RULES FOR CLASSIFICATION

Ships

Edition January 2017

Part 7 Fleet in service

Chapter 1 Survey requirements for fleet in service
FOREWORD

DNV GL rules for classification contain procedural and technical requirements related to obtaining and retaining a class certificate. The rules represent all requirements adopted by the Society as basis for classification.

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CHANGES – CURRENT

This document supersedes the July 2016 edition.
Changes in this document are highlighted in red colour. However, if the changes involve a whole chapter, section or sub-section, normally only the title will be in red colour.

Main changes January 2017, entering into force 1 July 2017

• Sec.1 General requirement
  — Intermediate survey for POSMOOR notation removed.

• Sec.2 Annual surveys extent - main class
  — Sec.2 [1.2.12]: Added verification by surveyor of overdue PCS deficiencies.
  — Sec.2 [3.1.5]: New requirements introduced for periodical (annual) follow up of monitoring of harmonic distortion from harmonic filters, where such are installed.
  — Sec.2 [3.1.9]:
    — added requirement for wall thickness measurement for overboard distance piece
    — added requirement for annual external visual inspection of inline scrubbers exhaust inlet welds, applicable where bypass is not fitted.

• Sec.4 Renewal surveys extent - main class
  — Sec.4 [3.1.16]:
    — added requirement for internal and external inspection of inline scrubbers exhaust inlet welds, applicable where no bypass is fitted
    — added requirement for testing of safety sensors.

• Sec.5 Miscellaneous main class surveys
  — Sec.5 [1.5.1]: New guidance note added
  — Sec.5 [6.1.3]: "Direct visual" included in guidance note to clarify the intention of the internal inspection referred to in the rule text.

• Sec.6 Optional class notation surveys
  — Sec.6 [12]: The sub-section is rewritten and updated to cover all dynamic positioning class notations.
  — Previous sub-section [36] Dynamic positioning systems - enhanced reliability is deleted and the notations DYNPOS(E) and DYNPOS(ER) are now covered by sub-section Sec.6 [12].

• Sec.7 Alternative survey arrangements
  — Sec.7 [3.2.3e): Class notation AUT added.

Editorial corrections

In addition to the above stated changes, editorial corrections may have been made.
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SECTION 1 GENERAL REQUIREMENTS

1 General

1.1 Definitions

Table 1 Definitions

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ballast tank</td>
<td>tank used primarily for salt water ballast</td>
</tr>
<tr>
<td></td>
<td>For ships with class notation <strong>ESP</strong> a ballast tank is a tank used solely for salt water ballast. For bulk carriers with class notation <strong>ESP</strong> 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 <strong>ESP</strong> 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.</td>
</tr>
<tr>
<td>bulk carrier</td>
<td>a ship intended primarily to carry dry cargo in bulk</td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
<tr>
<td>cargo area</td>
<td>comprises the following parts of the ship:</td>
</tr>
<tr>
<td></td>
<td>— all cargo holds</td>
</tr>
<tr>
<td></td>
<td>— all cargo compartments, tanks, slop tanks and cargo/ballast pump rooms</td>
</tr>
<tr>
<td></td>
<td>— fuel tanks, cofferdams, ballast tanks and void spaces adjacent to cargo holds, cargo tanks or slop tanks</td>
</tr>
<tr>
<td></td>
<td>— deck areas throughout the entire length and breadth of the part of the ship over the above mentioned spaces</td>
</tr>
<tr>
<td>chemical tanker</td>
<td>a ship intended to carry hazardous liquid chemicals in bulk (as listed in IBC Code, Chapter 17)</td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
<tr>
<td>close-up examination</td>
<td>examination where the details of structural components are within the close visual inspection range of the surveyor, i.e. normally within reach of hand</td>
</tr>
<tr>
<td>Term</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| 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                                                                 |
| 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. |
| 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)  |
| guidance note                    | It shall be checked that information has been added to the CTF. The technical standard or the quality of the work are not subject for evaluation. The information that shall be added to the CTF should be mentioned in the Procedures for in-service maintenance and repair of included to the CTF on board the vessel. If documentation has not been added to the CTF, a memo to owner regarding this matter shall be issued. IMO PSPC requirements may be mandatory by SOLAS or MODU Code or voluntary through COAT-PSPC class notation. |
| 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 |
| 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 |
| 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.  
<pre><code>                          |  Gas tankers may be designed with or without a secondary barrier between the cargo and the environment. |
</code></pre>
<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
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</thead>
</table>
| general dry cargo ships 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 **Great lakes bulk carrier**  
  — bulk carriers with class notation **ESP** (enhanced survey programme)  
  — dedicated container carriers  
  — 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)  
  — general dry cargo ships of double side-skin construction, with double side-skin extended for the entire length of the cargo area, and for the entire height of the cargo hold to the upper deck |
| 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 IBC Code.  
  For definition of tank type **A**, **B** and **C** (liquefied gas tankers) see IACS UR G1.4.4 to G1.4.6. |
| 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                                                                 |
| 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 |
| 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). |
<p>| overall examination                                                 | examination intended to report on the overall condition of the hull structure and determine the extent of additional close-up examinations |</p>
<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
</table>
| 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.                                                                                                                                                                                                                                                                                                               |
| 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                                                                                                                                                                                                                                                                                   |
| 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.                                                                                                                                                                                                                           |
| 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                                                                                                                                                                                                                                                                   |
| 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.                                                                                                                                                                             |
| spaces                           | separate compartments within the hull and superstructures, including independent cargo tanks in the cargo area, not including deckhouses                                                                                                                                                                                                                                                                                                    |
| 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 CSR Pt.1 Ch.13, 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.  

Rules for classification: Ships — DNVGL-RU-SHIP Pt.7 Ch.1. Edition January 2017  
Survey requirements for fleet in service  
DNV GL AS
**Term** | **Description**
--- | ---
*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 Table 1 Figure 1

**Figure 1 Survey schedule**

**suspect areas** | areas showing substantial corrosion and/or are considered by the surveyor to be prone to rapid wastage

**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.

Definitions from other parts of the rules also apply to Pt.7.

### 1.2 Periodical surveys

**1.2.1** 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.

**1.2.2** 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)

**1.2.3** 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).

1.2.4 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 for 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
- bottom survey.

The main class intermediate survey cannot serve as commencement of the next renewal survey. For concurrent surveys, the time window may be limited by that of the other survey.

1.2.5 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.

1.2.6 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.

1.2.7 The scope of survey may be extended when compliance with applicable rules cannot 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.

1.3 Survey of special equipment and systems installed

1.3.1 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.

1.3.2 Survey requirements exclusively applicable for optional class notation assigned are given in Sec.6.

1.4 Postponement of periodical surveys

1.4.1 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.
1.4.2 Postponement of main class renewal survey, boiler survey and bottom survey shall not exceed 3 months.
For main class renewal survey a postponement will not affect the next survey due date.

1.4.3 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.

1.4.4 For naval ships and ships with class notation Great lakes bulk carrier, the Society may upon request, accept to postpone the main class renewal survey and/or bottom survey for maximum 12 months.
A postponement shall be based on satisfactory result from a sighting survey and/or a bottom survey respectively.
The new class certificate will be valid for five years from date of issuance.

1.4.5 Other periodical surveys which are due during the ships normal winter lay-up period, shall be completed before the ship returns to operation. It is required that ships with class notation Great lakes bulk carrier are laid up in fresh water each winter in the St. Lawrence River or at a Great Lakes port.

Guidance note:
The Society requires a valid load line certificate for the applicable period before postponement of renewal survey can be granted.

---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---

1.5 Survey of ships out of commission

1.5.1 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.
See also class guideline DNVGL-CG-0290 for further details.

1.5.2 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.

1.6 Survey schedules

1.6.1 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 shall be completed not more than 6 months after the completion date of the commencement survey. 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 completion date of the commencement survey just carried out
— an additional main class annual survey may be required when the anniversary date has been advanced.
1.6.2 Intermediate survey schedule is as follows:
— the due date shall normally correspond to the date 2.5 years after the expiry date of the previous class 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.

1.6.3 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.

1.6.4 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 completion date of the commencement survey
— 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 cannot be credited towards both intermediate and renewal survey. Ships that are re-commissioned after being laid-up may be specially considered
— in cases where the vessel has been laid up or has been out of service for a considerable period because of a major repair or modification and the owner elects to only carry out the overdue surveys, the next period of class will start from the expiry date of the class renewal survey. If the owner elects to carry out the next due class renewal survey, the period of class will start from the survey completion date.

