. 2) Transverse sections shall be chosen where the largest reductions are suspected to occur or are revealed from deck plating measurements. 3) At least one section shall include a ballast tank, as far as applicable.					
<i>Source.: IACS UR Z10.5 TABLE II</i>					

Table D4.3 Thickness measurement, extent and pattern in way of areas of substantial corrosion, double skin bulk carriers				
	<i>Area / Structural member</i>		<i>Extent of measurement</i>	<i>Pattern of measurement</i>
<i>1a</i>	<i>Main deck structures</i>	<i>Deck plating.</i>	Suspect plate(s) and four adjacent plates.	5 points over 1 m ² of plating.
		<i>Deck longitudinals.</i>	Three longitudinals in way of suspect area.	5 points both web and flange over 1 m length.
		<i>Web frames or transverses.</i>	Suspect plate(s)	5 points over 1 m ² of plating.
<i>1b</i>	<i>Deck cross strips</i>	<i>Plating.</i>	Suspect plate(s).	5 points between stiffeners over 1 m length.
		<i>Underdeck stiffeners.</i>	Transverse members.	5 points at each end and midspan.
			Longitudinal members.	5 points on both web and flange.
<i>1c</i>	<i>Hatch covers and coamings</i>	<i>Hatch covers.</i>	Three locations on each side and end skirts.	5 points at each location.
			Two outboard strakes longitudinal bands. One centerline strake longitudinal band.	5 points each band.
		<i>Hatch coamings.</i>	One transverse band at lower 1/3 of each end. One transverse band at upper 2/3 of each end.	5 points each band.
			One longitudinal band at lower 1/3 of each side. One longitudinal band at upper 2/3 of each side.	5 points each band.
<i>1d</i>	<i>Top side ballast tanks.</i>	<i>Watertight transverse bulkhead.</i>	Lower 1/3 of bulkhead.	5 points over 1 m ² of plating.
			Upper 2/3 of bulkhead.	5 points over 1 m ² of plating.
			Stiffeners.	5 points over 1 m length.
		<i>Swash transverse bulkhead.</i>	Lower 1/3 of 2 representative bulkheads.	5 points over 1 m ² of plating.
			Upper 2/3 of 2 representative bulkheads.	5 points over 1 m ² of plating.
			Stiffeners.	5 points over 1 m length.
		<i>Sloping tank bottom.</i>	Three representative bays at lower 1/3 of tank.	5 points over 1 m ² of plating.
			Three representative bays at upper 2/3 of tank.	5 points over 1 m ² of plating.
			Longitudinals, suspect and adjacent.	5 points both web and flange over 1 m length.

Table D4.3 Thickness measurement, extent and pattern in way of areas of substantial corrosion, double skin bulk carriers (Continued)				
	<i>Area / Structural member</i>		<i>Extent of measurement</i>	<i>Pattern of measurement</i>
2	<i>Double side structures.</i>	<i>Side shell and inner side plating.</i>	Upper strakes and strakes in way of horizontal girders - minimum three bays along the tank.	1 point each strake and each bay when transverse frames. 1 point each panel between pair of longitudinals in each bay.
			All other strakes - same three bays as above.	1 point every third panel between pair of longitudinals.
		<i>Side shell and inner side frames or longitudinals.</i>	On upper strakes - all frames/ longitudinals in same three bays as above.	3 points across web. 1 point on flange.
			On all other strakes - one frame or every third longitudinal in same three bays as above.	3 points across web. 1 point on flange.
		<i>Brackets on side shell and inner side frames or longitudinals.</i>	Minimum of three at top, middle and bottom of tank in same three bays as above.	5 points over area of bracket.
		<i>Vertical web frames and transverse bulkheads.</i>	Strakes in way of horizontal girders - minimum two webs and both bulkheads.	5 points over 2 m ² of plating.
			Other strakes - minimum two webs and both bulkheads.	2 points between each pair of vertical stiffeners.
		<i>Horizontal girders.</i>	Plating on each girder in a minimum of three bays.	2 points between each pair of longitudinal girder stiffeners.
		<i>Panel stiffening.</i>	Where applicable.	1 point measurements.
3	<i>Transverse bulkhead structures in cargo holds.</i>	<i>Lower stool.</i>	Transverse band within 25 mm of welded connection to inner bottom.	5 points between stiffeners over 1 m length.
			Transverse band within 25 mm of welded connection to shelf plate.	5 points between stiffeners over 1 m length.
		<i>Bulkhead.</i>	Transverse band at approximately mid height	5 points over 1 m ² of plating.
			Transverse band adjacent to upper deck or shelf plate of upper stool, whichever is applicable.	5 points over 1 m ² of plating.

Table D4.3 Thickness measurement, extent and pattern in way of areas of substantial corrosion, double skin bulk carriers (Continued)				
	Area / Structural member		Extent of measurement	Pattern of measurement
4	Double bottom and hopper structures.	Bottom, inner bottom and hopper structures plating.	Three bays across double bottom tank, including aft bay. Around and under all suction bell mouths.	5 points each panel between longitudinals and floors.
		Bottom, inner bottom and hopper structures longitudinals.	Three - in each bay where bottom plating measured.	3 points in line across web. 3 points in line across flange.
		Bottom girders, including watertight girders.	At fore and aft watertight floors and in centre of tanks.	1 point between each panel stiffener on girder plating - vertical line of points - minimum three points.
		Bottom floors, including watertight floors.	Three - at bays where bottom plating measured, with measurements at both ends and middle.	5 points over 2 m ² of plating.
		Web frame rings - hopper structures.	Three - at bays where bottom plating measured, with measurements at both ends and middle.	5 points over 1 m ² of web plating. 1 point on flange.
		Transverse watertight bulkheads or swash bulkheads - hopper structures.	Lower 1/3 of bulkhead.	5 points over 1 m ² of plating.
			Upper 2/3 of bulkhead.	5 points over 2 m ² of plating.
			Three stiffeners.	2 points in line across web at each end. 1 point on web at centre of span. 1 point on flange at each end and at centre of span.
		Panel stiffening.	Where applicable	1 point measurements.
Source.: IACS UR Z10.5 TABLE III				

Table D5.1 Close-up examination, single hull oil tankers, single hull chemical tankers and ore/oil ships					
	Area	Renewal survey no. 1 Age ≤ 5 years	Renewal survey no. 2 Age 5 - 10 years	Renewal survey no. 3 Age 10 - 15 years	Renewal survey no. 4 and subsequent Age > 15 years
1	Deck transverse including adjacent deck structural members ¹⁾ .	One - in a cargo tank.	One - in all ballast tanks not covered by item 2.	For oil tankers: Minimum 30% of all - in each cargo centre tank.	For oil tankers: Minimum 30% of all - in each cargo centre tank. For chemical tankers: One in each cargo centre tank.
			One - in a cargo wing tank.	For chemical tankers: One in each cargo centre tank.	
			One - in each of two cargo centre tanks.		
2	Transverse web frame rings including adjacent structural members.	One - in a ballast wing tank, if any, or a cargo wing tank used primarily for ballast.	All - in a ballast wing tank, if any, or a cargo wing tank used primarily for ballast.	All - in all ballast tanks.	All - in all ballast tanks.
				All - in a cargo wing tank.	All - in a cargo wing tank.
				For oil tankers: Minimum 30% of all - in each remaining cargo wing tank.	For oil tankers: Minimum 30% of all - in each remaining cargo wing tank.
				For chemical tankers: One in each remaining cargo wing tank.	For chemical tankers: One in each remaining cargo wing tank.
3	Transverse bulkheads including girder system and adjacent structural members.	One, lower part - in a ballast tank.	Both - in a ballast wing tank, if any, or a cargo wing tank used primarily for ballast.	All - in all ballast tanks.	All - in all ballast tanks.
			One, lower part - in each remaining ballast tank.		
		One, lower part - in a cargo wing tank.	One, lower part - in a cargo wing tank.	All - in all cargo tanks.	All - in all cargo tanks.
		One, lower part - in a cargo centre tank ²⁾ .	One, lower part - in two cargo centre tank ²⁾ .		
4	Bottom transverse including adjacent bottom structural members.			For oil tankers: Minimum 30% of all - in each cargo centre tank. For chemical tankers: One in each cargo centre tank.	For oil tankers: Minimum 30% of all - in each cargo centre tank. For chemical tankers: One in each cargo centre tank.
1) Including external structure on deck in way of the tank, where applicable.					
2) Where no centre cargo tanks are fitted (as in the case of centre longitudinal bulkhead), transverse bulkheads in wing tanks shall be surveyed.					
Source.: IACS UR Z10.1 TABLE I and Z10.3 TABLE I					

Table D5.2 Minimum thickness measurements¹⁾, single hull oil tankers, single hull chemical tankers and ore/oil ships					
	<i>Area</i>	<i>Renewal survey no. 1 Age ≤ 5 years</i>	<i>Renewal survey no. 2 Age 5 - 10 years</i>	<i>Renewal survey no. 3 Age 10 - 15 years</i>	<i>Renewal survey no. 4 and subsequent Age > 15 years</i>
0a	<i>Transverse section(s) within the cargo area. ²⁾</i>	One section of deck plating only - for the full beam of the ship ³⁾	One complete section ³⁾	Two complete sections - at least one within 0.5L amidships ³⁾	Three complete sections - at least one within 0.5L amidships ³⁾
0b	<i>Structural members subject to close-up examination according to Table D5.1.</i>	Measurements, for general assessment and recording of corrosion pattern.	Measurements, for general assessment and recording of corrosion pattern.	Measurements, for general assessment and recording of corrosion pattern.	Measurements, for general assessment and recording of corrosion pattern.
1	<i>Main deck plating</i>		All - within the cargo area.	All - within the cargo area.	All - within the cargo area. All exposed - outside the cargo area.
2	<i>Wind- and water strakes.</i>		Selected outside the cargo area.	All - within the cargo area. Selected outside the cargo area.	All - full length.
3	<i>Transverse bulkheads</i>	See item 0b	See item 0b	See item 0b	See item 0b
4a	<i>Keel plates and bottom plates.</i>				All keel plates full length. All bottom plates, including lower turn of bilge, within the cargo area. Additional bottom plates in way of cofferdams, machinery space and aft end of tanks.
4b	<i>Sea chests and shell plating in way of overboard discharges.</i>				Plating of sea chests. Shell plating as considered necessary by the attending surveyor.
5	<i>Superstructure deck plating (poop, bridge and forecastle deck).</i>				Representative exposed deck plating.
6	<i>Internals in peak tanks.</i>			Forepeak and aftpeak.	Forepeak and aftpeak.
7	<i>Air pipes and ventilators</i>			All - on the fore deck (forward quarter length). All exposed air pipes to fuel and lube oil daily service tanks. Selected air pipes and ventilator coamings aft of the forward quarter.	All - on the fore deck (forward quarter length). All exposed air pipes to fuel and lube oil daily service tanks. Selected air pipes and ventilator coamings aft of the forward quarter.
Note:					
1) Thickness measurement locations should be selected to provide the best representative sampling of areas likely to be most exposed to corrosion, considering cargo and ballast history and arrangement and condition of protective coatings.					
2) Transverse sections shall be chosen where the largest reductions are suspected to occur or are revealed from deck plating measurements.					
3) At least one section shall include a ballast tank, within 0.5L amidships, as far as applicable.					
<i>Source.: IACS UR Z10.1 TABLE II and Z10.3 TABLE II</i>					

Table D5.3 Thickness measurement, extent and pattern in way of areas of substantial corrosion, single hull oil tankers, single hull chemical tankers and ore/oil ships

	<i>Area / Structural member</i>		<i>Extent of measurement</i>	<i>Pattern of measurement</i>
1	<i>Deck structures.</i>	<i>Deck plating.</i>	Two bands across tank.	3 points per plate per band.
		<i>Deck longitudinals.</i>	Three longitudinals in each of two bays.	3 points in line vertically on webs. 2 points on flange (if fitted).
		<i>Longitudinal girders and brackets.</i>	At fore and aft transverse bulkhead, bracket toes and in centre of tanks.	1 point between each panel stiffener on web plating - vertical line of points - minimum three points. 2 points across flange. 5 points on girder/ bulkhead brackets.
		<i>Transverse girders.</i>	Two - with measurements at both ends and middle.	5 points over 2 m ² of web plating. 1 point on flange.
		<i>Panel stiffening.</i>	Where provided.	1 point measurements.
2	<i>Side shell and longitudinal bulkhead structures.</i>	<i>Shell and bulkhead plating.</i>	On deckhead and bottom strakes - all longitudinals in same three bays as above.	3 points across web. 1 point on flange.
			On all other strakes - every third longitudinal in same three bays as above.	3 points across web. 1 point on flange.
		<i>Shell and bulkhead longitudinals.</i>	One transverse band at lower 1/3 of each end. One transverse band at upper 2/3 of each end.	5 points each band.
			One longitudinal band at lower 1/3 of each side. One longitudinal band at upper 2/3 of each side.	5 points each band.
		<i>Brackets on longitudinals.</i>	Minimum of three at top, middle and bottom of tank in same three bays as above.	5 points over area of bracket.
		<i>Web frames and cross ties.</i>	Three webs with minimum of three locations on each web, including in way of cross tie connections.	5 points over about 2 m ² web area. 1 point on web frame and cross tie flanges.
3	<i>Transverse bulkhead and swash bulkhead structures.</i>	<i>Plane bulkhead plating.</i>	Deckhead and bottom strakes, and strakes in way of stringer platforms - approximately 1/4, 1/2 and 3/4 width of tank.	5 points between each pair of stiffeners over 1 m length.
			All other strakes - at middle width of tank.	1 point between each pair of stiffeners.
		<i>Corrugated bulkhead plating.</i>	Strakes for each change of scantling at centre of panel and at flange or fabricated connection.	5 points over 1 m ² of plating.
		<i>Stiffeners</i>	Three typical stiffeners.	2 points in line across web at each end. 1 point on web at centre of span. 1 point on flange at each end and at centre of span.
		<i>Brackets.</i>	Three at top, middle and bottom of tank.	5 points over area of bracket.
		<i>Deep webs and girders.</i>	At toe of brackets and at centre of span.	5 points over about 2 m ² web area. 3 points across flange.
		<i>Stringer platforms.</i>	All - at both ends and middle.	5 points over 1 m ² web area. 1 point near bracket toes and on flange.

Table D5.3 Thickness measurement, extent and pattern in way of areas of substantial corrosion, single hull oil tankers, single hull chemical tankers and ore/oil ships (Continued)				
	Area / Structural member		Extent of measurement	Pattern of measurement
4	Bottom structures.	Bottom plating.	Three bays across tank, including aft bay. Around and under all suction bell mouths.	5 points each panel between longitudinals and webs.
		Bottom longitudinals.	Three longitudinals in each bay where bottom plating measured.	3 points in line across web. 3 points in line across flange.
		Bottom girders and brackets.	At fore and aft bulkhead bracket toes and in centre of tanks.	1 point between each panel stiffener on web plating - vertical line of points - minimum three points. 2 points across flange 5 points on girder/ bulkhead brackets.
		Bottom transverse webs.	Three webs at bays where bottom plating measured, with measurements at both ends and middle.	5 points over 2 m ² of plating.
		Panel stiffening.	Where provided.	1 point measurements.
Source.: IACS UR Z10.1 TABLE IV and Z10.3 TABLE IV				

Table D6.1 Close-up examination, double hull oil tankers and double hull chemical tankers					
	Area	Renewal survey no. 1 Age ≤ 5 years	Renewal survey no. 2 Age 5 - 10 years	Renewal survey no. 3 ⁸⁾ Age 10 - 15 years	Renewal survey no. 4 ⁸⁾ and subsequent Age > 15 years
1	Deck transverse including adjacent deck structural members ⁵⁾ .	One - in a cargo tank.	One - in each of two cargo tanks.	All - in a cargo tank.	All - in a cargo tank.
				One - in each remaining cargo tank.	One - in each remaining cargo tank.
2a	Transverse double hull web frames ¹⁾ , including adjacent structural members.	One - in a ballast tank within the cargo area.	All - in a ballast tank within the cargo area.	All - in all ballast tanks.	All - in all ballast tanks.
			One - knuckle area ³⁾ and the upper part (approximately 3 - 5 metres) in each remaining ballast tank.		
2b	Transverses web frames ⁴⁾ , including adjacent structural members.			All - in a cargo tank.	All - in a cargo tank.
				One - in each remaining cargo tank.	One - in each remaining cargo tank.
3	Transverse bulkheads including girder system and adjacent structural members.	One - in a ballast tank ²⁾ .	One - in each ballast tank ²⁾ .	All - in all ballast tanks.	All - in all ballast tanks.
		One, lower part ⁶⁾ - in a cargo wing tank.	One, lower part ⁶⁾ - in a cargo wing tank.	All - in all cargo tanks.	All - in all cargo tanks.
		One, lower part ⁶⁾ - in a cargo centre tank ⁷⁾ .	One, lower part ⁶⁾ - in two cargo centre tanks ⁷⁾ .		
4	Double bottom structures	As covered by item 2a and 2b.	As covered by item 2a and 2b.	As covered by item 2a and 2b.	As covered by item 2a and 2b.
Note:					
1) <i>Transverse double hull web frame</i> means vertical web in double side tank, hopper web in hopper tank, floor in double bottom tank and deck transverse in double deck tank (where fitted). When applicable to forepeak and aftpeak tanks this means a complete transverse web frame ring.					
2) Including double bottom tank, double side tank and double deck tank as applicable if these are separate tanks.					
3) The knuckle area is the area of the web frame around the connections of the slope hopper plating to the inner hull bulkhead and the inner bottom plating, up to 2 metres from the corners both on the bulkhead and the double bottom.					
4) <i>Transverses web frame</i> means deck transverse, longitudinal bulkhead vertical girder and cross ties where fitted.					
5) Including external structure on deck in way of the tank, where applicable.					
6) Including internal structure of lower stool, where fitted.					
7) In the case of centre longitudinal bulkhead, centre tank means a tank adjacent to this bulkhead.					
8) For vessels converted from single to double hull oil tankers, close-up examination for void spaces converted from cargo tanks:					
Transverse double hull web frames including adjacent structural members (where wing cargo tank divided with new inner shell).				One - in each void space.	
Transverses web frame rings including adjacent structural members (where wing cargo tank converted to void space).				One - in each void space.	
Transverse bulkheads including girder system and adjacent structural members.				All - in all void spaces.	
Source.: IACS UR Z10.4 TABLE I and Z10.3 TABLE I					