1.6.5 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 including those 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 administration, requires the bottom survey to be carried out annually.

---end---of---g-u-i-d-a-n-c-e---n-o-t-e---

### 1.6.6 Propeller shaft survey

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

- Oil lubricated tail shaft arrangement with approved sealing devices
- Water lubricated tail shaft arrangement with:
  - continuous corrosion resistant metallic liner
  - propeller shaft of approved corrosion resistant material
  - propeller shaft with approved protection arrangement
  - approved combination of the above.

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** and **CM-PS** the propeller shaft survey does not have a scheduled survey interval, see Sec.6 [17].

**Guidance note:**
Typical means of propeller shaft approved protection arrangement are:

- continuous cladding with corrosion resistant material
- multiple layer synthetic coating
- multiple layer of fibre glass coating
- rubber/elastomer coating
- shaft fitted with approved sealing devices in conjunction with corrosion inhibited and monitored lubricant system (e.g. closed loop water lubricated system).

---end---of---g-u-i-d-a-n-c-e---n-o-t-e---

### 1.6.7 Propeller connection survey

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.

The propeller connection survey is also applicable for ships with class notation **TMON** or **CM–PS**.

### 1.6.8 Survey of geared and podded thrusters

Survey of geared and podded thrusters for propulsion or dynamic positioning are scheduled according to complete survey (5 years).

Podded thrusters shall also have an annual survey. See Sec.5 [5]. The complete survey shall be completed concurrently with the last annual survey in each period of the classification certificate.

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.
1.6.9 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 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 10 years old and retaining the original fitting of a single unit, the main boiler shall be surveied annually (full scope) and within the annual survey scope. Boiler installations with one main boiler only and one auxiliary boiler powerful enough to operate the propulsion plant in an emergency (take-home boiler), count as multi-boiler plants
The boiler surveys apply to all types of boilers, i.e.:
— oil/gas fired
— exhaust gas heated
— composite
— steam generators
— electric heated.

1.6.10 Thermal oil heater will be internally surveyed and tested once during each 5-year period of the classification certificate. The survey will 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.
The thermal oil surveys apply to all types of thermal oil heaters, i.e.:
— oil fired
— exhaust heated
— steam heated.

1.6.11 Optional class notations where specific surveys have been defined are listed in Table 2.

Table 2 Surveys for optional class notations

<table>
<thead>
<tr>
<th>Class notation</th>
<th>Description</th>
<th>Survey type</th>
<th>Conjunction with main class survey</th>
<th>Survey requirements</th>
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</thead>
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<td>Annual</td>
<td>Sec.6 [34]</td>
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<td>Renewal</td>
<td>Renewal</td>
<td></td>
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<td>Anchor handling</td>
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<td>Annual</td>
<td>Sec.6 [34]</td>
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<td>Renewal</td>
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<td>Annual</td>
<td>Annual</td>
<td>Sec.6 [34]</td>
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<td>Renewal</td>
<td></td>
</tr>
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<td>Complete (2.5 years)</td>
<td>Intermediate and renewal</td>
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<td>Annual</td>
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<td></td>
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<td>Renewal</td>
<td></td>
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<tr>
<td>Class notation</td>
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<td>Survey type</td>
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<td>Bottom</td>
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<td>Annual</td>
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<td>Built for in-water survey</td>
<td>Bottom</td>
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<td>KAZ</td>
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<td>Annual</td>
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<td>Annual</td>
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<td>Sec.6 [27]</td>
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<td>Annual</td>
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<td>OILREC</td>
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<td>Annual</td>
<td>Sec.6 [3]</td>
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<td>Position mooring system</td>
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<td>Annual</td>
<td>DNVGL-RU-OU-0101 Ch.3 Sec.6 [2]</td>
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<td>Vessel purpose carriage of refrigerated containers</td>
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</tr>
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<td>Class notation</td>
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<td>Survey type</td>
<td>Conjunction with main class survey</td>
<td>Survey requirements</td>
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<td>RM Container</td>
<td>Carriage of refrigerated containers with cooling provided by the ship's refrigerating plant</td>
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<td>Annual</td>
<td>Sec.6 [4]</td>
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<td></td>
<td>Complete (5 years)</td>
<td>Renewal</td>
<td>Sec.6 [4]</td>
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<td>Sec.6 [32]</td>
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<td>SPS</td>
<td>Vessel purpose carriage of special personnel who are neither crew members nor passengers</td>
<td>Annual</td>
<td>Annual</td>
<td>Sec.6 [29]</td>
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<td>Intermediate</td>
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<td>Sec.6 [29]</td>
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<td>Complete</td>
<td>Renewal</td>
<td>Sec.6 [29]</td>
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<td>Tailshaft monitoring</td>
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<td>Annual</td>
<td>Sec.6 [17]</td>
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<td>TOW</td>
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<td>Annual</td>
<td>Sec.6 [34]</td>
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<td>Sec.6 [34]</td>
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<td>Renewal</td>
<td>Sec.6 [34]</td>
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<td>Towing</td>
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<td>Annual</td>
<td>Sec.6 [34]</td>
</tr>
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<td></td>
<td>Renewal</td>
<td>Renewal</td>
<td>Sec.6 [34]</td>
</tr>
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<td>VCS</td>
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<td>VEC</td>
<td>Vapour control system</td>
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<td>VIBR</td>
<td>Vibration level limitation</td>
<td>Complete (5 years)</td>
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### Survey requirements for fleet in service

<table>
<thead>
<tr>
<th>Class notation</th>
<th>Description</th>
<th>Survey type</th>
<th>Conjunction with main class survey</th>
<th>Survey requirements</th>
</tr>
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<tbody>
<tr>
<td>W1</td>
<td>Bridge design, bridge instrumentation, and workstation arrangement</td>
<td>Annual</td>
<td>Annual</td>
<td>Sec.6 [13]</td>
</tr>
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<td></td>
<td></td>
<td>Complete (5 years)</td>
<td>Renewal</td>
<td></td>
</tr>
<tr>
<td>Well stimulation vessel</td>
<td>Vessel purpose well stimulation</td>
<td>Annual</td>
<td>Annual</td>
<td>Sec.6 [2]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Complete (5 years)</td>
<td>Renewal</td>
<td></td>
</tr>
<tr>
<td>Winterized</td>
<td>Operation in cold climate</td>
<td>Annual</td>
<td>Annual</td>
<td>Sec.6 [24]</td>
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<tr>
<td>WSV</td>
<td>Vessel purpose well stimulation</td>
<td>Annual</td>
<td>Annual</td>
<td>Sec.6 [2]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Complete (5 years)</td>
<td>Renewal</td>
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</table>

**1.6.12** Class notations covered by the main class surveys are listed in Table 3.

#### Table 3 Class notations covered by main class surveys

<table>
<thead>
<tr>
<th>Class notation</th>
<th>Description</th>
<th>Main class survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery</td>
<td>Battery installation</td>
<td>Annual, renewal</td>
</tr>
<tr>
<td>Bulk carrier</td>
<td>Vessel purpose dry bulk cargo carriage</td>
<td>Annual, intermediate and renewal</td>
</tr>
<tr>
<td>Bulk carrier or Tanker for oil</td>
<td>Vessel purposes dry bulk cargo carriage alternating with oil carriage</td>
<td>Annual, intermediate and renewal</td>
</tr>
<tr>
<td>Bow loading</td>
<td>Bow loading system</td>
<td>Annual</td>
</tr>
<tr>
<td>Car carrier</td>
<td>Vessel purpose car carriage</td>
<td>Annual</td>
</tr>
<tr>
<td>CCO</td>
<td>Centralised cargo control for liquid cargoes</td>
<td>Renewal</td>
</tr>
<tr>
<td>CHEM</td>
<td>Transportation of toxic chemicals for offshore service vessels</td>
<td>Annual, intermediate and renewal</td>
</tr>
<tr>
<td>Container</td>
<td>Arranged for carriage of containers</td>
<td>Renewal</td>
</tr>
<tr>
<td>Container carrier</td>
<td>Vessel purpose container carriage</td>
<td>Renewal</td>
</tr>
<tr>
<td>Container ship</td>
<td>Vessel purpose container carriage</td>
<td>Renewal</td>
</tr>
<tr>
<td>COW</td>
<td>Crude oil washing</td>
<td>Annual, intermediate and renewal</td>
</tr>
<tr>
<td>FC</td>
<td>Fuel cell installations</td>
<td>Annual, intermediate and renewal</td>
</tr>
<tr>
<td>Gas fuelled</td>
<td>Gas fuelled engine installations</td>
<td>Annual, intermediate and renewal</td>
</tr>
<tr>
<td>GF</td>
<td>Gas fuelled engine installations</td>
<td>Annual, intermediate and renewal</td>
</tr>
<tr>
<td>Great lakes bulk carrier</td>
<td>Vessel purpose dry bulk cargo carriage, designed to operate within the limits of the Great Lakes and St. Lawrence river to the seaward limits defined by the Anticosti Island</td>
<td>Annual, intermediate and renewal</td>
</tr>
<tr>
<td>Inert</td>
<td>Inert gas system</td>
<td>Annual and renewal</td>
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### Class notation

<table>
<thead>
<tr>
<th>Class notation</th>
<th>Description</th>
<th>Main class survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>LC</td>
<td>Lashing computer</td>
<td>Renewal</td>
</tr>
<tr>
<td>LFL</td>
<td>Vessel purpose low flashpoint liquid carriage</td>
<td>Annual and renewal</td>
</tr>
<tr>
<td>MCDK</td>
<td>Moveable car decks</td>
<td>Annual</td>
</tr>
<tr>
<td>NAUTICUS</td>
<td>Enhanced information exchange, see Sec.6 [28]</td>
<td>Annual, intermediate and renewal</td>
</tr>
<tr>
<td>Offshore service vessel</td>
<td>Vessel purpose offshore service, e.g. support, supply, anchor handling or towing, see Sec.6 [34]</td>
<td>Annual</td>
</tr>
<tr>
<td>Ore carrier</td>
<td>Vessel purpose ore carriage</td>
<td>Annual, intermediate and renewal</td>
</tr>
<tr>
<td>Ore carrier or tanker for oil</td>
<td>Vessel purpose ore carriage alternating with oil carriage</td>
<td>Annual, intermediate and renewal</td>
</tr>
<tr>
<td>Passenger ship</td>
<td>Vessel purpose passenger carriage</td>
<td>Annual, intermediate and renewal</td>
</tr>
<tr>
<td>PET</td>
<td>Carriage of cars with fuel in their tanks</td>
<td>Annual</td>
</tr>
<tr>
<td>Pusher</td>
<td>Vessel purpose pushing</td>
<td>Renewal</td>
</tr>
<tr>
<td>Pusher/Barge unit</td>
<td>Vessel purpose pushing (pusher unit) and cargo carriage (barge unit)</td>
<td>Renewal</td>
</tr>
<tr>
<td>RSCS</td>
<td>Route specific container stowage</td>
<td>Renewal</td>
</tr>
<tr>
<td>Supply vessel</td>
<td>Vessel purpose supply, see Sec.6 [34]</td>
<td>Annual</td>
</tr>
<tr>
<td>Tanker for chemicals</td>
<td>Vessel purpose chemicals carriage</td>
<td>Annual, intermediate and renewal</td>
</tr>
<tr>
<td>Tanker for potable water</td>
<td>Vessel purpose potable water carriage</td>
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<tr>
<td>Tanker for liquefied gas</td>
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</tr>
<tr>
<td>Tanker for oil</td>
<td>Vessel purpose oil carriage</td>
<td>Annual, intermediate and renewal</td>
</tr>
</tbody>
</table>

## 2 Hull and equipment

### 2.1 Conditions for survey and access to structures

#### 2.1.1 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 or semi-hard 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 or semi-hard 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.

---end---of---guidance---note---
2.1.2 Casings, ceilings or linings, cement, asphalt covering 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)

2.1.3 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
- hydraulic arm vehicles such as conventional cherry pickers, lifts and moveable platforms
- 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

2.1.4 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 Safe Use Of Rafts Or Boats For Survey.

---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---

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.

---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---

2.1.5 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.


2.2 Survey extent

2.2.1 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.

2.2.2 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.

2.2.3 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 [2.2.4].

2.2.4 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.

The Society will decide corrosion and wear tolerances for each vessel.

2.2.5 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.

For structure built with a material other than steel, alternative thickness measurement requirements may be developed and applied as deemed necessary by the Society.

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

2.2.6 Where substantial corrosion, as defined in [1], 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 [4], depending on ship type.

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

2.2.7 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.

2.2.8 If the hard protective coating shall be renewed totally or partly, only approved coating is acceptable in case of a repair. The whole working procedure including the surface preparation shall be documented.

2.2.9 During operational phase any maintenance or repair of the applied coating system in tanks and cargo holds covered by IMO PSPC (MSC.215(82) for dedicated seawater ballast tanks and double-side skin spaces of bulk carriers, MSC.288(87) for Cargo Oil Tanks and MSC.244(83) for Void Spaces (voluntarily)) shall be documented and added to the coating technical file (CTF) on board the vessel. If repair or maintenance has been done in these tanks, the surveyor shall check that information has been added to the CTF.

2.3 Special consideration

2.3.1 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.

2.4 Repair of structural damage or deterioration

2.4.1 A prompt and thorough repair as defined in Table 1, 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.

2.4.2 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.

2.4.3 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.

2.4.4 Where the damage found on structure mentioned in item [2.4.1] is isolated and of a localized nature which does not affect the ship’s structural integrity, consideration may be given by the surveyor to allow an appropriate temporary repair to restore watertight or weather tight integrity and impose a condition of class, with a specific time limit.

2.5 Survey programme for ships subject to enhanced survey programme (class notation ESP)

2.5.1 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.

2.5.2 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 [2.6]  
— 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.

2.5.3 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.

2.5.4 The submitted survey programme shall, in addition to the requirements given in [2.6.4], 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.

2.5.5 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.

2.6 Documentation on board ships subject to enhanced survey programme (class notation ESP)

2.6.1 The owner shall supply and maintain on board documentation as specified in [2.6.2], [2.6.3] and [2.6.4]. The documentation shall be kept on board for the lifetime of the ship and shall be readily available for the surveyor.

2.6.2 For tankers and bulk carriers subject to SOLAS Chapter II-1 Part A-1 Regulation 3-10, the owner shall arrange the updating of the ship construction file (SCF) throughout the ship's life whenever a modification of the documentation included in the SCF has taken place. Documented procedures for updating the SCF shall be included within the safety management system.

2.6.3 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.
2.6.4 The following additional documentation shall be available on board:

a) main structural plans of cargo and ballast holds or tanks (for CSR ships these plans shall include for each structural element both the as built and renewal thickness. Any thickness for voluntary addition is also to be clearly indicated on the plans. The midship section plan to be supplied on board the ship shall include the minimum allowable hull girder sectional properties for the tank transverse section in all cargo 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.

2.6.5 For tankers and bulk carriers subject to SOLAS Chapter II-1 Part A-1 Regulation 3-10, the SCF (ship construction file), limited to the items to be retained onboard, shall be available on board.

3 Machinery and systems

3.1 Maintenance and preparation for survey

3.1.1 Every ship shall have implemented a maintenance system.

Maintenance of the hull structure, machinery, systems and equipment shall be in accordance with applicable recognised standards in the industry or in accordance with procedures recommended by the manufacturer.

3.1.2 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.

3.1.3 If machinery components are taken ashore for overhaul which may require class involvement, it is the responsibility of the owner to notify the Society.

3.2 Machinery verification

3.2.1 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.

3.2.2 Shaft alignment shall be confirmed by suitable measurements in the event of damages related to the propulsion shafting installation where alignment is suspected to be a root cause and/or when external forces (e.g. grounding, welding work) may have influenced the alignment.

For shafting installations requiring approval, the measurements shall be carried out in the presence of the surveyor. For shafting installations not requiring approval, documentation of the installation of the shafting in accordance with the alignment specifications shall be submitted to the surveyor.
SECTION 2 ANNUAL SURVEYS EXTENT – MAIN CLASS

1 General requirements

1.1 General

1.1.1 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.

1.1.2 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.

1.2 Review of documentation, operational instruments, signboards and markings

1.2.1 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.

1.2.2 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.

1.2.3 Manual with instructions for operation and/or maintenance shall be verified for:
— doors in ship's bow (outer and inner), sides and stern (OMM)
— combination ships
— inert gas system
— crude oil discharge monitoring system
— crude oil washing system
— vapour emission control system
— protected coating for dedicated seawater ballast tanks, double-side skin spaces and void spaces for PSC ships
— protected slop tanks in combination ships
— offshore bow loading arrangement
— liquefied gas tankers
— arrangement for carriage of low flashpoint liquids
— gas fuelled engine installations
— fuel cell installations
— maintenance records of fixed fire-extinguishing installation issued by approved service supplier.