Table D6.2 Minimum thickness measurements¹⁾, double hull oil tankers and double hull chemical tankers					
	<i>Area</i>	<i>Renewal survey no. 1 Age ≤ 5 years</i>	<i>Renewal survey no. 2 Age 5 - 10 years</i>	<i>Renewal survey no. 3 Age 10 - 15 years</i>	<i>Renewal survey no. 4 and subsequent Age > 15 years</i>
0a	<i>Transverse section(s) within the cargo area ²⁾</i>	One section of deck plating only - for the full beam of the ship ³⁾	One complete section ³⁾	Two complete sections - at least one within 0.5 L amidships ³⁾	Three complete sections - at least one within 0.5 L amidships ³⁾
0b	<i>Structural members subject to close-up examination according to Table D6.1.</i>	Measurements, for general assessment and recording of corrosion pattern.	Measurements, for general assessment and recording of corrosion pattern.	Measurements, for general assessment and recording of corrosion pattern.	Measurements, for general assessment and recording of corrosion pattern.
1	<i>Main deck plating</i>		All – within the cargo area.	All - within the cargo area.	All - within the cargo area. All exposed - outside the cargo area.
2	<i>Wind- and water strakes.</i>		Selected outside the cargo area.	All - within the cargo area. Selected outside the cargo area.	All - full length.
3	<i>Transverse bulkheads</i>	See item 0b	See item 0b	See item 0b	See item 0b
4a	<i>Keel plates and bottom plates.</i>				All keel plates full length. All bottom plates, including lower turn of bilge, within the cargo area. Additional bottom plates in way of cofferdams, machinery space and aft end of tanks.
4b	<i>Sea chests and shell plating in way of overboard discharges.</i>				Plating of sea chests. Shell plating as considered necessary by the attending surveyor.
5	<i>Superstructure deck plating (poop, bridge and forecastle deck).</i>				Representative exposed deck plating.
6	<i>Internals in peak tanks.</i>			Forepeak and aftpeak.	Forepeak and aftpeak.
7	<i>Air pipes and ventilators</i>			All - on the fore deck (forward quarter length). All exposed air pipes to fuel and lube oil daily service tanks. Selected air pipes and ventilator coamings aft of the forward quarter.	All - on the fore deck (forward quarter length). All exposed air pipes to fuel and lube oil daily service tanks. Selected air pipes and ventilator coamings aft of the forward quarter.
Note:					
1) Thickness measurement locations should be selected to provide the best representative sampling of areas likely to be most exposed to corrosion, considering cargo and ballast history and arrangement and condition of protective coatings.					
2) Transverse sections shall be chosen where the largest reductions are suspected to occur or are revealed from deck plating measurements.					
3) At least one section shall include a ballast tank, within 0.5L amidships, as far as applicable.					
<i>Source.: IACS UR Z10.4 TABLE II and Z10.3 TABLE II</i>					

Table D6.3 Thickness measurement, extent and pattern in way of areas of substantial corrosion, double hull oil tankers and double hull chemical tankers

	<i>Area / Structural member</i>		<i>Extent of measurement</i>	<i>Pattern of measurement</i>
1	<i>Deck structures.</i>	<i>Deck plating.</i>	Two bands across tank.	3 points per plate per band.
		<i>Deck longitudinals.</i>	Every third longitudinal in each of two bands with a minimum of one longitudinal.	3 points in line vertically on webs. 2 points on flange (if fitted).
		<i>Longitudinal girders and brackets. (usually in cargo tanks only)</i>	At fore and aft transverse bulkhead, bracket toes and in centre of tanks.	1 point between each panel stiffener on web plating - vertical line of points - minimum three points. 2 points across flange. 5 points on girder/ bulkhead brackets.
		<i>Transverse girders.</i>	Two - with measurements at both ends and middle.	5 points over 2 m ² of web plating. 1 point on flange.
		<i>Vertical web and transverse bulkhead in wing ballast tank (two metres from deck)</i>	Minimum of two webs, and both transverse bulkheads.	5 points over 1 m ² of plating/ web.
		<i>Panel stiffening.</i>	Where provided.	1 point measurements.
2a	<i>Double side structures.</i>	<i>Side shell and inner side plating.</i>	Upper strakes and strakes in way of horizontal girders - minimum three bays along the tank.	1 point each panel between pair of longitudinals in each bay.
			All other strakes - same three bays along the tank as above.	1 point every third panel between pair of longitudinals.
		<i>Side shell and inner side longitudinals.</i>	On upper strakes - all longitudinals in same three bays along the tank as above.	3 points across web. 1 point on flange.
			On all other strakes - every third longitudinal in same three bays along the tank as above.	3 points across web. 1 point on flange.
		<i>Brackets on side shell and inner side longitudinals.</i>	Minimum of three at top, middle and bottom of tank in same three bays along the tank as above.	5 points over area of bracket.
		<i>Vertical web frames and transverse bulkheads.</i>	Strakes in way of horizontal girders - minimum two webs and both bulkheads.	5 points over 2 m ² of plating.
			Other strakes - minimum two webs and both bulkheads.	2 points between each pair of vertical stiffeners.
		<i>Horizontal girders</i>	Plating on each girder in a minimum of three bays.	2 points between each pair of longitudinal girder stiffeners.
		<i>Panel stiffening.</i>	Where applicable.	1 point measurements.

Table D6.3 Thickness measurement, extent and pattern in way of areas of substantial corrosion, double hull oil tankers and double hull chemical tankers (Continued)

	Area / Structural member		Extent of measurement	Pattern of measurement
2b	Longitudinal bulkhead structures (other than inner side longitudinal bulkheads).	Bulkhead plating.	Deckhead and bottom strakes, and strakes in way of horizontal girders (also where girders on transverse bulkheads only) – minimum 3 bays along the tank.	1 point each panel between pair of longitudinals.
			All other strakes – same three bays as above.	1 point every third panel between pair of longitudinals.
		Bulkhead longitudinals.	On deckhead and bottom strakes – all longitudinals in same three bays as above.	3 points across web. 1 point on flange.
			On all other strakes – every third longitudinal in same three bays as above.	3 points across web. 1 point on flange.
		Brackets on longitudinals.	Minimum of three at top, middle and bottom of tank in same three bays as above.	5 points over area of bracket.
		Web frames and cross ties.	Three webs with minimum of three locations on each web, including in way of cross tie connections.	5 points over about 2 m ² web area. 1 point on web frame and cross tie flanges.
3	Transverse bulkhead and swash bulkhead structures in cargo tanks.	Upper and lower stool, where fitted.	Transverse band within 25 mm of welded connection to inner bottom or deck plating.	5 points between stiffeners over 1 m length.
			Transverse band within 25 mm of welded connection to shelf plate.	5 points between stiffeners over 1 m length.
		Plane bulkhead plating.	Deckhead and bottom strakes, and strakes in way of stringer platforms – approximately ¼, ½ and ¾ width of tank.	5 points each panel between pair of stiffeners over 1 m length.
			All other strakes – at middle width of tank.	1 point each panel between pair of stiffeners.
		Corrugated bulkhead plating.	Strakes for each change of scantling at centre of panel and at flange or fabricated connection.	5 points over 1 m ² of plating.
		Stiffeners	Three typical stiffeners.	2 points in line across web at each end. 1 point on web at centre of span. 1 point on flange at each end and at centre of span.
		Brackets.	Three at top, middle and bottom of tank.	5 points over area of bracket.
		Horizontal girders.	All – at both ends and middle.	5 points over 1 m ² web area. 1 point near bracket toes and on flanges.

Table D6.3 Thickness measurement, extent and pattern in way of areas of substantial corrosion, double hull oil tankers and double hull chemical tankers (Continued)

	<i>Area / Structural member</i>		<i>Extent of measurement</i>	<i>Pattern of measurement</i>
4	<i>Double bottom and hopper structures.</i>	<i>Bottom, inner bottom and hopper structures plating.</i>	Three bays across double bottom tank, including aft bay. Around and under all suction bell mouths.	5 points each panel between longitudinals and floors.
		<i>Bottom, inner bottom and hopper structures longitudinals.</i>	Three - in each bay where bottom plating measured.	3 points in line across web. 3 points in line across flange.
		<i>Bottom girders, including watertight girders.</i>	At fore and aft watertight floors and in centre of tanks.	1 point between each panel stiffener on girder plating - vertical line of points - minimum three points.
		<i>Bottom floors, including watertight floors.</i>	Three - at bays where bottom plating measured, with measurements at both ends and middle.	5 points over 2 m ² of plating.
		<i>Web frame rings - hopper structures.</i>	Three - at bays where bottom plating measured, with measurements at both ends and middle.	5 points over 1 m ² of web plating. 1 point on flange.
		<i>Transverse watertight bulkheads or swash bulkheads - hopper structures.</i>	Lower 1/3 of bulkhead.	5 points over 1 m ² of plating.
			Upper 2/3 of bulkhead.	5 points over 2 m ² of plating.
			Three stiffeners.	2 points in line across web at each end. 1 point on web at centre of span. 1 point on flange at each end and at centre of span.
		<i>Panel stiffening.</i>	Where applicable	1 point measurements.

Source.: IACS UR Z10.4 TABLE IV and Z10.3 TABLE IV

Table D7.1 Close-up examination, liquefied gas tankers

	<i>Area</i>	<i>Renewal survey no. 1 Age ≤ 5 years</i>	<i>Renewal survey no. 2 and Age 5 - 10 years</i>	<i>Renewal survey no. 3 and subsequent Age > 10 years</i>
1	<i>Ballast tanks transverse bulkheads, including girder system and adjacent structural members.</i>	One, lower part – in a tank within the cargo area	One in each tank within the cargo area	All – in all ballast tanks
2	<i>Ballast tanks transverse web frames, including adjacent structural members.</i>	One in a representative tank of each type within the cargo area	All in a tank, which shall be a double hull side tank or a top side tank. If such tanks are not fitted, another tank shall be selected One in each remaining tank within the cargo area	All – in all ballast tanks

Notes:

- 1) Ballast tank types within the cargo area: top side tank, double hull side tank, hopper side tank, double bottom tank.
- 2) For ships having independent tanks of type C, with a midship section similar to that of a general cargo ship, the extent of close-up surveys may be specially considered.

Source: IACS UR Z7.2 TABLE I

Table D7.2 Minimum thickness measurements^{1), 4)}, liquefied gas tankers					
	<i>Area</i>	<i>Renewal survey no. 1 Age ≤ 5 years</i>	<i>Renewal survey no. 2 Age 5 - 10 years</i>	<i>Renewal survey no. 3 Age 10 - 15 years</i>	<i>Renewal survey no. 4 and subsequent Age > 15 years</i>
0a	<i>Transverse sections within the cargo area.²⁾</i>	One section of deck plating only - for the full beam of the ship within 0.5 L amidships. ³⁾	One complete section - within 0.5 L amidships. ³⁾	Two complete sections - at least one within 0.5 L amidships. ³⁾	Three complete sections - at least one within 0.5 L amidships. ³⁾
0b	<i>Structural members subject to close-up examination according to Table D7.1.</i>	Measurements, for general assessment and recording of corrosion pattern.	Measurements, for general assessment and recording of corrosion pattern.	Measurements, for general assessment and recording of corrosion pattern.	Measurements, for general assessment and recording of corrosion pattern.
1	<i>Main deck plating</i>		All - within the cargo area.	All - within the cargo area.	All - within the cargo area. All exposed - outside the cargo area.
2	<i>Wind - and water strakes.</i>		In way of the transverse sections considered in item 0a. Selected outside the cargo area.	In way of the transverse sections considered in item 0a. Selected outside the cargo area.	All - full length.
3	<i>Transverse bulkheads</i>	See item 0b	See item 0b	See item 0b	See item 0b
4a	<i>Keel plates and bottom plates.</i>				All keel plates full length. All bottom plates, including lower turn of bilge, within the cargo area. Additional bottom plates in way of cofferdams, machinery space and aft end of tanks.
4b	<i>Sea chests and shell plating in way of overboard discharges.</i>				Plating of sea chests. Shell plating as considered necessary by the attending surveyor.
5	<i>Superstructure deck plating (poop, bridge and forecastle deck).</i>				Representative exposed deck plating.
6	<i>Internals in peak tanks.</i>			Forepeak and aft peak.	Forepeak and aft peak.
7	<i>Air pipes and ventilators</i>			All - on the fore deck (forward quarter length). All exposed air pipes to fuel and lube oil daily service tanks. Selected air pipes and ventilator coamings aft of the forward quarter.	All - on the fore deck (forward quarter length). All exposed air pipes to fuel and lube oil daily service tanks. Selected air pipes and ventilator coamings aft of the forward quarter.
Notes: 1) Thickness measurement locations should be selected to provide the best representative sampling of areas likely to be most exposed to corrosion, considering cargo and ballast history and arrangement and condition of protective coatings. 2) Transverse sections shall be chosen where the largest reductions are suspected to occur or are revealed from deck plating measurements. 3) At least one section shall include a ballast tank, as far as applicable. 4) For ships having independent tanks of type C, with a midship section similar to that of a general cargo ship, the extent of thickness measurements may be increased to include the tank top plating at the discretion of the Surveyor.					
<i>Source.: IACS UR Z7.2 TABLE II</i>					

E. Table of survey methods for machinery

E 100 General

101 Machinery components listed in Table E1 shall be surveyed according to the specified survey method as described in the table.

Table E1 Machinery surveys		
<i>Item</i>		<i>Survey method</i>
Main propulsion		
Prime movers	Diesel engine	1
	Steam turbines	1
	Gas turbines	See Sec.1 C500
	Electrical main motors, including frequency converters	2
Shafting	Thrust-and intermediate shaft including bearings, clutch, couplings and torsional and axial vibration damper	2
Gears	Shafts, pinions, gear wheels, couplings and bearings, clutch	1
	Power Take Off /In (PTO/PTI),	1
Auxiliary machinery		
Prime movers	Diesel engine	1
	Turbines	1
	Electrical motors, including frequency converters	2
	Hydraulic motors	2
Generators		2
Shafting	Shaft, couplings, clutch and torsional and axial vibration damper	2
Gears	Shafts, pinions, gear wheels, couplings and bearings	2
	Power Take Off (PTO)	2
Sea water cooling system	Pumps, Electrical motor and starter	1
	Heat exchangers	1
	Pipes, valves and filters	2
Fresh water cooling system	Pumps, electrical motor and starter	2
	Heat exchangers	1
	Pipes, valves and filters	2
Lubricating oil system	Pumps, electrical motor and starter	2
	Heat exchangers	1
	Pipes, valves and filters	2
Fuel oil system	Pumps, electrical motor and starter	2
	Heat exchangers	1
	Pipes, valves and filters	2
Bilge and ballast system	Pumps, Electrical motor and starter	1
	Ejectors/ Adductors	1
	Pipes, valves and filters inside machinery space	2
Steam system	Heat exchangers	1
	Pipes, valves and filters inside machinery space	2
Feed water and condensate system	Pumps, electrical motors and starters	2
	Turbines	1
	Evaporators (Fresh water generator (only for steam turbine propulsion)) and condensers with ejectors	1
	Heat exchangers	1
	Pipes, valves and filters	2
Compressed air system	Air compressors, piston	2
	Air compressors, screw	2
	Emergency compressors	2
	Compressed air receivers	1
	Pipes, valves and filters inside machinery space	2

Table E1 Machinery surveys (Continued)		
<i>Item</i>		<i>Survey method</i>
Hydraulic system	Pumps, electrical motor and starter	2
	Pipes, valves and filters inside machinery space	2
	Controllable pitch propeller oil distribution box	2
	Controllable pitch propeller inboard actuators	2
	Hydraulic motors	2
Cargo handling systems		
	Piston pumps	2
	Centrifugal pumps	2
	Screw pumps	2
	Electrical motors and starters	2
	Turbines	1
	Heat exchangers	1
	Pipes, valves and filters	2
	Gas compressors	1
	Diesel engine	1
Miscellaneous		
	Forced draught fan	2
	Other turbines	1
	Incinerator arrangement	1
The survey methods are defined as follows:		
<i>Survey method No. 1:</i> Visual inspection by opening up fully or partly as found necessary by the surveyor. Function testing and or pressure testing to be carried out when relevant		
<i>Survey method No. 2:</i> Visual inspection without dismantling and performance test to be carried out. Opening up if found necessary. Last overhaul to be verified.		