1.2.4 Required signboards or notice plates shall be verified.

1.2.5 It shall be verified that records of inspections and maintenance in accordance with the implemented maintenance system for machinery are kept available onboard.
1.2.6 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.

1.2.7 For ships with class notation ESP, the surveyor shall examine the documentation onboard as specified in Sec.1 [2.6], and its contents as a basis for the hull survey.

1.2.8 For tankers and bulk carriers subject to SOLAS Chapter II-1 Part A-1 Regulation 3-10, on completion of the survey, the surveyor shall verify that the update of the ship construction file (SCF) has been done whenever a modification of the documentation included in the SCF has taken place.

1.2.9 For tankers and bulk carriers subject to SOLAS Chapter II-1 Part A-1 Regulation 3-10, on completion of the survey, the surveyor shall verify any addition and/or renewal of materials used for the construction of the hull structure are documented within the SCF list of materials.

1.2.10 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.

1.2.11 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.

1.2.12 For all vessels subject to port state control (PSC) inspections, the surveyor shall examine previous reports and verify that no PSC deficiencies are overdue.

1.3 Asbestos free declaration

1.3.1 For vessels that shall comply with SOLAS Reg. II-1/3-5, the surveyor will carry out a review of asbestos-free declarations documenting that new installations of materials do not contain asbestos.

1.3.2 For non-SOLAS vessels, a master’s declaration that asbestos has not been installed on board the vessel since last survey shall be given.
2 Hull and equipment

2.1 General - all ships

2.1.1 The survey shall cover examination of:

a) weather decks and ship side plating above water line
b) anchoring equipment, see [2.1.2]
c) openings and closing appliances for cargo holds or tanks:
   — hatch covers and coamings on exposed weatherdecks, see [2.1.3]
   — cargo tank openings, see [2.1.5]
d) other openings and closing appliances:
   — doors in ship's bow, sides and stern, see [2.1.4]
   — ventilator and air pipes, see [2.1.5]
   — 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
   — condition and origin/identity of loose lashing/securing elements, against documentation on board
     (approved container stowage plan)
h) piping arrangements on deck, see [2.1.5]
i) means of protection of crew, such as guard rails, bulwark, gangways and lifelines
j) towing and mooring equipment, see [2.1.6]
k) emergency towing arrangements, see [2.1.7]
l) spaces:
   — ballast tanks, see [2.1.8]
   — suspect areas, see [2.1.9]
   — thickness measurements taken or extended when substantial corrosion recorded or found, see [2.1.10]
   — fire doors and fire dampers in ventilation ducts
   — means of escape, see [2.1.11]
m) special installations:
   — plants for refrigerated cargoes, see [2.1.12]
   — inert gas plants, see [2.1.5]
n) verification of electrical bonding to the hull of pipelines and independent tanks, as applicable
o) car decks shall be surveyed in respect of operational safety, technical condition and accident prevention.
2.1.2 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.

2.1.3 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, draining channels and non-return valves
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.

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

a) examination of:
   — structural arrangement of doors and ramps, including plating, secondary stiffeners, primary structure hinging arms and welding
   — shell structure surrounding door openings and the securing, supporting and locking device including shell plating, secondary structure, primary structure and welding
   — 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 including welding
   — space between outer and inner bow doors.

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

Clearances of hinges, bearings and thrust bearings are to be taken, where no dismantling is required. Where the function test is not satisfactory, dismantling may be required to measure the clearances. If dismantling is carried out, a visual examination of hinge pins and bearings together with NDT of the hinge pin is to be carried out. Clearances of securing, supporting and locking devices are to be measured, where indicated in the OMM.

c) testing of indicators and audible alarms including mode selection function “harbour/sea voyage”:
   — lamp test function
   — verification that it is not possible to turn off the indicator light
   — verification of fail-to-safe performance for indicator and alarm systems on the navigation bridge.
   — confirmation that the power supply for indicator system is supplied by the emergency source or other secure power supply and independent of power supply for operating the doors
   — sensors shall be examined for proper condition and protection from water, ice formation and mechanical damage.

   **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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d) testing of television surveillance systems.

e) testing of water leakage detection system.
f) examination of packing material/rubber gaskets and retaining bars or channels, including welding and 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.

h) shell doors on ships other than Ro-Ro-ships or Ro-Pax-ships and with a clear opening of less than 12 m² shall be checked as deemed necessary by the surveyor for their operability and unobjectionable technical condition.

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.

**2.1.5** 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 tank vents as applicable.

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 ships with inert gas plant, the inert gas piping shall be examined with special attention to gas or effluent leakage.
For ships with bow loading arrangement, 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.

**2.1.6** 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 2007-01-01.

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**2.1.7** 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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2.1.8 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.

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

2.1.10 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 5 — in general as guidance
- Sec.4 Table 10 — for single skin bulk carriers
- Sec.4 Table 14 — for double skin bulk carriers
- Sec.4 Table 17 — for single hull oil tankers and single hull chemical tankers
- Sec.4 Table 20 — 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.

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

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2.1.11 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, emergency escape routes from bow control station shall be verified in order.

2.1.12 For ships with plant for refrigerated cargoes, 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.

2.1.13 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
2.2 General dry cargo ships subject to extended hull survey requirements – additional requirements

2.2.1 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.

2.2.2 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.

2.2.3 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.

2.3 Dry bulk cargo ships subject to enhanced survey programme (class notation **ESP**) – additional requirements

2.3.1 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.

2.3.2 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.

2.3.3 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.

2.3.4 For single skin bulk carriers over 15 years of age, in addition to the requirements in [2.3.3], the survey shall include:
— close-up examination of one other selected cargo hold to the same extent as required for the forward cargo hold.

2.3.5 Where the close-up examination required in [2.3.3] and [2.3.4] 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.

2.3.6 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 the selected cargo holds, including overboard piping.

2.3.7 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.

2.3.8 For single skin bulk carriers built with an insufficient number of transverse watertight bulkheads to satisfy the requirements for damage stability as given in IACS UR S23 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.

2.4 Oil and chemical tankers subject to enhanced survey programme (class notation ESP) – additional requirements

2.4.1 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.

2.4.2 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.

2.4.3 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.
2.4.4 For combination ships with protected slop tanks the following shall be examined:
— closing arrangement for hatches and other slop tank openings
— blanking arrangement for slop tank pipes.

2.5 Liquefied gas tankers – additional requirements

2.5.1 The cargo handling piping, cargo process piping, spool pieces and expansion joints shall be examined, with special attention to insulation on piping.

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

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

2.5.4 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.

2.5.5 Gastight bulkheads with possible shaft sealing shall be examined.

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

2.6 Oil recovery vessels

2.6.1 For oil recovery vessels periodical survey requirements are given in Sec.6 [3].

3 Machinery and systems

3.1 General - all ships

3.1.1 The survey shall cover:

a) examination of spaces, see [3.1.2]
b) external examination of boilers steam drums and steam generators, see [3.1.19] and thermal oil heaters, see [3.1.20]
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: hot water heaters and incinerators
e) steering gear, see [3.1.3]
f) fire protection systems, see [3.1.4]
g) test of fire and general alarm systems
h) electrical installations, see [3.1.5]
Survey requirements for fleet in service

i) gas fuelled engine and boiler installations, see [3.1.14]

j) fuel cell installations, see [3.1.15]

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 including emergency bilge valve if applicable

m) testing of communication systems between bridge and machinery and steering gear spaces

n) equipment and systems related to carriage of special cargoes:
   — refrigerated cargo, see [3.1.10]
   — inert gas plants, see [3.1.11]
   — protected slop tanks, see [3.1.12]
   — volatile organic compound (VOC) recovery plants
   — low flashpoint liquids, see [3.1.13]
   — motor vehicles with fuel in their tanks, see [3.1.17]
   — examination of cargo systems in ships intended for supply service to offshore installations including those with class notation HNLS
   — examination and tightness testing of cement and dry mud cargo piping situated within the engine room

o) control and monitoring system see [3.1.7] and [3.1.17]

p) emergency systems for passenger ships, see [3.1.8]

q) exhaust gas cleaning systems for the reduction of SOx or NOx see [3.1.9].

3.1.2 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.

3.1.3 For the steering gear arrangement the survey shall include:
   — examination of all accessible parts of the steering arrangement including their associated equipment
   — operational test of main and auxiliary steering gear
   — test of alarms, local control and all modes of remote control, see [3.1.7].