SECTION 5 MISCELLANEOUS MAIN CLASS SURVEYS

A. Bottom Surveys

A 100 General

101 Bottom surveys are surveys of the outside of the ship's hull below the deepest load waterline and related items.

102 The survey shall include examination of:

- hull plating and stern frame
- openings. All sea valves, including scuppers and sanitary discharges, shall be fully or partly opened up and examined at alternate bottom survey
- for ships fitted with box coolers, the coolers shall be withdrawn at alternate bottom survey for examination of the box cooler space, water cover and top plate, mounting flange with weld connection to the hull, connection bolts and gaskets
- steering fins, shaft brackets and other appendages fitted
- rudder with attachments and bearings, see 200
- propeller with attachments and propeller shaft external parts, see 300
- thrusters, see 400
- stabiliser fins.

Guidance note:

The survey of stabiliser fins shall include, as far as practicable, examination of:

- fin including tail flap with hinge and link systems as applicable
- fin box with watertight boundaries
- fin bushes
- main seals of the stabiliser.

An operational test shall be carried out including mechanical securing devices. At the time of dry docking, NDT shall be carried out as deemed necessary by the surveyor.

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103 Bottom surveys are normally to be carried out with the ship in dry dock or on a slipway.

If the ship is built for in-water survey of the bottom and related items and sea conditions are such that an in-water survey can be satisfactorily carried out, bottom surveys may be permitted while the ship is afloat.

104 At the time of drydocking, the painting of markings required for the class notation **BIS** shall be checked and confirmed in order.

105 At the time of drydocking, a dock trial shall be carried out to confirm satisfactory operation of main and auxiliary machinery.

A 200 Rudder with attachments and bearings

201 Visible parts of the following items shall be examined:

- rudder
- rudder horn
- sole piece
- rudderstock and rudder shafts with couplings
- rudder pintles and gudgeons.

Dismantling may be required to the extent found necessary by the surveyor.

202 For oil lubricated rudder bearings the sealing arrangement shall be examined for tightness and the bearings shall be checked for wear as far as practicable.

For water lubricated rudder bearings the bearing clearances shall be measured.

203 For cone couplings, nuts shall be examined for verifying that all parts are intact and secure.

Inspection plates, where fitted, shall be removed.

204 For flange couplings, bolts and nuts shall be examined for verifying that all parts are intact and secure.

205 Areas susceptible to fractures shall be checked by an efficient crack detection method at every docking. Such areas are:

- weld connections at flanged connection between rudder and rudder stock, in particular for spade rudders
- rudder plating in way of abrupt changes in rudder cross section, e.g. at cutout for rudder horn bearing
- weld connections in way of removable plate for access to nut on rudder stock, pintle or shaft.

206 For flap rudders, the hinge and link systems shall be examined.

Retaining arrangement for hinge pins shall be examined as far as practicable.

A 300 Propeller with attachments

301 The propeller blades, propeller boss and propeller shaft external part shall be examined.

Dismantling may be required to the extent found necessary by the surveyor.

Guidance note:

If a rope guard is fitted, this shall be of such a construction as to facilitate the inspection of the shafting between the propeller hub and stern frame box.

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302 The propeller shaft external sealing arrangement and the propeller blade sealing arrangement shall be examined for tightness.

The propeller shaft bearing clearance shall be measured.

303 The following securing arrangements shall be examined for tightness:

- propeller nut
- propeller hub coupling bolts or nuts, if bottom survey afloat, only the securing of the protective arrangement to be examined
- propeller blade bolts.

A 400 Thrusters

401 All thrusters shall be externally examined. This comprise examination of gear housing, propeller blades, bolt locking and other fastening arrangements.

Dismantling may be required to the extent found necessary by the surveyor.

402 Thrusters for propulsion and thrusters for propulsion and steering shall have the sealing arrangement of propeller blades, propeller shaft and steering column examined.

A 500 Bottom survey afloat

501 Every alternate bottom survey may in general be permitted while the ship is afloat for ships with class notation **BIS**.

For ships which have not been assigned the class notation **BIS** alternate bottom survey afloat may be permitted provided the following design conditions are met:

- Rudder bearings shall have synthetic or metallic material. For water lubricated bearings, clearance measurements shall be possible while the ship is afloat.
- Propeller shaft bearing and sealing arrangement shall be of such type which does not require propeller shaft withdrawal carried out in less than 5-years intervals.
For water lubricated propeller shaft bearing, clearance measurements shall be possible while the ship is afloat.
- Thrusters/podded thrusters for propulsion and dynamic positioning systems need not have standard maintenance or examination schedule requiring the ship in dry dock at less than 5-years interval.

In such cases a proposal for in-water survey shall be submitted in advance of the survey confirming that rudder, tailshaft and/ or propulsion thrusters can be satisfactorily examined - as applicable, including the operating history for these components.

502 Bottom surveys afloat may be permitted subject to the following restrictions:

- For general dry cargo ships subject to EHSR (see Sec.1 A Definitions), for liquefied gas tankers and for ships with class notation **ESP** the bottom survey in conjunction with the renewal survey must be carried out with the ship in dry dock.
- For ships more than 15 years of age bottom surveys afloat will only be permitted after special consideration.
- For ships more than 15 years of age, with class notation **ESP**, bottom surveys afloat will not be permitted.

503 The in-water survey shall provide the information obtained from a docking survey. During such surveys the following conditions shall be satisfactorily fulfilled:

- the water conditions at the location of the survey shall be satisfactory with respect to visibility, current,

swell, etc.

- an approved diving company shall be used in the survey, using pictorial equipment of such quality that the surveyor is fully satisfied with the information relayed to him
- a diving report shall be presented
- location of possible damage to be ascertained
- the survey shall be witnessed by a surveyor of the Society.

The removal of inspection plates as given in 203 may be dispensed with if the surveyor is satisfied with the condition based on:

- examination of visible parts of rudderstock, rudder shafts and pintles with couplings and gudgeons
- the measurement of bearing clearances
- review of operating history
- on board testing as applicable.

504 If the in-water survey reveals damage or deterioration that requires early attention, the surveyor may require that the ship be dry-docked in order that a detailed survey can be undertaken and the necessary repairs carried out.

505 On a case by case basis, and in accordance with CN 72.2, the society may accept a survey scheme allowing two consecutive periodical bottom surveys to be carried out afloat.

B. Propeller Shaft Survey

B 100 General

101 The propeller shaft shall be drawn to permit examination of the shaft and the following parts:

- propeller shaft bearing areas
- stern bushes or bearings
- shaft sealing arrangement, including lubricating oil system
- aft bearing clearances to be measured/calculated and recorded
- oil level monitoring of lubricating oil system.

Guidance note:

Bearing clearances to be measured or calculated from wear down measurements and clearance from new building or last shaft withdrawal.

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102 For oil lubricated propeller shafts with type approved sealing glands, the withdrawal of the propeller shaft may be exempted at alternate surveys, i.e. extended to 10 years intervals, provided the following items have been examined with satisfactory result (Reduced scope):

- new oil seals fitted
- oil sealing contact surfaces in order
- aft bearing clearances measured/calculated and recorded
- oil level monitoring of lubricating oil system
- oil analysis (not older than 3 months) in order.

Guidance note:

Bearing clearances to be measured or calculated from wear down measurements and clearance from new building or last shaft withdrawal.

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In addition to the above, a propeller connection survey in accordance with C101 shall be carried out for propeller shafts with a keyway.

Guidance note:

The lubricating oil analysis should include the minimum parameters:

- water content
- chlorides content (sodium and magnesium)
- content of bearing metal particles (iron, aluminium, nickel, chromium, copper, tin, and lead)
- content of other particles (silicon)
- oil aging, resistance to oxidation (TAN, TBN).

Oil sample should be taken under service conditions.

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C. Propeller Connection Survey

C 100 General

101 For arrangements where the propeller is mounted on a keyed taper the following shall be examined after the propeller is backed off:

- propeller shaft threaded end
- propeller shaft taper and keyway
- propeller hub taper and keyway
- key
- NDT of fore part of the shaft taper and shaft keyway by an approved crack detection method.

102 For arrangements where the propeller is mounted on a keyless taper, or by means of a cylindrical/conical sleeve the following shall be examined after the propeller is backed off:

- propeller shaft threaded end
- propeller shaft tapered or cylindrical section
- propeller hub taper
- NDT of the fore part of the shaft taper, or shaft cylinder, by an approved crack detection method.

103 For arrangements where the propeller hub is fitted to a flange coupling or a forged propeller shaft flange the following shall be examined:

- visual inspection of the flange and its fittings
- tightness of bolts or nuts
- NDT of the flange fillet radius, by an approved crack detection method, may be required if the visual examination of the area is not satisfactory.

D. Survey of Geared Thrusters for Main Propulsion and Dynamic Positioning Systems

D 100 General

101 The requirements in this sub-section apply to thrusters for propulsion and thrusters for propulsion and steering of the ship.

Guidance note:

Thrusters installed to achieve redundant main propulsion systems shall be subject to the requirements in this sub-section.

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102 Thrusters for main propulsion and dynamic positioning systems shall be subjected to oil samples at regular intervals of not more than 3 months and analysed by recognized laboratories. The result shall be presented in a way that makes it easy to read the trends from the previous analyses. Record of results shall be available on board at all times.

A representative oil sample shall be taken before the filters and with the unit in its normal running condition. Oil analysis shall detect iron (Fe) and other solid contamination in addition to possible water content. The water content due to condensation is normally not to exceed 0.5%. The oil analysis shall if applicable cover all of the following areas:

- lubrication oil for gears, bearings
- sealing boxes
- steering gear
- propeller.

If the propeller shafts seal oil systems do not allow for sampling unless the vessel is in dry dock, a representative oil analysis shall be taken in connection with the Bottom Survey.

103 Outboard (wet) parts of the thruster accessible from the outside are covered by the bottom surveys.

104 Thrusters for main propulsion and dynamic positioning systems shall be subjected to survey every 5 years. The complete survey shall include:

- 1) evaluation of oil analysis of gear lubrication oil, propeller hydraulic system oil and sealing system oil. See 102
- 2) opening up of protection covers
- 3) inspection of power transmission gear (gear clearance to be measured), bearings (axial play to be measured), visible parts of shafts and general condition of housing internally.

- 4) examination of controllable pitch mechanism oil transmission system and feedback system for wear down and damage
- 5) full stroke ahead and astern to be verified and correct blade position feed-back and indication verified
- 6) examination of steering column and related sealing and bearing
- 7) running test at MCR.

Provided that an approved Thruster Condition Monitoring (CM) Survey Arrangement is in place. Ref. Sec.8 C300.

The scope described from 1) to 7) is covered by the Thruster CM Arrangement, and followed up through annual Thruster CM Survey and Bottom Survey.

105 Inboard parts of the thruster accessible from the inside, such as drive motors, shafting system, gear transmissions, pumps and piping systems, alarm, safety and control systems are covered by the main class surveys of machinery. In addition to geared thrusters this will be applicable for e.g. Voith-Schneider and pump type thrusters.

106 At each overhaul of the thruster unit the following shall be carried out in the presence of a surveyor to the Society:

- all relevant parts of the components made accessible during overhaul shall be surveyed using adequate methods, such as visual inspection MPI or DP, wear down measurements
- NDT for sub-surface cracking of the tooth flanks
- MPI shall be carried out of gear teeth and at least in way of stress raisers in the shafts
- proper assembly of the thruster shall be verified
- proper gear mesh shall be documented in same extent as required for new thruster.

Mounting of the thruster on board shall be verified and function tested.

E. Survey of Podded Thrusters for Main Propulsion and dynamic positioning systems

E 100 General

101 The requirements in this sub-section apply to thrusters of podded design, here after denoted pods, for propulsion and steering of the ship.

102 Propulsion pod survey implies a survey of the pod's internal power transmission elements and driving motor enclosed in the pod, strut and steering column.

Pods have two scheduled surveys:

- annual
- complete.

For some pod sizes it will be limited access from inside the vessel and annual survey should be done to the extent that is practically possible. Complete survey might require some dismantling.

103 Parts of the survey may be replaced by an approved condition monitoring arrangement, see Classification Note 10.2 Appendix H.

104 At each overhaul, all relevant parts of the components made accessible shall be presented for survey by the society, see 203.

Assembly and mounting on board shall be verified and tested.

E 200 Scheduled surveys

201 Annual survey

Scope of the annual pod survey by the society shall include:

- evaluation of lube oil analysis from recognized laboratory (see Sec.5 C101)
- survey of functionality and calibration of onboard control and monitoring system (incl. alarm functions if fitted for continuous monitoring systems)
- review of insulation resistance (megger-test) records
- maintenance records for various items, such as alarm tests for bilges, bearing inspections, pod inspections, maintenance of the slip rings electrical connections, etc.
- visual inspection of pod motor air cooling system
- record of running hours.

202 Complete survey

The complete survey shall include:

- same as for annual
- examination of drive motor rotor and stator condition and associated equipment, shafts, and stator fixation arrangement
- internal overall survey, check for cleanliness, oil leaks, general condition
- verification of seal tightness
- verification of bearing condition (e.g. Boroscopic examination to be carried out)
- external survey in dry dock, check housing for cracks, corrosion, damage
- verification of seals condition (pod/ship)
- verify condition of slewing gears and bearing.

203 At overhaul of the thruster unit the following shall be included in addition to the survey requirements given in 202:

- all relevant parts of the components made accessible during overhaul shall be surveyed using adequate methods, such as visual inspection and MPI or DP, wear down measurements
- MPI shall be carried out in way of stress raisers in the shafts
- proper assembly of the thruster shall be verified.

Mounting of the thruster on board shall be verified and function tested.

F. Boiler Survey

F 100 General

101 The requirements in this sub-section applies to all boilers, steam drums, steam generators and/or pipe arrangements.

Also applicable to steam/thermal oil heated steam generators.

102 Owner's duties prior to survey:

- cleanliness of boiler on both water and gas sides shall be ensured to a condition required to assess structures
- boiler to be completely isolated/secured from live steam systems, cooled down and opened up to give access to both steam/water and fire/gas sides. Hand-hole covers on headers/at bottom of water space shall be opened up to facilitate internal examination. Boiler armatures shall be readied for opening up
- boiler to be well ventilated on both steam/water and fire side. Safe work lighting to be provided.

103 The survey covers:

- internal examination of the water-steam and fire side, which includes functional testing of safety valves

Guidance note:

On small boilers and/or units fitted with steam generating coils / tube panels making internal examination unpracticable, the internal examination may be substituted by hydraulic pressure testing at 1.5 times the design pressure

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- external examination
- examination of mountings and fittings, including safety valves, pressure, level and temperature transmitters for control and monitoring. Opening up as found necessary by the surveyor
- review of the following records since the last survey:
 - operation
 - maintenance
 - repair history
 - boiler water management.
- verification of the safety valve setting
- examination and testing of the operation / function of safety valve relieving gear.

Guidance note:

If not possible to circulate steam/hot water through the exhaust gas heated economizer at the time of survey, setting of economizer safety valve(s) may be carried out by the Chief Engineer at sea, and results recorded in the log book.

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For shell type exhaust gas heated economizers, operating in fully flooded condition, the survey will include visual examination of all accessible welded joints. Crack detection by non destructive testing method as found necessary by the surveyor.

(Ref. IACS UR Z 18)

104 Upon completion of the internal examinations, boilers and steam / thermal oil heated steam generators shall be function tested according to the requirements for new installations. Ref. Pt.4 Ch.7 Sec.7 and Pt.6 Ch.3 Sec.5 C.

The test shall include instrumentation, automatic and remote control equipment, and be witnessed by a DNV surveyor.

Guidance note:

If not possible to raise steam and carry out testing at the time of the internal examination, the following procedure applies:

- Before surveyed unit is taken into use, safety valves to be set and control, monitoring and safety systems tested under steam by the Chief Engineer and the results recorded in the log book.
- At the vessel's next port of call and not later than 45 days from the date of internal examination, the safety valve setting and control, monitoring and safety systems shall be tested in the presence of a DNV surveyor.

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105 For exhaust boilers fitted with a “bursting disc”, the disc shall be undamaged and comply with the original setting.

106 Soot-cleaning arrangements is subject to visual inspection and function testing. Drainage of cleaning water shall be in working order.

107 Heaters for main boiler combustion air will be surveyed concurrently with internal boiler examination.

For rotary air heaters, the survey will include the satisfactory functioning of exhaust gas and combustion air bypass dampers, and assessment of the fixed fire extinguishing arrangement.