3.1.4 For fire protection 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
   — fire detection system if fitted.

3.1.5 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.
   — For all E0, AUT or AUT-nh vessels (built at any time) and all vessels constructed on or after 1998-07-01, where electricity is necessary for propulsion and steering, test of automatic start and connection to the switchboard of the stand-by generator set, shall be carried out.
— Where the electrical distribution system on board a ship includes harmonic filters (with exception of pumps' prime movers):

— harmonic distortion levels of main busbar on board such existing ships are to be measured annually under seagoing conditions as close to the periodical machinery survey as feasible. Records of all the above measurements are to be made available to the surveyor

Each measurement shall be taken at maximum distortion levels and identical conditions.

Guidance note:
This requirement applies for ships contracted for construction before 1 July 2017.

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— Where the engine room is provided with automated monitoring systems for harmonic distortion, this reading shall be logged electronically, otherwise it is to be recorded in the engine log book for inspection by the surveyor.

Guidance note:
This requirement applies for ships contracted for construction on or after 1 July 2017 or for ships retrofitted with harmonic filters.

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— Inspection of insulation monitoring devices for all distribution systems. If in doubt of correct reading (ex. if the reading is infinity), the device shall be tested.

— 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.

— Test of emergency power system, i.e. manual and automatic connection of generator/batteries to emergency switchboards, alternative start methods and emergency lighting in engine room.

— Examination of cables and equipment in gas dangerous spaces and zones with respect to general condition and spark/explosion hazard.

— It shall be verified that records of inspections and maintenance of Ex- installations in accordance with the implemented maintenance system are kept available onboard. This requirement is applicable for all vessels with keel-laying date after 2007-01-01 having zones as defined in IEC 60092-502.

— Verify that the maintenance record for batteries is kept up to date.

3.1.6 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 [6].

3.1.7 The control and monitoring systems for:

— propulsion
— steering
— electric power generation and distribution
— steam generation and distribution
— thermal oil heating and distribution
— integrated control and monitoring systems covering at least one of the functions listed above shall be surveyed including:
  — verification of changes
  — examination of electrical and mechanical condition
  — test of automatic and manual shutdown functions
  — test of alarm functions
— test of remote back-up means of operation.

Changes and updates to control system software shall be recorded in a software change log that is kept on board. The change log shall cover all control systems for which product certification is required (refer to Pt.4 Ch.9 Sec.1).

The change log shall be presented for the attending surveyor, and changes since last survey shall be checked. The following information shall be logged for each software change:

— reason/motive for the change
— description of the change
— evaluation of the criticality and possible impact of the change
— evidence of verification and testing of implementation.

Major changes to approved control systems shall be documented and submitted for approval prior to installation on board. The software change handling process shall be described in a procedure that upon request shall be presented for the surveyor.

**Guidance note:**

1) All software changes including change of parameters should be recorded in the change log. For minor changes (e.g. textual/visual corrections or unimportant parameter changes) the change log need not be detailed.

2) A major change in this connection normally includes modifications or upgrades where existing components are retrofitted or where the functionality of the controlled machinery or process is extended or altered. A major change normally requires testing according to an approved test procedure before installation or before the changed system is set in operation, and witnessed by a DNV GL surveyor.

For ships with notation **E0**, **AUT** or **ECO**, see Sec.6 [25].

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

3.1.9 For ships with exhaust gas cleaning system for the reduction of SOx or NOx the survey shall include:

— External examination of the system, including testing of shutdown functions, emergency stop buttons and auto standby function as applicable.

— Where a by-pass arrangement is installed this shall be verified to fail to safe mode (bypass open) upon loss of power.

— Where the exhaust pipes of multiple engine installations are combined into one cleaning system, the isolation valves shall be verified tight in closed position.

— Back pressure of the exhaust gas system shall be verified to be within engine manufacturers’ recommendations.

— Where an oil burner is installed the flame failure switch shall be tested.

— The wall thickness of distance piece(s) for SOx scrubber system discharge valve(s) shall be verified to be undiminished.

**Guidance note:**

Overboard distance pieces of SOx scrubbers are normally of the coated type; reduction in wall thickness normally indicates a damage to the coating and requires replacement of the overboard distance piece.

— Additionally for systems utilizing treatment fluids:

— The storage tank high level alarm shall be tested.

— Quick acting shut off valves shall be tested when applicable.

— Condition of screening of possible leakage sources shall be verified.

— Where installed the functionality of the ventilation system and leakage detection in the storage space shall be verified.

— Where treatment fluids are considered to represent a hazard to personnel, protective measures, as required, shall be verified in place and in good condition.
— Scrubber units designed with bottom exhaust inlets and without bypass, e.g inline scrubbers, or otherwise designed such that failure of the inlet pipe weld or other welded connections may cause water ingress into the exhaust line below, shall be visually inspected for leaks.

3.1.10 For ships with refrigeration plant, RSW plant or controlled atmosphere installations (as applicable) 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.
— if ammonia is used as refrigerant, the end covers of one or more heat exchangers shall be opened for inspection of the tube plates if deemed necessary by the surveyor.

3.1.11 For ships with inert gas plant, 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, see [3.1.7]
— examination/testing of oil burning equipment, automation, instrumentation and safety functions on inert gas generator, see [3.1.7].

3.1.12 For combination ships with protected slop tanks, the following shall be examined:

— gas detection arrangement in cofferdams
— oxygen control equipment.

3.1.13 For ships arranged for carriage of low flash point liquids and/or having class notation 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.

3.1.14 For ships with gas fuelled engine installations (class notation Gas fuelled or GF), 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.

3.1.15 For ships with class notation fuel cells (FC) and corresponding 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.

3.1.16 For vessels with additional class notation Battery with qualifiers Safety or Power the survey shall include:
— visual check of the safety measures and functions related to battery spaces i.e. battery installation, ventilation, fire safety measures and alarms.
— for vessels with Battery(Power) notation, it shall be verified that the battery capacity (state of health - SoH) has been regularly tested and are consistent with the SOH value presented on the bridge for all the battery systems.

3.1.17 For ships carrying motor vehicles with fuel in their tanks in enclosed spaces, the survey shall include:
— examination of automatic fire alarm 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.

3.1.18 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 relevant rules.
** For bulk carriers complying with the requirements of SOLAS XII/12 and XII/13, see relevant rules.

3.1.19 Boilers, steam drums, steam generators and other components included in Sec.5 [6.1.1] shall be subject to the following:
— external survey including test of safety and protective devices, see [3.1.9]
— function test of safety valves using its relieving gear. Inspection of oil burning equipment.
For exhaust gas heated economizers, the safety valves shall be tested by the chief engineer at sea within the annual survey window. This test shall be recorded in the log book for review by the attending surveyor.
The boiler water quality shall be maintained to the standard required by the boiler manufacturer. Oil contamination of boiler water shall be ruled out by suitable evidence.

**Guidance note:**

Oil traces on the water level column in the gauge glass and/or hot well are common indications of oil contamination of boiler water.

Verification and review of monitoring/testing of the boiler water shall be carried out at least once in every 24 hours for main boilers. For auxiliary boilers the interval may be extended however shall as a minimum be in accordance with the boiler maker's recommendations.

**Guidance note:**

Ship specific chemical treatment programme regulates the testing frequency of verification of the boiler water quality however this should not exceed 48 hours for auxiliary boilers.

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**3.1.20** Thermal oil installations shall be subject to an external examination, including assessment/test of safety and protective devices, see [3.1.9], and thermal oil analysis (not older than 3 months). Thermal oil analysis is expected to cover the following factors as a minimum.

— chemical degradation of oil in circulation
— contamination by low flashpoint petrochemical products
— contamination by carbon particles.

The flue gas side of oil fired thermal oil heaters and the exhaust gas side of thermal oil heaters heated by exhaust gases shall be inspected by the chief engineer within the annual survey window. Satisfactory documentation of the inspection shall be made available for review by the attending surveyor.

**3.1.21** For ships having class notation CHEM, the survey shall include:

— examination of pumping and piping systems (cargo, heating, bilge)
— testing of emergency stop of pumps
— testing of quick release of transfer hose
— examination of deck foam system
— verify certificates confirming the physical and chemical condition of the 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 as amended. 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 and testing of gas detection system in cargo pump rooms
— testing of bilge alarm in cargo pump room
— 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
— examination of p/v valves for tightness and test of function (use check lift)
— test alarms for inert gas oxygen concentration high, low level in deck water seal, low pressure in inert gas main.
— 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
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— examination and testing of sampling arrangements for cargo heating/cooling system
— 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 of 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
— function test of double-block and bleed valve arrangement (if fitted) in inert gas (or nitrogen) supply line and check alarm for faulty operation.