F 200 Damage and repairs to boilers and pressure vessels

201 All damage shall be reported to the Society for assessment.

202 The Society will determine necessary accessibility to ensure that the full extent of the damage is ascertained.

203 The following procedure applies:

- a) A repair plan shall be discussed with the Society, and concluded.
- b) The Society will normally supervise execution of repairs at agreed hold-points.
- c) Repairs shall in general be carried out in such a way that the original design and scantlings are restored.
- d) Repair work shall be carried out by qualified personnel observing good engineering practices.

204 The requirements in Pt.4 Ch.7 Sec.8 applies to all repair work.

F 300 Emergency repairs

301 To retain the ship's manoeuvrability, reach safe- or scheduled port, emergency measures/repairs to pressure parts may have to be performed without DNV attendance.

Information about such emergency measures planned or initiated shall however, always be submitted to DNV without delay.

Any such repairs are considered temporary measures only, and permanent repairs/ repair solutions shall be finalized prior to further trading.

Guidance note:

Repair work may carried out without the attendance of a surveyor (e.g. during voyage), provided the Society is informed, and a repair plan accepted in advance by the Society.

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302 A DNV surveyor shall be called to survey repairs performed according to 301, when completed.

Guidance note:

It is for the owner to document to the satisfaction of the attending surveyor that the agreed repair plan has been adhered to.

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F 400 Repairs

401 A repair proposal shall detail:

- a) Full extent of damage to be repaired
- b) Material certification
- c) Certification of consumables

- d) Welding procedures
- e) Welding procedure certification
- f) Welders qualification certification
- g) Testing schedule.
- h) Access work, including procedures for “buttering up” (welding up) of material lost when cutting out the temporary opening.

402 Plugging of boiler tubes initially constitutes a temporary measure only, and shall be reported to the Society without delay.

The extent of plugging and possible acceptance as permanent repair, is subject to assessment by the Society.

403 Cracked steel boiler shell plating, tube plates, corroded welding and pitting shall be repaired through plate replacement.

404 Heat affected zones of insert welding shall not interfere with heat affected zones of original welding.

405 Longitudinal and circumferential main joints on boiler shells/drums shall be full penetration butt welds.

Guidance note:

For other than the above circumferential butt welds, see Pt.4 Ch.7 Sec.5 and Sec.8 B201.

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406 Joints shall be welded from both sides of the plates unless otherwise approved.

Guidance note:

Circumferential joints where dimensions do not allow welding from both sides in headers, pipes and tubes may be welded from one side only, with or without backing strip.

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407 No attachment shall be welded on in the immediate vicinity of a welded joint.

Guidance note:

If this cannot be avoided, the welds shall cross or overlap each other completely.

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408 Ends made of welded plates shall be so arranged that they are exposed to the least possible stress. Welded joints passing through flanged curvatures shall be at right angles to these.

F 500 Boiler armature/valve replacement

501 Safety valves shall be designed and manufactured according to a recognized standard.

Guidance note:

Acceptable standard could be e.g. ASME, DIN or equivalent.

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A DNV product certificate is required for valves with $D > 100$ mm having a design pressure, $p > 16$ bar. For other valves, manufacturers' certificate is acceptable.

A DNV material certification is required when operating temperature $> 400^{\circ}\text{C}$.

F 600 Post weld heat treatment

601 Pressure vessels including boilers shall be thermally stress relieved after welding when the material thicknesses at any welded connection exceed 20 mm for any material other than NV1 Cr 0.5Mo and NV 2.25 Cr 1 Mo where all thicknesses shall be subject to heat treatment (ref. Pt.4 Ch.7 Sec.8 C100 and Table C1).

Guidance note:

Alternatively, if the manufacturer can document that work procedures control or even eliminate formation of undue stresses, the requirement for additional stress relieving may be omitted by the Society.

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F 700 Testing

701 Non-destructive testing shall be carried out as follows:

- All longitudinal butt welded joints in drums, shells and headers subjected to 100% radiographic testing.
- 25% of the length of circumferential butt welded joints in drums, shells and headers subjected to radiographic testing.
- 10% of the total number of circumferential butt welded joints in pipes and tubes shall be subject to

radiographic testing

- For set-in flat plates the cylindrical shell shall be ultrasonically tested for lamellar tearing in way of the circumferential weld to the flat plate. For shell plate thickness 15 mm and less the extent of testing shall be at least 10% and for greater thickness at least 20% of the total length of the weld. The internal fillet weld, see Fig.8 in Sec.5 to be 100% magnetic particle tested for surface flaws.
- For standpipes and branches with outside diameter exceeding 100 mm, all weld connections to shell and reinforcement rings shall be subjected to magnetic particle testing. For outside diameters 100 mm and less, spot testing is considered a satisfactory extent. The magnetic particle testing shall also cover weld joints between reinforcement rings and shell.
- For furnaces and fireboxes non-destructive testing shall as minimum be carried out as follows, and be witnessed by a DNV Surveyor:
 - 10% of the length of longitudinal butt welded joints subjected to radiographic examination
 - 10% of the length of circumferential butt welded joints subjected to radiographic examination.
 - 25% of the length of T-welds and corner welds subjected to ultrasonic examination.

702 Hydraulic pressure testing shall be carried out at 1.5 times the design (calculated) pressure, and be witnessed by a DNV surveyor.

G. Thermal Oil Heater Survey

G 100 General

101 For thermal oil heaters the following will be assessed:

- tightness of the installation
- external condition of coils heated by
 - oil or gas burner(s)
 - exhaust gases
- functional testing of plant instrumentation and safety systems
- setting of liquid relief valves.

Guidance note:

Safety valves may be set and tested hydraulically in a test bench

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- condition of oil burning equipment
- condition of fire extinguishing system
- soot blowing arrangements including automatic operation
- exhaust gas bypass arrangement
- fire fighting arrangement
- drainage of fire fighting/cleaning water.

102 Assessment of laboratory analysis report of thermal oil in circulation will be part of the survey.

If the laboratory analysis reveals, either:

- chemical degrading of oil in circulation
- contamination by low flashpoint petrochemical products
- contamination by carbon particles,

one or more of the following actions shall be initiated by the owner, and verified by the Society:

- selected sections of heating coils and/or piping internally examined for accumulation of coke deposits
- chemical cleaning of the piping system
- circulating pumps opened for examination
- oil charge replaced.

G 200 Testing

201 Testing shall be witnessed by a DNV surveyor.

202 Performance test

Instrumentation, automatic equipment and remote control systems shall be subjected to testing and verification that flow of thermal oil has not been restricted.

203 Hydraulic pressure testing

For coils in thermal oil installations heated by oil or gas burner(s) or by exhaust, which are not accessible for

visual external inspection, survey may be performed by hydraulic pressure testing 1.5 times the calculated working pressure.

The test pressure shall be maintained for a period of at least 30 minutes.

SECTION 6 OPTIONAL CLASS NOTATION SURVEYS

A. Fire Fighting Installations

A 100 General

101 The requirements in this sub-section apply to vessels with class notation:

Fire Fighter I or

Fire Fighter II or

Fire Fighter III or

Fire Fighter Capability

A 200 Complete survey (2.5 years)

201 Water spray plant for self protection, including pumps, pipes and nozzles, shall be surveyed and tested.

202 Pumps for water monitors including their prime movers shall be surveyed and tested at maximum capacity. Remote control of monitors including valve operation shall be tested.

203 Hoses with their equipment shall be surveyed and tested.

204 Firefighters' outfits and compressors for charging the air bottles shall be surveyed.

205 Floodlights shall be tested.

206 It shall be verified that the required operation manual is in order.

207 For ships with class notation **Fire Fighter II**, or **Fire Fighter III** or **Fire Fighter Capability** the survey shall include examination of the mobile generator for foam production with its equipment.

208 For ships with class notation **Fire Fighter III** or **Fire Fighter Capability** the survey shall include examination of the fixed foam monitors with foam production equipment and remote control.

B. Well Stimulation Installations

B 100 General

101 The requirements in this sub-section apply to ships with class notation:

Well Stimulation Vessel

102 Survey requirements for installed equipment, systems and features which are generally covered by classification, are included in the main class surveys.

B 200 Annual survey

201 The flexible high pressure hose including end connectors shall be hydraulically pressure tested to 1.25 times its maximum working pressure.

202 The survey shall include examination and testing of:

- emergency remote stop of pumps and shut-off of liquid nitrogen supply valves
- tank level gauges
- tank level alarms and liquid leakage alarms
- hydrogen and oxygen detection and alarm system
- hydrogen and oxygen detection and alarm system
- decontamination showers and eye washes
- personnel protective equipment.

B 300 Complete survey (5 years)

301 Liquid nitrogen tanks shall be inspected internally. On highly stressed parts, non-destructive testing may be required if considered necessary by the surveyor. The tanks shall be hydrostatically, hydropneumatically or otherwise pressure tested to their MARVS (Maximum Allowable Relief Valve Setting).

302 Acid tanks shall be examined internally.

303 All pressure relief valves shall be opened for survey, adjusted, sealed and function tested.

- 304 Pressure/vacuum relief valves for the acid tanks shall be surveyed and tested for proper function.
- 305 Spot checking by NDT of the high pressure piping shall be carried out.
- 306 The nitrogen vaporiser shall be opened for internal inspection and hydraulically tested to 1.25 times its maximum working pressure after reassembly.
- 307 The high pressure piping shall be hydraulically tested to 1.25 times its maximum working pressure.
- 308 The emergency depressurisation and disconnecting of the transfer hose shall be tested.

C. Reception Systems for Recovered Oil

C 100 General

101 The requirements in this sub-section apply to ships with class notation:

OILREC

102 Survey requirements for installed equipment, systems and features which are generally covered by classification, are included in the main class surveys.

C 200 Complete survey (2.5 years)

201 The survey is normally to include examination of the following components and arrangements:

- tanks intended for storage of recovered oil if the tanks are not separated from the engine room by cofferdams
- piping system for oil recovery operations. If recovered oil is led into tanks through hatch openings, the existence of special hatch covers to prevent gas outflow through the openings shall be verified
- blanking-off arrangements for pipe systems not in use during oil recovery operations
- disconnecting arrangements of non-certified electrical equipment in spaces adjacent to tanks for recovered oil and on open deck
- dry powder fire extinguishers including hoses
- portable hydrocarbon gas-measuring instrument
- electrical equipment certified for use in gas dangerous areas
- instruction book for oil recovery operations and signboards.

D. Refrigerated Cargo Plants

D 100 General

101 The requirements in this sub-section apply to ships with class notation:

Reefer or RM or RM CONTAINER or KMC or CA or CA (port.)

102 Survey requirements for installed equipment, systems and features which are generally covered by classification, are included in the main class surveys.

D 200 Annual survey

201 The refrigerating plant, with machinery and equipment, shall be surveyed in running condition, preferably without cargo onboard. Temperature- and capacity control systems as well as alarm and shut-down systems shall be checked.

202 A tightness test shall be carried out of refrigerant systems with odourless refrigerants. Systems with a refrigerant with distinct odour and brine systems shall be inspected for tightness.

203 The freezing point (density) and acidity (pH value) of the brine shall be checked.

204 Thermometers and other equipment for measuring temperature in holds, chambers, air ducts, RSW tanks, freezing tunnels and plate freezers shall be surveyed and their accuracy checked to the extent found necessary by the surveyor.

205 CO₂ detectors, if required installed, shall be checked.

206 For ships with class notation **CA** or **CA (port.)** the survey shall include:

a) examination and testing of the controlled atmosphere installation as follows:

- check that P/V-valves are operational
- examination of cleats, hinges, catches and locks for hatches and doors

- examination of seals and gaskets on hatches and doors
 - spot check of interlocks on inlet valve arrangement
 - examination of required ventilation fans during operation
 - examination of portable ventilators
 - spot check of N₂ release prealarm
 - spot check of water seals
 - examination of the N₂ generating unit during operation
 - if arranged, examination of the CO₂ scrubber(s) during operation
 - examination and spot check of gas analysing and monitoring equipment, including fixed equipment, portable equipment for chamber or space monitoring and portable equipment for personal protection. Calibration records and procedures shall be checked. Use and availability of certified test gases shall be confirmed
 - verification of satisfactory maintenance and function testing procedures for instrumentation. Spot check of monitoring, alarm and safety functions
 - all signboards on the entrances to rooms adjacent to CA chambers shall be checked. The signboards shall be in accordance with the approved instruction manual
 - locks on doors and hatches to be checked. For number and location of locks, see approved instruction manual.
- b) tightness testing with air of all CA chambers or gastight groups of chambers, to the design overpressure. The pressure drop during 15 minutes shall not exceed 30% of the design overpressure. Testing by the vessel's master carried out maximum one month prior to the survey may be accepted based on written report by the master and provided the visual inspection does not cause doubts about the tightness.
- c) verification that the approved instruction manual is onboard, is complete and that the responsible officers are familiar with its content.

D 300 Complete survey (5 years)

301 The refrigerating plant with machinery and equipment shall be tested while cooling down from ambient temperature to the lowest design temperature for the chambers. The ability to maintain stable delivery air temperature at all design chamber temperatures shall be demonstrated. Satisfactory operation during defrosting shall be demonstrated.

302 The insulation shall be examined for cold spots when the chambers are at the lowest design temperature.

303 Sufficient areas of insulation shall be stripped from the holds, air trunks, pressure vessels, piping and other insulated parts in order to assess the condition of the insulated steel and the insulation itself.

304 At the second and all subsequent complete surveys pressure vessels with R717 shall be examined internally with regard to possible ammonia stress corrosion cracking.

305 Reciprocating compressors may be required opened up for examination, if found necessary by the surveyor. Screw- and turbo-type compressors may be examined without opening up, provided they are test-run to the surveyor's satisfaction.

306 Air coolers, freezing tunnels and plate freezers shall be examined.

307 Condenser cooling water pumps, brine pumps and RSW pumps shall be opened up and examined.

308 Brine and RSW piping systems shall be examined at working pressure.

309 Water side of water cooled condensers and brine side of brine coolers shall be opened up for examination of tubes, tube plates and end covers.

310 Pressure gauges, thermometers and automatic controls and alarms shall be tested.

311 Pressure relief valves and safety discs shall be examined externally and on the outlet side after dismantling of outlet piping and possible external bodies. The tightness over the seat shall be verified. Testing or opening up is required only when specially deemed necessary by the surveyor. Discharge piping shall be examined with regard to integrity and non-obstructed flow.

312 For ships with class notation **CA** or **CA (port.)** the survey shall include:

- examination and testing of the complete controlled atmosphere installation. Air compressors, pressure vessels and other machinery components shall be surveyed in accordance with the principles of the main class machinery renewal survey
- tightness testing with air of all CA chambers or gastight groups of chambers, to the design overpressure. The testing shall be carried out in the presence of the surveyor, and the pressure drop during 15 minutes shall not exceed 30% of the design overpressure
- examination of all entrances to CA chambers, through running pipes, hatches and other connections from adjacent spaces, with respect to corrosion, damaged gaskets and other items which may affect the tightness between CA chambers and adjacent spaces
- testing of gas separating and absorption units, with regard to capacity and quality of the produced gas.

D 400 Survey in loading port, upon request

401 The Society may upon request carry out surveys of refrigerated cargo installations in the loading port for such cargo. Such surveys are not mandatory for retention of class.

The chambers shall be examined in an empty state to ascertain that they are clean and free from odour, that the dunnage ribs are in good order, and that no damage has been sustained to the aid ducts, facing or insulation.

The surveyor shall ascertain that all pipes for the drainage of the chambers and the drip pans are in good working order. The temperatures in the chambers shall be recorded, and the condition of the remote thermometers shall be checked. It shall be ascertained that the plant is free from leakage.

E. Arrangement for Carriage of Dangerous Goods

E 100 General

101 The requirements in this sub-section apply to ships with class notation:

DG-P or **DG-B**

E 200 Complete survey (5 years)

201 These survey requirements are applicable to all types of cargo spaces and classes of dangerous goods.

202 It shall be verified that the following documents are available onboard:

- International Maritime Dangerous Goods Code (IMDG), IMO Res. A.81(IV), as amended.
- Relevant sections and the related parts of Appendix B of the Code of Safe Practice for Solid Bulk Cargoes (BCCode), IMO Res. A.434(XI), as amended.
- The IMO/WHO/ILO Medical First Aid Guide for Use in Accidents Involving Dangerous Goods (MFAG), 1982.

203 The following shall be surveyed and tested as applicable:

- electrical installation in cargo spaces
- ventilation system for cargo spaces
- separate bilge pumping system or drainage for cargo spaces
- personnel protective clothing and breathing apparatus
- portable fire extinguishers for cargo spaces
- insulation of machinery space boundaries
- water spray system on open Ro-Ro cargo spaces.

F. Cranes

F 100 General

101 The requirements in this sub-section apply to ships with class notation:

Crane Vessel, Crane Barge or **CRANE** or **CRANE(N)**

F 200 Annual survey

201 An overall survey shall be carried out with particular emphasis on structural integrity, including examination of:

- wire ropes and end attachments
- blocks and sheaves
- hooks with accessories
- shackles
- bearings of boom heel and eyebolt connections
- securing arrangement for crane during passages.

202 Slewing system (slewing bearing or hook rollers) including tightness of bolts shall be examined as found necessary by the surveyor.

203 Examination and functional testing shall be carried out as found necessary by the surveyor for the following:

- correct adjustment of brakes
- resistance measurement of electrical systems
- leakages in hydraulic system

- safety devices
- emergency stop function
- fire extinguisher.

204 It shall be verified that the load charts, marking and components certificates are available and in order.

F 300 Complete survey (5 years)

301 Thickness measurements of structural parts shall be carried out as far as deemed necessary.

302 The following components shall be dismantled (opened up) and/or checked by MPI (magnetic particle inspection):

- boom heel bearings
- fixed sheaves
- blocks
- axle pin and housing
- eyebolt connections
- hooks, ring and balls.

303 Slewing ring shall be opened up, and internal fillets, raceway and bolts shall be subjected to MPI.

Alternatively, if a crane has an approved securing device (retainer) fitted, opening up is not required, but at least 50% of the holding down bolts shall be drawn and subjected to MPI.

304 Flatness and condition of bearing mounting flanges shall be checked.

305 A load test, as outlined on Form No. CG 2 in the DNV Standard for Certification No. 2.22 “Lifting Appliances”, shall be carried out.

G. Cable Laying Installations

G 100 General

101 The requirements in this sub-section apply to ships with class notation:

Cable Laying Vessel/Barge

G 200 Annual survey

201 An overall survey shall be carried out and shall include:

- hydraulic systems
- function testing.

G 300 Complete survey (5 years)

301 Bearings and shafts of revolving equipment shall be opened up for examination.

302 Gear wheel and pinions of cable winch shall be checked.

303 Resistance measurements of electrical systems related to cable laying systems shall be carried out.

H. Helicopter Decks

H 100 General

101 The requirements in this sub-section apply to ships with class notation:

HELDK

H 200 Complete survey (5 years)

201 The survey required is normally to include examination of the following components and arrangements:

- drainage arrangements
- surface protection on wooden decks
- safety net
- lashing arrangements for the helicopter
- arrangement for the prevention of sliding
- helicopter deck including supporting structure.

I. Diving Systems

I 100 General

101 The requirements in this sub-section apply to ships with class notation:

DSV-SURFACE or **DSV-SAT** and Diving systems with class notation **-SAT** or **-SURFACE**.

102 The requirements also apply to transferable diving systems, where the regular periodical surveys are carried out when such systems are in service.

When transferable diving systems are out of commission, annual surveys as described in C500 are carried out.

103 Survey requirements by a recognised classification society apply to all diving systems on vessels classed by the Society.

104 A *Survey Planning Document* shall be part of the documentation on board for the lifetime of the diving system.

105 For transferable diving systems, the *Survey Planning Document* shall specify scope for surveys when the system is installed and for surveys when the system is in storage (laid-up).

106 The *Survey Planning Document* shall be written in English (or translated into English), and approved by the Society prior to the survey taking place. Checklists shall be included, as attachments.

It shall have the following information printed on the front page:

- "DSV Survey Planning Document " (title)
- name of support vessel or installation given in the Classification Register
- the Society's identity number given in the Classification Register
- IMO number (for statutory surveys)
- name of company
- revision number and date.

Guidance note:

A *Survey Planning Document* gives owners and surveyors a chance to tailor the instructions to fit each individual system or component and thereby avoid misunderstandings often encountered with respect to the application of generic requirements. This may also streamline the surveys in consideration of the operational situations in each case.

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107 Checklists shall be made available for the surveyor to fill out and endorse at each survey. The checklists shall include the following information at the top of each page:

- name of support vessel or installation given in the Classification Register
- the Society's identity number given in the Classification Register
- IMO number (for statutory surveys)
- page number
- name of company
- scope of survey (Annual, Intermediate, Renewal or otherwise)
- in columns:
Survey item, Condition, Action, Comment.

I 200 Annual survey

201 The survey is normally to include:

- calibration of essential instrumentation (depth gauges, gas analysers etc.)
- switching from main to emergency electrical power supply
- emergency systems including bell emergencies (buoyancy if applicable)
- functional and power testing of normal and emergency systems of the bell handling system shall be carried out with a load of at least 1.25 times the working weight in the most unfavourable position
- partly dismounting of heat protection and penetrators on the bell may be required.

Detailed specification of test requirements are given in the relevant sections of DNV-OSS-305 "Rules for Certification and Verification of Diving Systems" and the accompanying standard DNV-OS-E402 "Offshore Standard for Diving Systems".

I 300 Intermediate survey

301 The following tests shall be carried out:

- gas leak tests
- testing of safety valves

- functional test of fire detection-, alarm- and extinction systems
- functional tests of life support systems
- functional tests of alarm systems
- functional tests of mechanical and electrical systems.

I 400 Complete survey (5 years)

401 Bell buoyancy materials, heat protection, penetrators, windows and attached members shall be dismantled for inspection for possible corrosion and deterioration.

402 Pressure tests and inspections shall be carried out according to an approved procedure given as part of the *Survey Planning Document*, and following the principles given in items 406 and 407.

Test pressure shall be stamped on the pressure vessels according to the design code or, in the case of welded pressure vessels, engraved on an attached tag.

Applicable codes, standards and regional requirements shall be specified in the procedure.

Pressure testing shall be carried out according to the design code of the pressure vessel and to international standards for such testing.

The test pressure shall be as stamped on the pressure vessel and given in the accompanying certificate.

Guidance note:

International testing standards include EN 1968 "Transportable gas cylinders - Periodic inspection and testing of seamless steel gas cylinders".

The applicable working pressure and corresponding filling ratios should meet the requirements in BS5355 "Filling ratios and developed pressures for liquefiable and permanent gases" or equivalent standard.

Regional requirements may also apply, such as the HSE Approved Specification Number CP1-3T "Specification for Large seamless steel (897 to 1069 N/mm²) Transportable Gas Containers" or Code of Federal Regulations Title 49 Ch.I Part 178 Subpart C Sec.178.45 "Specification 3T seamless steel cylinder". (CITE: 49CFR178.45 US DOT).

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403 Proof test or volumetric expansion test shall be carried out according to that which is required by the design code or regional requirements.

404 Downgrading of chambers may be requested either:

- to carry out periodical pressure testing after ten years pneumatically at a reduced pressure, or
- after installation of view-ports with a lower design pressure than the chamber, or
- after any other causes which do not imply a reduction of strength of the pressure vessel.

The procedure necessitates re-stamping of the pressure vessel, and issue of Memo to Owners (MO). The MO shall include the necessary information with respect to:

- the new maximum operating pressure of the diving system, and
- the reasons behind the downgrading.

405 Pneumatic testing shall not be carried out at pressures above the design working pressure.

406 At 1st Complete survey the interval for hydraulic pressure testing of gas containers may be extended to 10 years if the following principles are applied:

- External and internal survey by intrascope.
- If internal survey is not possible or if corrosion or other items of concern are found, hydraulic test shall be carried out to the test pressure determined by the design code.

At all subsequent Complete periodical surveys:

- External and internal survey by intrascope.
- Hydraulic test to the test pressure determined by the design code.

407 At 1st Complete survey the interval for hydraulic pressure testing of bell and chambers may be extended to 10 years if the following principles are applied:

- External and internal survey.
- If internal survey is not entirely possible or if corrosion or other items of concern are found, hydraulic test shall be carried out to the test pressure determined by the design code.
- Alternatively, pneumatic test to the working pressure may be carried out and the pressure vessel down graded, see 404

At all subsequent Complete periodical surveys:

- External and internal survey.

- Hydraulic test to the test pressure determined by the design code.
- Alternatively, pneumatic test to the working pressure may be carried out and the pressure vessel down graded, see 404

408 The working weight of the bell shall be checked.

409 A test of the bell handling system with a static load equal to the design load shall be carried out.

410 If applicable the bell's releasable ballast system with attachments shall be structurally tested with a static load 1.5 times the weight of the ballast in air.

411 Viewports with an age of 10 years or more shall be changed unless a special survey warrants an extension.

The special survey shall be carried out to a procedure approved by the Society in accordance with ASME PVHO-2-2002 "In-Service Guidelines for PVHO acrylic windows".

I 500 Survey of diving systems 'out of commission'

501 Diving systems which have been out of commission, i.e. laid up, for a period normally of at least 12 months, shall be surveyed and tested before re-entering service. The extent of the surveys and tests will be considered in each case depending upon:

- the time the diving system has been out of commission
- the maintenance and preservative measures taken during lay-up
- the extent of surveys carried out during this time.

As a minimum, a sea trial for function testing of the diving system shall be carried out.

502 During lay-up, diving system shall be subjected to a lay-up survey on an annual basis.

The extent of the lay-up survey is reduced compared to the regular annual survey, but shall cover system integrity, planned maintenance system, fire protection and equipment in use.

503 If the lay-up period is more than 12 months, other periodical surveys may be postponed, depending on the maintenance and preservative measures taken during lay-up.

J. De-icing or Anti-icing Systems

J 100 General

101 The requirements in this sub-section apply to ships with class notation:

DEICE or **DEICE-C**

J 200 Annual survey

201 Visual inspection of anti-icing and de-icing switchboards and confirm heating load on each circuit according to marking on the switchboards.

202 Examination of equipment for de-icing and anti-icing including:

- heaters
- covers
- equipment for manual de-icing
- radar equipment
- heating coils
- steam tracing lines.

K. Additional Fire Protection Arrangements

K 100 General

101 The requirements in this sub-section apply to ships with class notation:

F-A or **F-M** or **F-C** or **F-AM** or **F-AC** or **F-MC** or **F-AMC**

102 For ships with the previously given class notation:

F

the requirements are applicable as far as they are relevant.

K 200 Complete survey (2.5 years)

201 Fire pumps including emergency fire pump and prime movers shall be examined and tested.

202 Firefighters' outfits and compressors for charging of air bottles shall be examined.

203 For ships with class notation including the letter **A** (for accommodation spaces) the survey shall include:

- examination of fire retarding partitions in the accommodation
- examination and testing of automatic fire-detecting and alarm systems including release arrangement for self-closing doors in passageways, stairways and machinery casings
- examination of hose stations in the accommodation together with their equipment.

204 For ships with class notation **F-M** the survey shall include:

- examination and test of main and local extinguishing systems in engine and boiler rooms including detection and alarm arrangements. The quantity of extinguishing medium shall be checked
- survey of portable dry powder fire extinguishers and spare charges
- survey of hose stations in the engine and boiler rooms together with their equipment
- review of the report resulting from the annual "infrared scanning".

Guidance note:

An infrared scanning of all engines and similar equipment shall be carried out on an annual basis - as prescribed in Pt.6 Ch.4 Sec.3.

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L. Dynamic Positioning Systems

L 100 General

101 These rules do not include verification of requirements or recommendations in regard to the vessels operation or other characteristics.

102 The owner shall advise the Society of major alterations to the DP system hardware or software.

The owner may, however, assign the task of advising the Society to a responsible body, representing the owner, e.g. the manufacturer.

The Society will consider the need for documentation, re-survey or test.

Guidance note:

In addition to renewal of the DP controller hardware or software, a major alteration might also be:

- installation of a new position reference system or other sensor interfaced to the DP-control system
- installation of new thrusters
- software changes
- structural changes
- changes in power system.

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103 The requirements in this sub-section apply to ships with class notations for dynamic positioning systems. This being **DYNPOS-AUTS** or **DYNPOS-AUT** or **DYNPOS-AUTR** or **DYNPOS-AUTRO** or **DPS 0** or **DPS 1** or **DPS 2** or **DPS 3**, and to ships with previous corresponding class notations.

104 The requirements in sub-sections L400 and L500 apply to ships with class notation:

DPS 0, or

DPS 1, or

DPS 2, or

DPS 3.

105 For vessels with qualifier **(A)** given as:

DYNPOS-AUTR(A) or

DYNPOS-AUTRO(A) or

DPS 2(A) or

DPS 3(A)

notations, also the annual survey shall be carried out in accordance with the requirement for complete survey,

as given in L300 or L500 as applicable.

106 For class notations with the qualifier **(A)** an updated FMEA report with a corresponding FMEA test program shall be kept onboard, and shall be used as basis for the testing.

L 200 Annual survey

201 System maintenance documentation, including information regarding hardware and software changes, shall be reviewed.

Guidance note:

This requirement includes, in addition to the DP-control system, the joystick control system and other systems necessary for performing position keeping, e.g. thruster control system.

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202 The electrical installation in excess of the main class requirements shall be visually inspected, i.e. installations comprising the DP system, e.g. controllers and operating stations for DP and independent joystick, references systems, sensors and mode change system.

203 The technical condition of the DP system shall be verified during the survey.

Guidance note 1:

Verification of the technical condition of the DP system denotes testing to verify that the DP system is capable of positioning the vessel, and thus validating that system functionality is in place.

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Guidance note 2:

Testing should preferably be done during a sea trial. However, in the case where this is inconvenient (e.g. the vessel is in the middle of a long term operation) the survey may be performed during regular operations. This may imply that it may not be possible to test all different operational modes.

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204 If the survey is carried out when the vessel is undergoing regular operations, then tests that possibly can introduce unacceptable risks shall not be performed.

205 Capacity of UPSs and other battery systems serving the DP-control system, including its peripherals, shall be verified. The alarm for loss of charging power shall be verified.

Guidance note:

If the survey is carried out during regular operations, then the capacity of the batteries need not be proven by testing.

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206 For class notation **DYNPOS-AUTRO**, normal working condition of the back-up DP-control system shall be verified.

Guidance note:

If the survey is carried out during regular operations, then control need not be transferred to the back-up DP-control system.

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207 Emergency stop of thrusters from the DP-control centre shall be tested. If the survey is carried out when the vessel is undergoing regular operations, then testing shall not be performed if there is any possibility of introducing unacceptable risks.

L 300 Complete survey (5 years)

301 With the vessel in DP mode, a sea trial shall be performed.

302 The complete system shall be tested in all operational modes. The testing shall include simulation of different failure conditions to verify switching of modes, back-up systems and the alarm system.

303 The different modes of thruster control from the DP control centre(s) shall be tested:

- manual control
- joystick control (independent joystick, if installed)
- DP control
- transfer of control.

Manual override i.e. by thruster lever control and independent joystick control shall be demonstrated during normal operation and during failure conditions.

304 Emergency stop of DP thrusters from DP-control centre to be tested.

305 All sensors, peripheral equipment and reference systems shall be tested:

- verify correct operation and adequate accuracy
- failure of sensors and reference systems shall be simulated to check the alarm system and the switching logic
- switch-over between reference systems as input to controller shall be carried out to assure that warnings, alarms and information to operator are satisfactory.

Guidance note 1:

Due to practicalities some reference systems may be unavailable during the tests. In such cases the testing can be performed by the crew as soon as possible after survey. When testing is left to the crew this must be recorded in the survey report, and a condition of class or memo to owner must be issued. The condition of class or memo to owner can be deleted based on a signed test report from the master.

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Guidance note 2:

The survey of the thruster unit shall be carried out as for thrusters for propulsion and DP, see Sec.5 C. Surveys of the thrusters are separate survey elements and these surveys do not need to take place at the same time as the DP survey.

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306 Alarm for loss of position and heading out of limit shall be demonstrated.

307 The electrical installation in excess of the main class requirements, shall be visually inspected, i.e. installations comprising the DP system, e.g. controllers and operating stations for DP and independent joystick, references systems, sensors and mode change system.

308 Single failures in thruster control systems including signal wire breaks of thruster command and feedback signals shall be tested in order to verify safe response on the thrust output. Equivalent testing may also be required for rudders controlled by the DP-control system.

309 Overload prevention shall be tested.

Guidance note:

If it is possible to induce overload by setting out thrust command from the DP-control system (e.g. by use of joystick function) then the overload protection function (e.g. pitch reduction) shall be tested.

System configuration and/or available power considerations may lead to this test being omitted.

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310 Capacity of UPSs and other battery systems serving the DP-control system including it peripherals shall be verified by testing. Alarm for loss of charging power shall also be verified.

311 For class notations **DYNPOS-AUTR** and **DYNPOS-AUTRO** the required redundancy with respect to defined single failures modes shall be verified by redundancy testing.

312 For class notations **DYNPOS-AUTR** and **DYNPOS-AUTRO** the FMEA report and FMEA test program shall be verified to ensure that they have been updated when alterations have been done.

Guidance note:

This requirement is only valid for vessels with class request after 1. July 2004.

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313 For class notations **DYNPOS-AUTR** and **DYNPOS-AUTRO** correct functioning of the Consequence Analysis facility shall be verified as far as possible.

314 For class notation **DYNPOS-AUTRO** testing shall also be performed on the back-up DP-control system. Switchover to back-up shall be tested, and monitoring of back-up control system status on the main control system shall be verified.