3.2 Oil and chemical tankers – additional requirements

3.2.1 The survey shall include:
— examination of deck foam system
— verify certificates confirming the physical and chemical condition of the 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 as amended. 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 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
— testing of bilge alarm in cargo pump room
— 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
— examination of p/v valves for tightness and test of function (use check lift)
— test alarms for inert gas oxygen concentration high, low level in deck water seal, low pressure in inert gas main.

3.2.2 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.

3.2.3 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
— function test of double-block and bleed valve arrangement (if fitted) in inert gas (or nitrogen) supply line and check alarm for faulty operation.

3.2.4 For ships with bow loading arrangement, 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, as far as possible, 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, as far as possible, of interlock functions for the mooring and loading systems.

3.2.5 For ships with vapour processing and recovery plant 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 [3.1.6]
— 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 [3.1.6].

3.3 Liquefied gas tankers – additional requirements

3.3.1 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
— verify 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
— fire-fighting systems in the cargo tank area, including the compressor room.

3.3.2 Ventilation systems for cargo handling spaces and other spaces within the cargo area which are normally entered, shall be examined and tested as necessary.
3.3.3 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.

3.3.4 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.

3.3.5 The following shall be surveyed and tested as applicable:
— cargo hoses
— decontamination showers and eyewashes.

3.3.6 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

1 General requirements

1.1 General

1.1.1 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.

1.1.2 Intermediate surveys are required to be carried out for all seagoing self-propelled ships.

1.1.3 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.

2 Hull and equipment

2.1 General - all ships

2.1.1 The survey shall cover:

— ballast tanks, see [2.1.2], [2.1.3], [2.1.4], [2.1.5] and [2.1.6]
— cargo compartments, see [2.1.9]
— extended thickness measurements when substantial corrosion has been found, see [2.1.10]
— lower portions of the cargo and ballast tanks, see [2.1.11].

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.

Guidance note:

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

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2.1.2 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.

For ships with class notation Great lakes bulk carrier with no protective coating, soft or semi-hard, the examination need not be extended to other ballast tanks unless areas with substantial corrosion have been found.

2.1.3 For ships over 10 years of age, an overall examination of all ballast tanks shall be carried out.

For ships with class notation Great lakes bulk carrier, an overall examination of representative ballast tanks selected by the surveyor shall be carried out.
If such inspections reveal no visible structural defects, the examination may be limited to a verification that the corrosion protection system remains efficient.

2.1.4 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 [2].

2.1.5 For those tanks subjected to survey according to [2.1.2] and [2.1.3], including additional tanks specified in [2.2] to [2.4], 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.

2.1.6 For those ballast tanks subjected to survey according to [2.1.2] and [2.1.3], including additional tanks specified in [2.3] to [2.4] the survey shall include examination of the condition of corrosion prevention system, where provided.
A ballast tank 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.
Ships with class notation Great lakes bulk carrier with unprotected ballast tanks shall only be recorded for examination at subsequent annual survey in case areas with substantial corrosion are found.

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.

2.1.7 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.

2.1.8 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.

2.1.9 For dry cargo ships over 15 years of age the survey shall include an overall examination of cargo compartments selected by the surveyor.
2.1.10 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 8** in general as guidance
- **Sec.4 Table 13** for single skin bulk carriers
- **Sec.4 Table 17** for double skin bulk carriers, ore carriers
- **Sec.4 Table 20** for single hull oil tankers, single hull chemical tankers and ore carriers
- **Sec.4 Table 23** for double hull oil tankers and double hull chemical tankers

2.1.11 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.

2.1.12 For ships with class notation **Great lakes bulk carriers** over 10 years of age, the survey shall include a thorough examination of hatch covers and coamings with closing, sealing and securing devices.

2.1.13 Elastic mountings of deckhouses shall be thoroughly checked for the general condition and operability of:
- the spring elements (possibly pre-stressing of screwed connections)
- the insulation
- the securing devices to prevent shifting and lifting
- the pipe and cable connections to the hull.

If damages are suspected, mountings not easily accessible shall be dismounted and examined in detail.

2.2 General dry cargo ships subject to extended hull survey requirements – additional requirements

2.2.1 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.

2.2.2 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.

2.2.3 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 ballast tanks in way of all cofferdams, pipe tunnels and void spaces within the cargo area
Part 7 Chapter 1 Section 3

2.3 Dry bulk cargo ships subject to enhanced survey programme (class notation ESP) – additional requirements

2.3.1 For bulk carriers with hybrid cargo hold arrangements, e.g. with some cargo holds of single skin and others double side skin, 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.

2.3.2 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: sufficient extent of minimum 25% of frames, shall be carried out to establish the condition of shell frames including their upper and lower end attachments, adjacent shell plating, and transverse bulkheads in the forward cargo hold and one other selected cargo hold. 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.

2.3.3 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 11** for single skin bulk carriers
- **Sec.4 Table 14** for double skin bulk carriers
- **Sec.4 Table 15** for ore carriers

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

- **Sec.4 Table 12** for single skin bulk carriers
- **Sec.4 Table 16** for double skin bulk carriers and ore carriers

h) A bottom survey in accordance with **Sec.5 [1]**.

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2.3.4 For single skin bulk carriers required to comply with the retroactive requirements given in IACS UR S31, the survey of the side frames shall include:

- Representative thickness measurements shall be taken for each side frame.
- For the purpose of steel renewal, sand blasting and coating, four zones A, B, C and D are defined, as shown in **Figure 1**.
- 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 respective requirements 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 respective requirements, 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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**Steel renewal, sand blasting and coating**

- When zone B is made up of different plate thicknesses, the requirements shall be based on the lesser thickness.
- In case of integral brackets, when the criteria in the $T_{\text{min}}$ list are not satisfied for zone A or B, steel renewal, sand blasting and coating, as applicable shall be done for both zones A and B.
- In case of separate brackets, when the criteria in the $T_{\text{min}}$ list are not satisfied for zone A or B, steel renewal, sand blasting and coating shall be done for each one of these zones, as applicable.
- When steel renewal is required for zone C, it shall be done for both zones B and C. When sand blasting and coating is required for zone C, it shall be done for both zones B, C and D.
- When steel renewal is required for zone D it needs only to be done for this zone. When sand blasting and coating is required for zone D, it shall be done for zones C and D.
- Special consideration may be given by the society to zones previously renewed or re-coated, if found in “as new” condition (i.e. without breakdown or rusting).
- When adopted, on the basis of the renewal thickness criteria in the $T_{\text{min}}$ list, in general coating shall be applied in compliance with the requirements (IACS UR Z9), as applicable.
— Where, according to the requirements in the $T_{\text{min}}$ list, a limited number of side frames are shown to require coating over part of their length, the following criteria apply:

a) The part to be coated includes:
   — the web and the face plate of the side frames and brackets
   — the hold surface of side shell, hopper tank and topside tank plating, as applicable, over a width not less than 100 mm from the web of the side frame.

b) Epoxy coating or equivalent shall be applied.
   — in all cases, all the surfaces to be coated shall be sand blasted prior to coating application
   — when flanges of frames or brackets shall be renewed according to these requirements, the outstanding breadth to thickness ratio shall comply with the respective requirements.

Figure 1 Lower part of side frames

Reinforcing measures
— Reinforcing measures are constituted by tripping brackets, located at the lower part and at mid-span of side frames (see Figure 2). Tripping brackets may be located at every two frames, but lower and mid-span brackets shall be fitted in line between alternate pairs of frames.
— The thickness of the tripping brackets shall be not less than the as-built thickness of the side frame webs to which they are connected.
— Double continuous welding shall be adopted for the connections of tripping brackets to the side shell frames and shell plating.
Figure 2 Tripping brackets

Weld throat thickness
— In case of steel renewal the welded connections shall comply with applicable rules.

Pitting and grooving
— If pitting intensity is higher than 15% in area (see Figure 3), thickness measurement shall be taken to check pitting corrosion.
— The minimum acceptable remaining thickness in pits or grooves is equal to:
— 75% of the as built thickness, for pitting or grooving in the frame and bracket webs and flanges
— 70% of the as built thickness, for pitting or grooving in the side shell, hopper tank and topside tank plating attached to the side frame, over a width up to 30 mm each side of it.

![Pitting Intensity Diagrams](image)

**Figure 3 Pitting intensity diagrams (from 5% to 25% intensity)**

*Renewal of all frames in one or more cargo holds*

When all frames in one or more holds are required to be renewed according to IACS UR S31, the compliance with the requirements of related rules from the Society may be accepted in lieu of the compliance with the requirements in this sub-section, provided that:

— it is applied at least to all the frames of the hold(s)
— the coating requirements for side frames of "new ships" are complied with
— the section modulus of side frames is calculated according to the Society’s rules.

*Renewal of damaged frames*

In case of renewal of a damaged frame already complying with these rules (IACS UR S31), the following requirements apply:

— The conditions accepted in compliance with these rules shall, as a minimum, be restored.
— For localized damage, the extension of the renewal shall be carried out according to the standard practice of the individual classification society.

(IACS UR S31)
2.4 Oil and chemical tankers subject to enhanced survey programme (class notation ESP) – additional requirements

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

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

— overall examination of all cargo tanks and ballast tanks and all 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 18 for single hull oil tankers and single hull chemical tankers
Sec.4 Table 21 for double hull oil tankers and double hull chemical tankers

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

Sec.4 Table 19 for single hull oil tankers and single hull chemical tankers
Sec.4 Table 22 for double hull oil tankers and double hull chemical tankers

— a bottom survey in accordance with Sec.5 [1].

2.4.3 A ballast tank shall be recorded for examination at subsequent annual surveys where, in addition to the conditions given in [2.1.1] and [2.1.6]:

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

2.5 Liquefied gas tankers - additional requirements

2.5.1 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.

Guidance note:

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.
3 Machinery and systems

3.1 General - all ships

3.1.1 The survey shall cover:
— electrical installations, see [3.1.2]
— gas fuelled engine installation, see [3.1.3]
— fuel cell installations, see [3.1.4].

3.1.2 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 1:
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.

Guidance note 2:
Reference is made to IACS Rec. No.35 Inspection and maintenance of electrical equipment installed in hazardous areas.

3.1.3 For ships with gas fuelled engine installation (class notation Gas fuelled or GF), the survey shall include:
— testing of all alarm and shutdown functions for:
  — gas compressor
  — gas engine
  — governor (rpm) stability for generator driving engines when changing from gas mode to fuel oil mode under high load operation.

3.1.4 For ships with fuel cell installations, the survey shall include:
— testing of all alarm and shutdown functions for:
  — FC fuel gas compressor
  — fuel cell installation.
3.2 Oil and chemical tankers – additional requirements

3.2.1 For chemical tankers the survey shall include:
— examination of systems for cargo heating and cooling.

3.2.2 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.

3.2.3 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.

3.3 Liquefied gas tankers – additional requirements

3.3.1 For the control and monitoring systems required to be tested by Sec.2 [3.3], the testing shall be performed 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.

3.3.2 For ships using boil-off gas from the cargo or gas vaporized from the cargo as fuel, the following shall be surveyed and tested:
— vaporizers, fuel gas heaters, fuel gas compressors (low duty compressors)
— double walled or ducted fuel gas piping inside machinery spaces and their ventilation systems, alternatively inerting arrangements
— gas detection in double wall space with alarm and automatic shut off of gas supply
— gas detection in machinery space with alarm and automatic shut off of gas supply
— control and monitoring system for dual fuel boilers including change-over from fuel oil mode to dual fuel-or gas only mode
— for gas burning engines testing as required by [3.1.3].

3.4 Ships having **CHEM** notation – additional requirements

3.4.1 For ships having the **CHEM** notation the survey shall include:
— examination of systems for cargo heating and cooling.
SECTION 4 RENEWAL SURVEYS EXTENT – MAIN CLASS

1 General requirements

1.1 General

1.1.1 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.

1.1.2 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.

1.1.3 For liquefied gas tankers the renewal survey of cargo handling installations with related automatic control, alarm and safety systems shall preferably 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.

1.2 Review of documentation, operational instruments, signboards and markings

1.2.1 The draught marks shall be verified in order.

1.2.2 For ships equipped for the carriage of containers, instructions (container securing manual) shall be verified available on board. For vessels with class notation Container ship, Equipped for carriage of containers, Container or Container carrier the container securing manual shall be approved by the Society.

Instrument (computer program) for stowing and securing of containers, if furnished (mandatory for class notation LC, RSCS), shall be checked with verification of valid certificate, approved test conditions and tested for functionality and accuracy.

2 Hull and equipment

2.1 General - all ships

2.1.1 The survey shall cover:

a) thickness measurements of hull structure, see [2.1.4]
   — extended thickness measurements when substantial corrosion has been found, see [2.1.18]

b) anchoring equipment, see [2.1.5]

c) hatch covers and coamings, see [2.1.6]

d) doors in ship's bow, sides and stern, see [2.1.7]

e) air pipes and ventilators on deck, see [2.1.8] and [2.1.9]
f) examination of spaces:
   — all spaces, general, see [2.1.10]
   — watertight integrity of internal bulkheads and decks, see [2.1.14]
   — tightness of tank boundaries, see [2.1.15]
   — ballast tanks, see [2.1.16]
   — engine room structure, see [2.1.19]
   — piping on deck and in spaces outside the machinery area, see [2.1.20]
   — sea connections in machinery area, with pipes, valves and filters, see [2.1.22]
   — coating in tanks for potable water, see [2.1.29]
   — tanks for low flashpoint liquids, see [2.1.31]

   g) ships equipped for the carriage of containers, see [2.1.26]

   h) ships with movable car decks, see [2.1.27]

   i) mooring and towing equipment, see [2.1.23] and [2.1.24]

   j) pushing arrangement, see [2.1.30]

   k) loading instrument or loading computer system, if available onboard, shall be tested by comparing calculation results with approved test conditions. Functionality and accuracy shall be verified with respect to strength and stability, whichever is applicable.

      Guidance note:
      Results of loading computer calculations shall be evaluated as follows:
      — for approved loading test conditions no deviation is acceptable
      — for bending moments, shear forces and torsion moment the deviation from approved loading manual shall not exceed 5%
      — for stability the deviation from approved stability booklet shall not exceed those given in IACS UR L5.

   l) examination of masts with standing rigging and foundations, including those for cargo gear, see [2.1.25]

   m) elastic mounting of deck houses, see [2.1.35].

2.1.2 A bottom survey shall be carried out in accordance with Sec.5 [1], as part of the renewal survey.

2.1.3 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.

2.1.4 Thickness measurements of hull structures shall be carried out in accordance with [4].

2.1.5 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. The mean diameter of the anchor chain cables shall be determined on at least three (3) links per length.
 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.
---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---
If deemed necessary by the surveyor the anchor shall be weighted and the result recorded. The maximum allowable reduction in weight of anchor is 10%.
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.

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

da) close-up examination of hatch cover plating and hatch coaming plating.

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 5.

Additional thickness measurements are also specified in:
- Table 10 for general dry cargo ships subject to EHSR
- Table 12 for single skin bulk carriers
- Table 13, Table 16 for double skin bulk carriers.

2.1.7 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 are to be taken. Unless otherwise specified in the OMM or by manufacturer's recommendation, the measurement of clearances on Ro-Ro cargo ships may be limited to representative bearings where dismantling is needed in order to measure the clearances. If dismantling is carried out, a visual examination of hinge pins and bearings together with NDT of the hinge pin is to be carried out

d) examination of doors shall be supported by thickness measurements. 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.

2.1.8 Thickness measurements of air pipes and ventilators shall be carried out if deemed necessary by the surveyor. Thickness diminution shall not exceed allowable limits.

2.1.9 Automatic air pipe heads on exposed decks shall be externally and internally examined.
For all ships except for passenger ships the following apply:
At 1\textsuperscript{st} 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 2\textsuperscript{nd} 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 3\textsuperscript{rd} 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 shall 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.

2.1.10 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.
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.
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.
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 [2.1.32], for chemical tankers and liquefied gas tankers in [2.4] and [2.5]. 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.
2.1.11 Examination of fuel oil, lube oil and fresh water tanks shall be in accordance with Table 1. Independent tanks in machinery spaces shall be externally examined including the tank supporting structures.

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

2.1.13 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 1 Minimum requirements for internal examination of fuel oil, lube oil and fresh water tanks

<table>
<thead>
<tr>
<th>Tank</th>
<th>Age of ship, years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 to 5</td>
</tr>
<tr>
<td>Fuel oil/diesel oil engine room/machinery space</td>
<td>None</td>
</tr>
<tr>
<td>Fuel oil/diesel oil area outside engine room/machinery space</td>
<td>None</td>
</tr>
<tr>
<td>Lube oil</td>
<td>None</td>
</tr>
<tr>
<td>Fresh water (^5)</td>
<td>None</td>
</tr>
<tr>
<td>Waste-/sludge-/drain tanks</td>
<td>None</td>
</tr>
</tbody>
</table>

1) Tanks of integral (structural) type.
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.
3) Peak tanks (all uses) are subject to internal examination at each renewal survey.
4) At renewal surveys no 3 and subsequent surveys, one deep tank for fuel oil outside engine room shall be included, if fitted.
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 [2.1.13].