L 400 Annual survey

401 A survey covering the scope described in L200 shall be carried out.

Guidance note 1:

DPS 0 shall follow the scope for **DYNPOS-AUTS**,

DPS 1 shall follow the scope for **DYNPOS-AUT**,

DPS 2 shall follow the scope for **DYNPOS-AUTR**,

and **DPS 3** shall follow the scope for **DYNPOS-AUTRO**, as far as possible.

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Guidance note 2:

Class entry vessels coming from other class societies with class notation:

DPS 0, or

DPS 1, or

DPS 2, or

DPS 3,

may have deviations from Pt.6 Ch.7, see also L202 above.

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L 500 Complete survey (5 years)

501 A survey covering the scope described in L300 shall be carried out

Guidance note 1:

DPS 0 shall follow the scope for **DYNPOS-AUTS**,

DPS 1 shall follow the scope for **DYNPOS-AUT**,

DPS 2 shall follow the scope for **DYNPOS-AUTR**,

and **DPS 3** shall follow the scope for **DYNPOS-AUTRO**, as far as possible.

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Guidance note 2:

Class entry vessels coming from other class societies with class notation

DPS 0, or

DPS 1, or

DPS 2, or

DPS 3,

may have deviations from Pt.6 Ch.7, which may make some of the items listed in L301-L314, inapplicable.

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M. Nautical Safety

M 100 General

101 The requirements in this sub-section apply to vessels with class notation:

- **NAUT** including qualifiers **AW**, **OC**, **OSV(A)**, **OSV(T)**, **NAVY**, **Q**, **A**, **B** and **C**
- **W1** including qualifiers **OC** and **Q**
- **NAV-O**, item 201 only.

M 200 Annual survey

201 Navigation related requirements of the Cargo Ship Safety Equipment Annual Survey shall be performed.

202 The functional status of the navigational equipment shall be verified, including information of any changes to software and hardware which have been logged.

203 For software and/or hardware changes of the Integrated Navigation System (e.g. comprising track control system or heading control), a sea trial to verify system performance may be required.

204 For vessels with qualifier **Q**, the qualification assurance system, operational procedures and certificates of competence shall be examined to verify compliance with Pt.6 Ch.8 Sec.9.

M 300 Complete survey (5 years)

301 The function of navigation bridge equipment shall be verified:

- adjustable lights in instruments and at workstations
- temperature and ventilation control systems
- de-misting and de-icing systems, if provided
- fresh water window washing systems
- window wipers
- sunscreens
- lighting, white and red.

302 The bridge alarm management system shall be tested for:

- automatic reset of monitoring system (only for qualifiers **OSV(A)** and **OSV(T)**)
- release of transfer alarm.

The central alarm panel shall be tested for transfer of non-acknowledged alarms and warnings relating to:

- cross track distance (XTD)
- automatic radar plotting aid (ARPA).

The automatic radar plotting aid (ARPA) shall be tested for the time to the closest point of approach (TCPA) alarm.

The function shall be verified for:

- track control system, if installed.

303 For vessels with qualifier **AW** or class notation **W1**, the survey shall include:

- function verification of the grounding avoidance system (GAS)
- examination of documentation or poster providing information on the vessel's manoeuvring characteristics
- examination of the contents of the manoeuvring booklet
- testing of the conning information display (also for qualifier **NAVY**)
- verification of chart radar function (also for qualifiers **OSV(A)** or **OSV(T)**).

N. Hull Monitoring Systems

N 100 General

101 The requirements in this sub-section apply to ships with class notation:

HMON(...)

N 200 Annual survey

201 The following documents shall be present:

- user/operational manual for the system
- maintenance manual
- maintenance record (if applicable)
- calibration record for sensors.

Guidance note:

A yearly calibration of the sensors is required. The calibration may be carried out by the crew.

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202 The inspection of the hull monitoring system shall include verification of the following:

- that all dedicated **HMON(...)** sensors are functioning (visual inspection of display)
- that all connections to ship systems are functioning (visual inspection of display)
- that the UPS can power the system for at least 10 minutes
- that the deviation between the measured global still water bending moments (stresses) and global moments calculated by loading computer is within 5% of maximum permitted moments (stresses), and
- run the self-check procedure for the system, if applicable.

Guidance note:

Typical ship systems connected to the hull monitoring system are loading computer, GPS, speed log and gyro.

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Guidance note:

If data from the loading computer is not available for the present condition, historical data from last month may be used.

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O. Vapour Control Systems

O 100 General

101 The requirements in this sub-section apply to ships with class notation:

VCS-1 or **VCS-1B** or **VCS-2** or **VCS-2B** or **VCS-3**

102 Survey requirements for the optional class notations:

VCS-1, **VCS-2** and **VCS-3**

are partly covered by the main class requirements for tankers for oil and chemicals.

O 200 Complete survey (5 years)

201 The survey shall include:

- internal examination of deck tank for liquefied gas, if fitted, including piping, valves etc. and including NDT and thickness measurement as found necessary
- external examination and tightness testing of deck tank.

At the 2nd and 4th complete survey, and thereafter at each complete survey deck tanks shall be strength tested as specified in Sec.4 B508.

- examination, testing and sealing of deck tank safety relief valves
- examination and testing of cooling machinery and equipment.

202 For ships with class notation **VCS-1B** and **VCS-2B** the survey shall include examination and testing of the following instruments and equipment:

- the means to inert the vapour transfer hose
- oxygen analyser with alarms
- detonation arrester.

P. Clean Ships

P 100 General

101 The requirements in this sub-section apply to ships with class notation:

CLEAN or **CLEAN DESIGN**

P 200 Annual survey

201 The basic requirement is that the vessel holds a valid international pollution prevention certificate.

For the oil pollution prevention certificate, the following shall be checked onboard during survey:

- certificates for type approved oily water separating or filtering equipment, process unit and oil content meters
- oil record book entries
- approved SOPEP manual
- means of control of sludge
- standard discharge connection.

Additionally, the following shall be examined and tested, as applicable:

- oil filtering equipment (15 ppm) and process unit with alarm
- automatic stopping device (15 ppm)
- separation of oil fuel and water ballast system
- sludge tank and discharge arrangement externally.

202 In addition the following shall be checked or verified as applicable:

- all refrigerant consumption figures
- consumption figures for fire fighting substances with global warming potential (GWP) > 0
- garbage record book
- oil record books and cargo record book
- fuel oil log
- NO_x emission control equipment log, where applicable
- ballast water management log
- documentation of antifouling used during dry-dockings since last review.

Q. Tailshaft Monitoring

Q 100 General

101 The requirements in this sub-section apply to ships with class notation **TMON**.

102 A tailshaft condition monitoring arrangement (class notation **TMON**) will be granted for oil lubricated tailshafts that are monitored to ascertain the condition of the tailshaft system during operation, and that fulfils the design requirements in Pt.4 Ch.4 Sec.1 E300 provided a successful initial survey is carried out.

In such cases the Society will not require any specific time interval between propeller shaft withdrawal surveys.

103 Ships with more than 3 years since the last propeller shaft withdrawal are normally to carry out a propeller shaft survey as described in Sec.5 B in connection with the **TMON** initial survey.

Guidance note:

The requirement for a propeller shaft withdrawal at **TMON** initial survey may be waived on a case by case basis, provided that documentation showing satisfactory condition of the stern tube arrangement is presented to the Society. Such documentation, normally covering the last 3 years, should include:

- monthly measurements of stern tube bearing temperatures with corresponding sea water temperatures, oil consumption, water content in oil
- bearing clearances from new building and last dry docking and clearances calculated from wear down measurements since new building shall be presented, where available
- lub. oil analysis reports from accredited laboratory with conclusion, where available (ref. Q301 d).

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Q 200 Initial survey

201 The survey shall include:

- verification of correct readings of remote thermometers for stern tube bearing, seawater and alarm set point
- low level alarm for lubricating oil gravity tank and sealing gravity tanks to be tested
- a general survey of shafting and sealing arrangement shall be carried out
- verification that the oil sampling point is identified with signboard
- verification that a written procedure for taking representative oil samples is present onboard
- verification that electric grounding device is fitted on the propeller shaft.

Q 300 Annual survey

301 The survey shall include:

a) examination of the **TMON** record file:

- verification that the on board oil analysis for checking of water content in the stern tube lubricating oil has been performed monthly and recorded in the file by the Chief Engineer

Guidance note:

As an alternative to the monthly onboard checking of the water content in the oil, submitted lubricating oil samples to an accredited laboratory every 3 months is acceptable (ref. Q301 d) below).

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- verification that the stern tube bearing temperatures have been recorded every month with highest and lowest temperatures, with corresponding seawater temperatures
- verification that the consumption of stern tube lubricating oil has been recorded for every month by the Chief Engineer
- if there are performed any overhauls, complete oil changes or similar, this shall be recorded in the **TMON** record file on the overhaul page
- verify functionality of tailshaft grounding device, where applicable
- verification that wear down measurements have been taken at every dry-docking.

b) testing of stern tube aft bearing alarm

c) visual inspection of inner and outer shaft seal for leakage, as far as practicable

d) verification that documentation of laboratory analysis is kept on board:

- at least two oil samples per year shall be submitted to an accredited laboratory for analysis testing of water content, iron, chromium, copper, tin, silicon, sodium and magnesium
- the documentation shall contain a conclusion regarding the condition of the oil and its suitability for further use
- the report from the latest oil analysis shall be less than three months old.

R. Fuel Treatment and Condition Systems

R 100 General

101 The requirements in this sub-section apply to ships with class notation:

FUEL (-cSt, -kg/m³, -°C)

R 200 Annual survey

201 General examination of fuel oil separation system with focus on unapproved modifications and cleanliness.

202 Reference is made to survey requirements for the class notation **E0** regarding record of systematic maintenance and function testing. The review of maintenance and testing records, and additional testing, if necessary, shall also include the fuel class specific items:

- viscosity at engine inlet (high and low)
- temperature in service and settling tanks (high and low)
- pressure differential areas - fuel filters (high), and
- level in mixing tank (low).

203 Satisfactory operation of fuel oil separators shall be verified.

R 300 Complete survey (5 years)

301 Complete overhaul of fuel oil separators shall be carried out.

S. Loading Computers for Damage Control

S 100 General

101 The requirements in this sub-section apply to ships with class notation:

LCS-DC

S 200 Annual survey

201 It shall be checked that the approved in-service test programme for all sensors has been followed.

T. Arrangements for Carriage of Refrigerated Containers

T 100 General

101 The requirements in this sub-section apply to ships with class notation:

RC-1 or RC-2 or RC-3

T 200 Complete survey (5 years)

201 The survey shall include examination and testing, as applicable, of:

- control and alarm systems for ventilation, cargo hold temperature and cargo refrigerating system
- emergency shut down and closure of ventilation system
- cargo hold pressure/vacuum relief valve if fitted

U. Vibration Class

U 100 General

101 The requirements in this sub-section apply to ships with class notation:

VIBR

102 Before the notation can be issued, vibration measurements at the different positions and components, as described in the Protocol, shall be carried out. The Protocol is a table of positions to be measured worked out prior to the measurements based on a risk evaluation and experience. If minor excessive vibration levels are found for non-critical components or positions, dispensation may be given, which may also include a requirement for new measurements, after a limited period. This will be decided by the Society.

U 200 Complete survey (5 years)

201 Complete measurements at the different positions, as described in the Protocol, shall be carried out by or under the supervision of a surveyor of the Society.

V. Ballast Water Management

V 100 General

101 The requirements in this sub-section apply to ships with class notation:

BWM-E () or **BWM-EP ()** or **BWM-T**

V 200 Annual Survey

201 Ballast water management plan and ballast water record book shall be confirmed to be onboard and in use.

202 The structure, any equipment, systems, fittings, arrangements and materials and processes associated with the Ballast Water management plan shall be examined for compliance with the applicable requirements and verified in good working order.

W. Alternative Propulsion

W 100 Application

101 The requirements in this sub-section apply to ships with class notation:

AP-1(a%)(+) or **AP-2(a%)(+)** or **AP-3(a%)(+)**

W 200 Complete survey (2.5 years)

201 When the alternative propulsion system is part of the main propulsion system inspection of the alternative propulsion system with its components are considered covered by the rules laid down for main class. If the alternative propulsion system is not part of the main propulsion system the alternative propulsion system with its components shall be surveyed in accordance with requirements for dynamic positioning thrusters.

202 Starting-up of the alternative propulsion system shall be demonstrated when simulating failure which makes the main propulsion inoperable.

203 For **AP-2(a%)(+)** and **AP-3(a%)(+)**: Spot check of the tests in the FMEA test program shall be carried out, as a minimum:

- Partial black-out on the electrical power system
- Black-out on UPS/battery supplies
- Black-out on switchboard with dual power supplies.

204 For **AP-2(a%)(+)** and **AP-3(a%)(+)**: The FMEA report and FMEA test program shall be verified to ensure that they have been updated when alterations have been done.

X. Winterized Vessels

X 100 General

101 The requirements in this sub-section apply to ships with class notation:

WINTERIZED BASIC

WINTERIZED COLD (t₁, t₂)

WINTERIZED ARCTIC (t₁, t₂)

X 200 Annual survey

201 Anti-icing and de-icing switchboards shall be surveyed. It shall be verified that the heating load on each circuit is according to relevant marking on the switchboards.

202 The equipment for de-icing and anti-icing shall be examined, including the following items:

- heaters
- covers

- Equipment for manual de-icing
- radar equipment
- heating coils
- steam tracing lines.

203 Thermal protection suits including face masks, gloves and boots in sufficient number for all crew members to be verified on board.

204 For vessels with class notation **WINTERIZED COLD (t₁, t₂)** and **WINTERIZED ARCTIC (t₁, t₂)**, the ice search light on wheelhouse top shall be tested.

Y. Periodically unattended machinery spaces E0 and ECO

Y 100 General

101 The requirements in this sub-section apply to ships with class notation:

E0 or

ECO

Guidance note:

The annual and complete survey may in general be performed alongside or at anchor. However, the complete survey should if feasible include trials at sea, ref. 300.

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Y 200 Annual survey

201 The surveyor shall verify that the plan for periodic test of instruments required by the **E0** or **ECO** notation is available onboard. The plan may either be printed or electronic, but it must be evident that the contents are approved by DNV. The surveyor shall further verify that the plan includes a log/record of all successfully performed tests in accordance with the test intervals specified in the plan. All relevant testing of specific instruments shall be logged with date and signature.

The surveyor may require spot checks of critical instruments. If the records from periodical test are inadequate and not according to the plan, the surveyor may require extended testing of alarms and safety functions from the list.

For required contents of the plan for periodical test, refer to Pt.6 Ch.3 Sec.1.

202 Testing of instruments, referring to 201, shall in general include the physical sensor and the whole signal loop, and a verification of correct functionality including indication and alarming.

The test equipment shall be calibrated according to the manufacturers' instructions, at least every 5 years.

Guidance note:

Different ways of testing the field instruments may be applied, according to manufacturers' recommendations and as described in the plan for periodical test. Normally, the installation of the field instrument should allow for easy hook-up to a test kit (e.g. via a 3-way valve, thermo-well etc). Alternative test methods may be acceptable, e.g. by comparing two or more sensors measuring the same process parameter, hooking up a temporary reference test sensor, etc.

The test equipment necessary to perform the tests identified in the plan for periodical test may be kept on board or brought on board when needed.

Calibration of ship's test equipment may be carried out on board by comparison with a portable "master calibrating kit" which has been brought on board, and in turn has a valid calibration status. The ship's personnel may carry out the calibration and the ship's personnel may sign the documentation of the calibration.

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203 The extension alarm - and watch responsibility system shall be verified through spot checks. Duty instructions of how to change between attended / unattended mode and how to handle alarms in unattended mode shall be available on the bridge and in the engine room. This requirement applies to **E0** only.

204 Fire detection and alarming in case of fire in the unattended machinery spaces shall be verified through check/simulation and activation of fire detectors.

205 Remote start of the main fire pump shall be tested, if provided.

Y 300 Complete survey

301 The remote control system shall be verified to demonstrate stable control and operation of the propulsion system with its necessary auxiliaries, regardless of the type of propulsion. It shall be demonstrated that necessary ramping / controller functions are tuned to ensure that operation of the manoeuvring levers do not

cause shutdown, instability or damage to the propulsion machinery or power generating units, and hence that the necessary machinery control functions keep the process parameters within its normal operating range. The remote control system tests shall be carried out without manual assistance from the engine room, and all systems shall be in operation as normal for unattended machinery space.

Guidance note:

The general performance of the machinery plant is considered to be documented through daily operation. If testing at sea is not practicable, the extent of required tests should be considered in conjunction with the contents of the engine log book, records from periodical test and maintenance, eventual alternative surveys or possibly confirmation from the master.

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SECTION 7 OPTIONAL CLASS NOTATION SURVEYS – CONTINUED

A. Naval and Naval Support(...)

A 100 General

101 The requirements in this sub-section apply to ships with class notation:

Naval or Naval Support(...)

A 200 Annual survey

201 The survey shall, in addition to the requirements of annual survey given in Sec.2, include the requirements in this sub-section.

202 For ships with class notation **Naval** and **Naval Support(sys)**, the survey shall include examination of marking of cables (see Pt.5 Ch.14 Sec.8 G600).

203 For ships with class notation **Naval** and **Naval Support(sam)**, list of required signboards or notice plates shall be verified for:

- no smoking
- warning against use of electronic radiating equipment
- warning against use of inflammable liquid
- warning against activity which could compromise the safety of the ammunition
- observe anti static precautions.

204 For ships with class notation **Naval** and **Naval Support(sam)**, the survey shall include examination and testing as applicable in storage rooms for explosives:

- safety arrangement plan (posted)
- escape route plan (posted)
- supply lines for explosives
- temperature and humidity regulation
- temperature detectors
- water spray system (survey)
- water total flooding system (survey)
- securing arrangements for explosives.

205 For ships with class notation **Naval** and **Naval Support(rad haz)**, the following documentation shall be available onboard:

- up to date RADHAZ Control Document.

206 For ships with class notation **Naval** and **Naval Support(rad haz)**, the following protection measures shall be examined or tested as applicable:

- physical controls (interlocks, fences and locks)
- administrative controls (signs, operational procedures and training).

207 For ships with class notation **Naval** and **Naval Support(emc)**, the following documentation shall be available onboard:

- up to date EMC Management Control Document (EMCD).

208 For ships with class notation **Naval** and **Naval Support(emc)**, the following protection measures shall be examined or tested as applicable:

- markings of shielded zones
- signboards posted at access points and at cable penetrations into other shielded zones
- rooms containing electrostatic sensitive devices having signs for ESD protected area
- filters, attenuators and EMC gaskets.

A 300 Complete survey (5 years)

301 The survey shall, in addition to the requirements of renewal survey given in Sec.4, include the requirements in this sub-section.

302 The following shall be examined and tested as applicable for ships with class notation **Naval** and **Naval Support(fire)**:

- smoke evacuation systems
- remote control for fire extinguishing system at local workstations
- remote control for fans and dampers system at local workstations

303 The following shall be examined and tested as applicable for ships with class notation **Naval** and **Naval Support(sys)**:

- disabling of control system limitations for machinery systems
- anti-icing systems in air intakes for machinery space.
- remote control for bilge and ballast systems at local workstations
- remote control for seawater main system at local workstations
- remote control for pre-wetting system at local workstations
- remote control for electrical power supply system at local workstations.

304 A lightweight survey shall be carried out for ships with additional notation **Naval** or **Naval Support (stab)**. The lightweight survey shall be reported in accordance with Rules for Classification of High Speed, Light Craft and Naval Surface Craft, Pt.3 Ch.6 Sec.1 A300.

305 The craft should be re-inclined whenever, in comparison with the approved stability information, a deviation from the lightweight displacement exceeding 2% or a deviation of the longitudinal centre of gravity exceeding 1% of L is found or anticipated.

Guidance note:

A lightweight survey should be carried out to verify any changes in lightweight displacement and longitudinal centre of gravity.

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B. NAUTICUS(Operation)

B 100 General

101 The requirements in this sub-section apply to ships with class notation **NAUTICUS(Operation)**

102 *Nauticus 3D graphic model* consists of a three dimensional view of the entire hull structure and associated features. Other relevant elements of information may be linked to this model.

103 *Nauticus Ship Maintenance Toolbox* is a computer program for visualisation, calculation and documentation of the ship hull structure and related condition data, as well as supporting generation of repair and docking specifications.

B 200 Assignment of the class notation

201 Ships that have the Nauticus 3D graphic model and the Nauticus Ship Maintenance Toolbox may be given the class notation **NAUTICUS(Operation)**.

202 It is the responsibility of the Society to generate and maintain the Nauticus 3D graphic model. It is further the responsibility of the Owner to supply the drawings necessary to generate the Nauticus 3D graphic model.

203 It is the responsibility of the Society to develop and maintain the Nauticus Ship Maintenance Toolbox computer program.

204 The Nauticus 3D graphic model for a specific ship and its attached information may be of a confidential nature and will not be passed on to a third party without the owners written consent, except as provided in Pt.1 Ch.1 Sec.1 B600.

B 300 Retention of the class notation

301 Unless otherwise agreed between the involved parties, the notation **NAUTICUS(Operation)** is maintained upon change of ownership of a ship.

C. Special Purpose Ships (SPS)

C 100 General

101 The requirements in this sub-section apply to ships with class notation **SPS**.

102 Survey requirements for installed equipment, systems and features which are generally covered by classification, are included in the main class surveys.

103 Special purpose ships shall be subjected to the surveys as specified for a general dry cargo ship, except where Pt.5 Ch.7 Sec.18 requires that the ship be considered as though it is a passenger ship. This includes annual periodical surveys with respect to:

- stability and subdivision (watertight integrity), see Pt.5 Ch.7 Sec.18 B200 for application
- machinery installations, see Pt.5 Ch.7 Sec.18 B300 for application
- electrical installations, see Pt.5 Ch.7 Sec.18 B400 for application
- emergency source of power, see Pt.5 Ch.7 Sec.18 B500 for application
- fire protection, see Pt.5 Ch.7 Sec.18 B700 for application.

D. Easy Cleaning and Easy Loading

D 100 General

101 The requirements in this sub-section apply to ships with class notation **EC** and or **EL-2**, see Pt.5 Ch.2 Sec.5 H200 and H300.

D 200 Annual survey - class notation EC

201 The cleaning equipment and related construction shall be examined or tested as applicable:

- cleaning system
- separate or combined hold wash water holding/water ballast tank(s) and related access and equipment for internal cleaning of the tank(s)
- water and air supply lines to cargo holds
- handling davit for air driven mocking pump
- coating of cargo holds.

D 300 Annual survey - class notation EL-2

301 The following documentation shall be available onboard:

- documentation of each steps in the loading sequences and corresponding de-ballasting operation.

302 It shall be verified that the remote tank sounding and draught reading system is maintained and calibrated as recommended by the manufacturers.

E. NAUT- NAVY

E 100 General

101 The requirements in this sub-section apply to ships with class notation **NAUT- NAVY**, see Pt.6 Ch.17.

E 200 Annual survey

201 The following documentation shall be available onboard:

- up to date versions of nautical charts and publications covering the area of operation
- manoeuvring data
- certification for additional or replacement equipment.

202 The following shall be examined or tested as applicable:

- a) electronic position-fixing system
- b) radar systems
- c) compasses
- d) visual compass reading at the emergency steering position
- e) auto pilot
- f) speed log
- g) echo sounder
- h) rate of turn indicator
- i) night vision equipment (if provided)

- j) searchlights
- k) equipment in compliance with COLREG:
 - navigational lights
 - shapes
 - mast for hoisting signals
 - means of making sound signals.
- l) Automatic Radar Plotting Aid (ARPA)
- m) Electronic Chart Display Information System (ECDIS)
- n) heading/track control system
- o) sound reception system (if applicable)
- p) bridge alarm management system.

203 The bridge arrangement shall be examined to be in accordance with approved drawings.

Guidance note:

A statement from the navigating officer will be accepted where approved bridge design, layout and instrument location is not available.

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F. Nuclear, Biological and Chemical Protection (NBC)

F 100 General

101 The requirements apply for ships with the additional class notations:

- **NBC-1**
- **NBC-2**

The complete survey applies for ships with class notation **NBC-2**.

102 The NBC systems are subjected to periodical surveys to ascertain that the condition of the shelter and/or citadel is in order.

F 200 Annual survey

201 The survey shall include examination of the shelter and/or citadel checking its integrity, comprising examination of doors, air locks, hatches and openings into the NBC shelter and functional check of operation of remote indication of NBC- appliances' status (closures, pre-wetting valves, etc.).

202 The pre-wetting and wash-down system shall be surveyed comprising:

- visual examination of the system
- function control of remotely operated valves (water pressure is not required for this test)
- function test of the whole system to prove that full coverage is maintained.

203 The survey shall include examination of gas tight zones and divisions.

F 300 Complete survey (5 years)

301 The following shall be examined and or tested:

- the integrity and condition of cleansing stations, air locks and filter stations
- the citadel pressure for duration of ½ hour in fully closed down conditions with NBC filters or corresponding dummy filters engaged
- the environmental conditions (temperature) in engine rooms in use during closed down condition with the propulsion machinery at maximum power setting
- gas tight zones and divisions (examination and test).

G. SILENT

G 100 General

101 The requirements in this sub-section apply to vessels with class notation: **SILENT-**

G 200 Complete renewal survey (5 years)

201 The Society shall be notified immediately of any modifications which may influence noise radiation, e.g. any modifications to the propeller(s), main machinery or underwater hull.

Guidance note:

The Society will notify the owner as a consequence of modifications if new measurements are required in order to retain the class notation.

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202 The scope of the renewal survey is equivalent to the initial **SILENT**- Class notation measurement survey, ref. Pt.6 Ch.24 Sec.3.

H. Enhanced System Verification - SiO

H 100 General

101 The requirements in this sub-section apply to ships with class notation:

ESV - Enhanced System Verification

H 200 Hardware-In-the-Loop (HIL)

201 The requirements in this sub-section applies to ships with class notations

ESV-DP [HIL]

ESV-TAM [HIL]

202 The owner shall at all times during the operational phase advise the Society of major alterations to the target system hardware or software. The owner may, however, assign the task of advising the Society to a responsible body, representing the owner, e.g. the manufacturer.

The Society will require verification of major alterations in the form of:

- documentation and/or,
- functional testing with or without the HIL simulator and/or,
- failure testing with or without the HIL simulator.

The documentation and possible test programs shall be submitted to the Society, and if required the testing shall be witnessed by the Society, in order to verify that the changes can be accepted.

Guidance note:

In addition to renewal of the DP-controller software or hardware, a major alteration might also be:

- installation of a new position reference system or other sensor interfaced to the DP
- installation of new thrusters
- software changes
- structural changes
- changes in the power system.

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H 300 Annual survey

301 The annual survey shall be based on:

- the ESV test notation document (see Pt.6 Ch.22 Sec.2 Table B2, HIL test notation document)
- the target system hardware and software version numbers,
- change handling documentation for the ESV target system.

302 The ESV test notation document shall be updated with the hardware and software version numbers for the target system valid at the time of the survey. It shall be possible to identify these version numbers on the installed equipment and software onboard.

303 In the case of changes in the ESV test notation document, the differences shall be explained by means of change handling documentation.

304 In the case that major alterations are identified, the Society will require verification of the alterations according to 202.

305 In the case that no major alterations are identified, the survey can be credited, and the notation can be continued.

306 The ESV notation document shall be updated, filed onboard, and in addition submitted to the Society.

H 400 Complete survey (5 years)

401 The complete survey requires testing by use of an HIL-test simulator.

402 The test program for the complete HIL test survey shall be based on the previous HIL-test package scope and survey. The proposed test program shall be submitted to the Society for acceptance upfront the testing.

Guidance note:

The test scope should be updated to include tests which are considered to improve the verification of the target system. The need for updating the test program may originate from e.g.:

- changes in the target system
- experiences established since last HIL testing
- to vary and increase the total test scope during the system lifetime
- changes in the HIL test simulator tool.

The time frame for execution of the updated test program should be in the same range as the original onboard test.

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403 The ESV notation document shall be updated, filed onboard, and in addition submitted to the Society.

I. Tug, Towing, Anchor Handling, AHTS

I 100 General

101 The requirements in this sub-section apply to ships with class notations:

- **Tug**
- **Towing**
- **Anchor Handling**
- **AHTS**.

I 200 Annual survey

201 Winch and other equipment for towing and anchor handling made mandatory by the class notation shall be surveyed and function tested to the extent deemed necessary by the Surveyor, taking the manufacturers recommendation into account. The survey shall include function testing of emergency release systems.

J. Recycling

J 100 General

101 The requirements in this sub-section apply to vessels with class notation:

Recyclable.

J 200 Renewal Survey

201 Renewal survey of IHM shall be carried out at simultaneously with main class renewal survey. This survey shall verify that Part I of the Inventory of Hazardous Materials required by Regulation 5 of the 'Hong Kong Convention for the Safe and Environmentally Sound Recycling of Ships, 2009' SR/CONF/45 complies with the requirements of the Convention.

J 300 Occasional survey

301 An occasional survey, either general or partial, according to the circumstances, may be made at the request of the ship owner after a change, replacement, or significant repair of the structure, equipment, systems, fittings, arrangements and material. The survey shall be such as to ensure that any such change, replacement, or significant repair has been made in the way that the ship continues to comply with the requirements of the Convention, and that Part I of the Inventory is amended as necessary.

K. Dynamic Positioning Systems – Enhanced Reliability, DYNPOS-ER

K 100 General

101 These rules do not include verification of requirements or recommendations in regard to the vessels operation or other characteristics.

102 Owner obligations

The owner shall advise the Society of major alterations to the DP-system hardware or software.

The owner may, however, assign the task of advising the Society to a responsible body, representing the owner, e.g. the manufacturer.

The Society will consider the need for documentation, re-survey or test.

Guidance note:

In addition to renewal of the DP-controller, a major alteration might also be:

- installation of a new position reference system
- installation of new thrusters
- software changes
- structural changes
- changes in power system.

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103 For vessels with qualifier **(A)** the annual survey shall be carried out in accordance with the requirement for complete survey, as given in 300.

K 200 Annual survey

201 System maintenance documentation, including information regarding hardware and software changes, shall be reviewed.

Guidance note:

This requirement includes, in addition to the DP control systems, the independent joystick control system (if installed) and other systems necessary for performing position keeping, e.g. thruster control system.

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202 The electrical installation in excess of the main class requirements shall be visually inspected, i.e. installations comprising the dynamic positioning system, e.g. controllers and operating stations for DP, references systems, sensors and mode change system.

203 The technical condition of the DP system shall be verified during the survey.

Guidance note 1:

Verification of the technical condition of the DP system denotes testing to verify that the DP system is capable of positioning the vessel, and thus validating that system functionality is in place.

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Guidance note 2:

Testing should preferably be done during a sea trial. However, in the case where this is inconvenient (e.g. the vessel is in the middle of a long term operation) the survey may be performed during regular operations. This may imply that it may not be possible to test all different operational modes.

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204 Normal working condition of the main and alternative DP control system shall be verified.

205 The different modes of thruster control from the DP control centre(s) shall be tested:

- manual control
- main and alternative DP control (all relevant modes)
- transfer of control.

206 Manual override i.e. by thruster lever control shall be demonstrated.

207 Switchover to alternative DP control system shall be tested, and monitoring of alternative DP control system status on the main control system shall be verified.

208 If the survey is carried out when the vessel is undergoing regular operations, then tests that possibly can introduce unacceptable risks shall not be performed.

Guidance note:

If the survey is carried out during regular operations, then control need not be transferred from the main DP control system.

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209 Capacity of UPSs and other battery systems serving the DP control system, including its peripherals, shall be verified. The alarm for loss of charging power shall be verified.

Guidance note:

If the survey is carried out during regular operations, then the capacity of the batteries need not be proven by testing.

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210 Emergency stop of thrusters from the DP control centre shall be tested. If the survey is carried out when the vessel is undergoing regular operations, then testing shall not be performed if there is any possibility of introducing unacceptable risks.

K 300 Complete survey (5 years)

301 With the vessel in DP mode, a sea trial shall be performed.

302 The complete system shall be tested in all operational modes. The testing shall include simulation of different failure conditions to verify switching of modes, back-up systems, redundant systems and the alarm system.

303 The different modes of thruster control from the DP control centre(s) shall be tested:

- manual control
- main and alternative DP control (all relevant modes)
- transfer of control.

304 Manual override i.e. by thruster lever control shall be demonstrated during normal operation and during failure conditions.

305 Switchover to alternative DP control system shall be tested, and monitoring of alternative DP control system status on the main control system shall be verified

306 Emergency stop of DP thrusters from DP control centre to be tested. Alarms for loop failure shall be tested.

307 All sensors, peripheral equipment and reference systems shall be tested:

- verify correct operation and adequate accuracy
- failure of sensors and reference systems shall be simulated to check the alarm system and the switching logic
- switch-over between reference systems as input to controller shall be carried out to assure that warnings, alarms and information to operator are satisfactory.

Guidance note 1:

Due to practicalities some reference systems may be unavailable during the tests. In such cases the testing can be performed by the crew as soon as possible after survey. When testing is left to the crew this must be recorded in the survey report, and a condition of class or memo to owner must be issued. The condition of class or memo to owner can be deleted based on a signed test report from the master.

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Guidance note 2:

The survey of the thruster unit shall be carried out as for thrusters for propulsion and dynamic positioning, see Sec.5 C. Surveys of the thrusters are separate survey elements and these surveys do not need to take place at the same time as the DP survey.

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308 Alarm for loss of position and heading out of limit shall be demonstrated.

309 The electrical installation in excess of the main class requirements shall be visually inspected, i.e. installations comprising the dynamic positioning system, e.g. controllers and operating stations for DP, references systems, sensors and mode change system.

310 Overload prevention shall be tested.

Guidance note:

If it is possible to induce overload by setting out thrust command from the DP control system (e.g. by use of joystick function) then the overload protection function (e.g. pitch reduction) shall be tested.

System configuration and/or available power considerations may lead to this test being omitted.

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311 Capacity of UPSs and other battery systems serving the DP control system including it peripherals shall be verified by testing. Alarm for loss of charging power shall also be verified.

312 The required redundancy and single failure tolerance with respect to defined single failures shall be verified by redundancy testing in accordance with the FMEA report and FMEA test program. The FMEA report and FMEA test program shall be verified to ensure that they have been updated when alterations have been

done.

Guidance note:

The scope of testing will depend on the actual installation and will vary from vessel to vessel. The FMEA test program should be followed. Examples of typical failure testing are:

- Black-out testing of AC, DC and UPS systems according the redundancy groups
- Black-out testing of systems/components with dual power supply
- Functional testing of change-over mechanism and stand-by start being part of the redundancy
- I/O failure on control systems (E.g. thruster control system, DP control system, PMS)
- Network failures.

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313 Correct functioning of the Consequence Analysis facility shall be verified as far as possible.

SECTION 8 ALTERNATIVE SURVEY ARRANGEMENTS

A. General

A 100 General overview of survey arrangements

101 Alternative survey arrangements may be accepted as an option to applicable periodical surveys for main class.

102 The following survey arrangements may be granted upon written request from the owner:

- *Hull Continuous*, see B100.
- *Hull PMS (Planned Maintenance System)*, see B200
- *Machinery Continuous*, see C100.
- *Machinery PMS (Planned Maintenance System)*, see C200.
- *Machinery CM (Condition Monitoring)*, a survey arrangement that is based on Machinery PMS, but allow for use of condition based maintenance methods on selected parts of the machinery, see C300.

103 Reference is made to owner's obligation for retention of class, see Pt.1 Ch.1 Sec.3.

B. Hull Survey Arrangements

B 100 Hull Continuous

101 Hull Continuous is a survey arrangement whereby the survey items in the hull list established for the ship are subject to separate surveys with interval 5 years.

The arrangement shall provide for survey of approximately 20% of the total number of survey items during each year of the five-year class period.

For ships over 10 years of age:

- all ballast tanks
- tanks used for sewage (black water) and/or wastewater (gray water), see Sec.3 B

shall be examined twice in each five-year class period and the arrangement shall provide for approximately 40% of the total number of survey items for such tanks during each year of the five-year class period.

The time window for surveys to be carried out are generally set as 6 months before the due dates as distributed.

102 Hull Continuous may normally be accepted for ships less than 20 years of age.

Hull Continuous for ships above 20 years of age may be specially considered provided the following additional acceptance criteria are complied with:

Coating

- The hard protective coating in ballast tanks shall be not less than FAIR condition with no areas under consideration with coating in POOR condition.

Corrosion

- Substantial corrosion shall not be accepted.
- Local corrosion shall be within 2/3 of the main class allowable limit.

Guidance note:

With local corrosion is normally meant findings such as edge corrosion, grooving and pitting

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Hull Continuous is not acceptable for ships with class notation **ESP** and not for general dry cargo ships subject to EHSR (see Sec.1 A).

103 The bottom survey in dry dock or on a slipway in accordance with Sec.5 A may be carried out at any time within the five-year class period.

The overall and close-up examination and thickness measurements, as applicable, of the lower portions of the ballast tanks shall be carried out not later than concurrently with the bottom survey in dry dock.

Guidance note:

Lower portions of the ballast tanks are considered to be the parts below light ballast water line.

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The examination and gauging of anchoring equipment including internal examination of chain lockers in accordance with Sec.4 B shall normally be carried out during the bottom survey in dry-dock.

The survey planning meeting as specified in Sec.1 B100 shall be held prior to commencement of the renewal survey and the bottom survey in dry-dock.

B 200 Hull PMS (Planned Maintenance System)

201 Hull PMS is a survey arrangement offered as an integral part of classification compliance for the hull structure through the alignment and integration of classification requirements with an approved and implemented planned inspection and maintenance system. The system performance and condition of hull structure and maintenance work carried out shall be verified by the society during annual survey and in connection with dry docking of the ship.

202 Hull PMS is applicable for ships with survey arrangement Hull Continuous.

203 An initial survey shall be carried out onboard the ship in order to verify that the system has been implemented in accordance with the approved documentation and that the system is used as intended. It is required that the planned maintenance system has been operated for at least 6 months before the initial survey is carried out.

204 For Hull PMS the structural condition and coating condition shall be maintained to a standard above the minimum class requirement.

Coating

— The hard protective coating in ballast tanks shall be not less than FAIR condition with no areas under consideration with coating in POOR condition.

Corrosion

— Substantial corrosion shall not be accepted.

— Local corrosion shall be within 2/3 of the main class allowable limit.

For ships with Hull PMS, the retention of this survey arrangement will be evaluated in connection with completion of 5 yearly hull renewal survey.

205 If the conditions for the survey arrangement are not complied with or in case of change of technical management of the vessel, the survey arrangement will be cancelled and substituted by Hull Continuous survey arrangement.

C. Machinery Survey Arrangements

C 100 Machinery Continuous

101 Machinery Continuous is a survey arrangement where the components in the machinery list established for the vessel are subject to separate surveys with survey interval 5 years.

The due dates shall normally be distributed with 20% of the surveys each year and the separate surveys shall in all cases be carried out once in each 5 year period of the class certificate.

The time window for surveys to be carried out are generally set as 6 months before the due dates as distributed.

102 A follow-up system covering the Society's machinery list in accordance with Sec.4 Table E1 shall be established on board the ship.

103 Machinery component surveys may be credited based on documented maintenance history presented by the Chief Engineer.

The following conditions apply:

- a) The Owner/Manager is responsible for ensuring that the Chief Engineer is qualified to register and carry out maintenance on all class related machinery items.

Guidance note:

In reference to Res. 741 (18) ISM Code, 1995 STCW A-III as amended.

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- b) The Chief Engineer shall be the responsible person for the follow-up of the machinery maintenance onboard.

- c) Documented maintenance history shall include extract of engine logbook, maintenance history, wear measurements forms etc.
- d) Half of all machinery component surveys, for components of which there are more than one, can be credited based on documented maintenance history presented by the Chief Engineer, every second time they are credited. This does not apply to complete main engines and engines in an electric propulsion system. These can not be credited based on documented maintenance history, even if more than one main engine is installed.
- e) The surveyor can, if found necessary, require a re-survey of items surveyed by the Chief Engineer.

104 Survey of the following items shall be carried out by a surveyor:

- steam turbines for propulsion and power generation
- reduction gears in steam driven propulsion plants.

C 200 Machinery PMS (Planned Maintenance System) requirements

201 *General requirements:*

- a) Machinery PMS is a survey arrangement based on audits of an approved and implemented planned maintenance system onboard which shall cover all component surveys in the machinery list for the vessel.
- b) The audits shall be part of the main class annual survey, see Sec.2 A200.
- c) The Owner/Manager is responsible for ensuring that the Chief Engineer is qualified to register and carry out maintenance on all class related machinery items.

Guidance note:

In reference to Res. 741 (18) ISM Code, 1995 STCW A-III as amended.

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- d) The Chief Engineer shall be the responsible person on board in charge of the Machinery PMS.
- e) If the conditions for the survey arrangement are not complied with, or in case of change of technical management of the vessel, the Survey Arrangement Machinery PMS will be cancelled and substituted by Survey Arrangement Machinery Continuous or Survey Arrangement Machinery Renewal, as applicable.

202 The Survey Arrangement Machinery PMS shall be operated under the following conditions:

- a) The surveyor may credit relevant component surveys in the machinery list based on the recorded maintenance, except for the following, that shall be surveyed by the Society:
 - main steam piping
 - feed water piping
 - steam turbines for propulsion and power generation
 - reduction gears in steam driven propulsion plants.
- b) Change or a major upgrade of planned maintenance system shall always be notified to the Society and will be subject to new approval.

Guidance note:

Major upgrade meaning changes that affects reporting of maintenance on machinery items, or changes that might implicate additional training of crew.

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- c) Back up of the PMS database, making it possible to restore all data, shall be taken at least once a week.
- d) The surveyor can, if found necessary, require a re-survey of items reported by the Chief Engineer.
- e) All damage/break-downs on class related machinery items shall be reported to class and included in the system.

203 The planned maintenance system onboard shall comply with the following requirements:

- a) The system shall be computer based.
- b) The system shall be able to produce a maintenance history report of all main overhauls carried out for a specific time period.
- c) Corrective maintenance shall be possible to be especially identified in the system and traceable.
- d) The system shall include at least the applicable machinery and equipment listed in Sec.4 Table E1 All these components shall be identified with their belonging the Society's machinery item code or alternatively the full name of the component survey according to the machinery list for the specific ship.

- e) All main overhaul jobs on class related components shall be identified as class related jobs in the maintenance system.
- f) For ships with class notation **E0** or **ECO**, the system shall include the periodical testing of control, alarm and safety components and systems required by Pt.6 Ch.3 Sec.1. These jobs shall be especially identified in the system and include test routines and set-points based on Pt.6 Ch.3 Sec.3 Table A1 to Table A10.
- g) The system is subject to approval by the Society, either a Type Approved system or non-Type Approved system.
- h) Changes to the system (maintenance intervals, job descriptions, etc) shall be traceable and documented and presented to the attending surveyor at the next annual survey for acceptance.

Guidance note:

Documentation in order to adjust maintenance intervals, job descriptions etc, may be accepted by attending surveyor on the basis of maintenance reports, wear measurement forms, service letters from maker etc.

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- i) The job descriptions for the main overhaul for all the machinery and equipment subject to class shall be available either as part of the planned maintenance system and/or as specific reference to makers' manuals. The extent of the job descriptions either within the PMS or in the referred manual, shall be self-explaining to a surveyor. When references to makers' manuals are made, these shall be ready available onboard.
- j) Job intervals shall be based on maker's recommendations, adjusted for prevailing operational conditions. Deviations from initial intervals shall only be accepted when documented experience can justify changes.

Guidance note:

For items with few running hours (compared to makers maintenance recommendations) in one class period (e.g. standby functions), or with no running hours recommendations, calendar-based maintenance are recommended.

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- k) The job descriptions and maintenance history shall be in English.

204 The approval process for the Machinery PMS survey arrangement is a two step process: The first step, called "Management Approval", is a review by the Society of the set-up of the planned maintenance system prior to the initial survey onboard the first vessel in a fleet. The final step is the initial survey onboard each applicable vessel, see 205. This process applies to each type of planned maintenance system used by the management company.

The "Management Approval" includes, but is not limited to:

- examination of examples of points 203 a) to k)
- document describing how to handle periodical surveys ("User Guide" for the C/E) for the Society.

The "Management approval" is valid until cancelled in writing from the Society.

205 An initial survey shall be carried out onboard the vessel in order to verify that the system has been implemented in accordance with the approved documentation and that the system is used as intended. It is recommended that the planned maintenance system has been operated for at least 6 months before the initial survey is carried out.

During the initial survey, it will be verified that:

- a) The Chief Engineer is familiar with the planned maintenance system and is able to demonstrate the different functionalities in the system to the attending surveyor.
- b) The general condition of the machinery and the machinery systems in the engine room is good.
- c) All the requirements in 203 except h) are complied with.

Provided the initial survey is carried out with a satisfactory result, the Survey Arrangement Machinery PMS will be granted and a certificate will be issued stating system name and conditions for the survey arrangement for the specific vessel.

Guidance note:

Prior to the initial survey onboard, requirements listed under 205 c) may be carried out in the owner's/ manager's office, if found convenient both to the Society and owner/manager. This requires that the onboard database is available in subject office. Results of this review must be given to the attending surveyor onboard.

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206 The components in the machinery list are credited at the first annual survey after their main overhaul is carried out.

This also applies if the maintenance interval is based on running hours and the time between main overhauls for this reason exceeds 5 years.

207 An annual survey shall be carried out onboard the vessel in order to verify that the conditions for maintaining the Survey Arrangement Machinery PMS are complied with.

During the annual survey, in addition to 206, the following will be verified:

- a) The vessel Machinery PMS certificate is valid for present management.
- b) The Chief Engineer is familiar with the planned maintenance system and is able to demonstrate the different functionalities in the system to the attending surveyor.
- c) Reasons for overdue/ postponed (deferred) jobs shall be explained.
- d) General maintenance is satisfactory, including an in depth examination of reported maintenance history since last annual survey, to the extent deemed necessary by attending surveyor.
- e) The general condition of the machinery and the machinery systems in the engine room is good.
- f) The onboard machinery list is reflecting the machinery list of the Society.

Documented changes to the system (maintenance intervals, job descriptions, etc) shall be presented to the attending surveyor for acceptance.

C 300 Machinery CM (Condition Monitoring)

301 Machinery CM is a survey arrangement based on audits of an approved and implemented condition monitoring programme onboard. Machinery CM allows the manager to adjust maintenance intervals based on condition monitoring of applicable components onboard the ships.

The audits shall be part of the main class annual survey, see Sec.2 A200.

See also Classification Note 10.2 for further details of requirements in 302 and 304.

302 The following conditions apply:

- the extent of condition monitoring is based on the company's own choice
- valid Machinery PMS survey arrangement shall be approved and implemented
- condition monitoring strategy shall be successfully implemented onboard
- condition monitoring shall be an implemented part of a planned maintenance system
- programme for fuel oil bunker analysis shall be implemented and documented onboard
- programme for lubricating oil analysis shall be implemented and documented onboard
- vibration measuring equipment and software shall be provided and in use onboard.

If propulsion steam turbines, including reduction gears shall be a part of the survey arrangement, a renewal survey will be a part of the survey arrangement. This survey shall be a voyage survey for the surveyor to verify the condition of the propulsion plant.

303 The following components, if monitored, shall be analysed by use of FFT (Fast Fourier Transformation) analysis:

- steam turbines
- electrical motors for propulsion
- reduction gears and power take off
- generators
- reciprocating machinery
- steam turbines.

304 The following documentation shall be submitted for approval:

- description of the company's maintenance strategy
- monitoring methods for components, including baseline
- condition monitoring equipment
- implementation of condition monitoring in the planned maintenance system
- training programme and plan
- programme for fuel oil bunker analysis, if applicable
- programme for lubricating oil analysis.

305 A company approval certificate will be issued upon satisfactory review and approval of the documentation submitted in accordance with 304.

306 An initial survey shall be carried out onboard the ship in order to verify that the system has been implemented in accordance with the approved documentation.

It is required that the programme has been operated for at least 6 months before the initial survey is carried out.

Provided the initial survey is carried out with satisfactory results, the Machinery CM survey arrangement will be granted and a certificate will be issued stating conditions for the survey arrangement for the specific vessel.

307 Damage to machinery systems or equipment covered by classification shall always be reported to the Society and into the planned maintenance system as a corrective action. See Pt.1 Ch.1 Sec.3 B.

308 If the conditions for the survey arrangement are not complied with or in case of change of technical manager of the vessel, the survey arrangement will be cancelled and substituted by Machinery Continuous survey arrangement or the Machinery PMS survey arrangement.

SECTION 9

SURVEYS PERFORMED BY APPROVED COMPANIES

A. Surveys by Approved Companies or Service Suppliers

A 100 Thickness measurements

101 Thickness measurements as parts of the periodical surveys shall be carried out by a qualified company approved by the Society unless carried out by the surveyor himself.

102 Thickness measurements shall normally be carried out by means of ultrasonic test equipment. The accuracy of the equipment shall be proven to the surveyor as required.

103 A thickness measurement report shall be prepared. The report shall give the location of the measurements, the thickness measured and the corresponding original thickness. Furthermore, the report shall give the date when the measurements were carried out, type of measuring equipment, names of personnel and their qualifications. The report shall be signed by the operator.

A 200 Examination of bow, side and stern doors on roll on/ roll off ships.

201 Parts of the periodical examination of bow door (outer and inner), side and stern doors on roll on/ roll off ships may be accepted as basis for limiting the extent of the annual class survey when carried out by companies engaged by the owner and approved by the Society for such inspections.

202 Inspections acceptable may include locking arrangement and supports, cleats, hydraulic operating system, electric control and indicator or monitoring systems, sealing arrangement and tightness testing.

Guidance note:

Inspections encompass visual examination, NDT of vital elements (i.e. dye penetrant, magnetic particle inspection) and measurement of clearances.

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203 An inspection report shall be prepared. The report shall give information on arrangement and systems covered by the inspection and the results of visual examination and tests as applicable. Furthermore, the report shall give the date when the inspection was carried out, type of test equipment, names of personnel and their qualifications. The report shall be signed by the person in charge.

Guidance note:

For more information on reporting, see Standard for Certification No. 2.9, Type Approval Programme No. 409.

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204 Upon satisfactory review of the inspection report, the extent of annual surveys may be limited at the discretion of the surveyor.

A 300 Bottom survey afloat

301 An approved diving company shall be used for the underwater inspection.

302 The survey shall be witnessed by a surveyor of the Society. The diver shall use pictorial equipment of such quality that the surveyor is fully satisfied with the information relayed.

303 Detailed requirements are given in Sec.5 A500.