(IACS UR Z7)

2.1.14 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.

---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---

2.1.15 Testing of structures forming boundaries of tanks, including holds adapted for the carriage of liquid, shall be in accordance with Table 2. 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 2 Minimum requirements for testing of tanks

<table>
<thead>
<tr>
<th>Tanks 1) to be tested</th>
<th>Test head or pressure</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ballast tanks</td>
<td>Top of air pipe</td>
<td></td>
</tr>
<tr>
<td>Cargo holds adapted for carriage of ballast</td>
<td>Near the top of cargo hold hatch coaming</td>
<td>3)</td>
</tr>
<tr>
<td>Bilge water holding tanks</td>
<td>Top of air pipe</td>
<td>2) alternatively as for fuel oil tanks</td>
</tr>
<tr>
<td>Fuel oil tanks</td>
<td>Head of liquid to the highest point that liquid will rise under service conditions</td>
<td>2), 3)</td>
</tr>
<tr>
<td>Lub. Oil tanks</td>
<td>Head of liquid to the highest point that liquid will rise under service conditions</td>
<td>2)</td>
</tr>
<tr>
<td>Fresh water tanks</td>
<td>Head of liquid to the highest point that liquid will rise under service conditions</td>
<td>2), 3)</td>
</tr>
<tr>
<td>Sewage (black and grey water) tanks</td>
<td>Top of air pipe</td>
<td>As deemed necessary by the surveyor</td>
</tr>
<tr>
<td>Tanks containing other liquids</td>
<td>Head of liquid to the highest point that liquid will rise under service conditions</td>
<td>As deemed necessary by the surveyor</td>
</tr>
</tbody>
</table>

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.

For ships with class notation Great lakes bulk carrier, the testing of tanks required above may be waived at the discretion of the surveyor, provided an internal examination is carried out, together with an examination of the tank top.

2.1.16 For ballast tanks the survey shall include examination of the condition of corrosion prevention system, where provided.
A ballast tank 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.
Satisfaction with class notation **Great lakes bulk carrier** with unprotected ballast tanks shall only be recorded for examination at subsequent annual survey in case areas with substantial corrosion are found.

**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.

---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---

### 2.1.17 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 [1], examination at subsequent annual surveys in accordance with [2.1.18] 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.

---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---

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

The following tables shall be used:

- **Table 8** in general as guidance,
- **Table 13** for single skin bulk carriers,
- **Table 17** for double skin bulk carriers,
- **Table 20** for single hull oil tankers and single hull chemical tankers,
- **Table 23** for double hull oil tankers and double hull chemical tankers.

### 2.1.19 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.

### 2.1.20 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 350°C
— compressed air
— hydraulic, including steering power actuating
— fuel oil.

Steam pipes with temperature ≥ 350°C shall be examined for expansion and tested as deemed necessary by the surveyor. NDT of welding seam shall be performed as required by the surveyor.

2.1.21 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 shall 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.

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

2.1.23 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 bits, 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.

  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 2007-01-01.

2.1.24 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).

2.1.25 Crane pedestals, cargo gear foundation 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.
2.1.26 For ships equipped for the carriage of containers, 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.

2.1.27 For ships with movable car decks, 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.

2.1.28 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 shall 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 ship sides
- steps/knuckles in upper decks
- transverse bulkheads with large openings, generally around quarter lengths of the ship.

2.1.29 For ships arranged for carriage of potable water, the coating in cargo tanks shall be examined.

2.1.30 For ships with arrangement for pushing or being pushed, the following shall be examined:
- connecting points and contact areas with supporting structure
- connecting equipment including locking device if any.

2.1.31 For ships arranged for carriage of low flash point liquids, the survey shall include:
- pressure testing (hydrostatic, hydro-pneumatic or otherwise) of all cargo tanks to their MARVS (maximum allowable relief valve setting)
2.1.32 For ships with gas fuelled engine installation (class notation Gas fuelled or GF), 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 [2.5]
   — external examination including the tanks supports with foundations.

2.1.33 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.

2.1.34 Starting from renewal survey no. 2 (ships 5 - 10 years of age), where hull structural members are made of steel with yield strength of 460 N/mm² and above, additional ultrasonic testing of the butt welds shall be carried out – see also Table 4 for reference.

2.1.35 Elastic mountings of deckhouses shall be thoroughly checked for the general condition and operability of:
   — the spring elements (possibly pre-stressing of screwed connections)
   — the insulation
   — the securing devices to prevent shifting and lifting
   — the pipe and cable connections to the hull.
If damages are suspected, mountings not easily accessible shall be dismounted and examined in detail.

2.2 General dry cargo ships subject to extended hull survey requirements (EHSR) – additional requirements

2.2.1 Close-up examination shall be carried out in accordance with Table 9.

2.2.2 Thickness measurement shall be carried out in accordance with Table 10.
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 specially considered 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.

2.2.3 A bottom survey in dry dock shall be carried out in accordance with Sec.5 [1], as part of the renewal survey.

2.3 Dry bulk cargo ships subject to enhanced survey programme (class notation ESP) – additional requirements

2.3.1 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.
2.3.2 Close-up examination shall be carried out in accordance with:
Table 11 for single skin bulk carriers,
Table 14 for double skin bulk carriers,
Table 15 for ore carriers.

2.3.3 Thickness measurements shall be carried out in accordance with:
Table 12 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.
Table 16 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.

2.3.4 A bottom survey in dry dock shall be carried out in accordance with Sec.5 [1], as part of the renewal survey.

2.3.5 For single skin bulk carriers subject to compliance with the requirements given in IACS UR S19, additional thickness measurements shall be carried out of the vertically corrugated transverse watertight bulkhead between cargo holds Nos. 1 and 2, as applicable.
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 Figure 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)
2.3.6 For single skin bulk carriers required to comply with the retroactive requirements given in IACS UR S31, the survey of the side frames shall be carried out according to Sec.3 [2.3.4].

2.4 Oil and chemical tankers subject to enhanced survey programme (class notation ESP) – additional requirements

2.4.1 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.

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

Table 18 for single hull oil tankers and single hull chemical tankers,
Table 21 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.
2.4.3 Thickness measurements shall be carried out in accordance with:

- Table 19 for single hull oil tankers and single hull chemical tankers,
- Table 22 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.

2.4.4 A bottom survey in dry dock shall be carried out in accordance with Sec.5 [1], as part of the renewal survey.

2.4.5 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.

Cargo tank testing carried out by the vessel’s crew under the direction of the Master may be accepted by the surveyor provided the following conditions are complied with:

- a tank testing procedure, specifying fill heights, tanks being filled and bulkheads being tested, has been submitted by the owner and reviewed by the Society prior to the testing being carried out
- there is no record of leakage, distortion or substantial corrosion that would affect the structural integrity of the tank
- the tank testing has been satisfactorily carried out within special survey window not more than 3 months prior to the date of the survey on which the overall or close up survey is completed
- the satisfactory results of the testing is recorded in the vessel’s logbook
- the internal and external condition of the tanks and associated structure are found satisfactory by the surveyor at the time of the overall and close up survey.

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.

2.4.6 A ballast tank shall be recorded for examination at subsequent annual surveys where, in addition to the conditions given in [2.1.4] and [2.1.18]:

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

2.4.7 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.

2.4.8 Pressure/vacuum valves shall be opened up, overhauled, adjusted and tested as deemed necessary by the surveyor.

2.5 Liquefied gas tankers – additional requirements

2.5.1 Close-up examination shall be carried out in accordance with Table 24.

2.5.2 Thickness measurement shall be carried out in accordance with Table 25.
2.5.3 A bottom survey in dry dock shall be carried out in accordance with Sec.5 [1], as part of the renewal survey.

2.5.4 All cargo tanks shall be examined internally. Cargo tanks shall also be examined externally, as far as practical. 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.

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

2.5.6 Non-destructive testing shall supplement cargo tank inspection. Special attention shall 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, for type C tanks, 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 tanks vertical supports, longitudinal supports, transverse/anti-roll supports and anti-flotation supports web frames or stiffening rings
- swash bulkhead boundaries
- dome and sump connections to tank shell
- foundations for pumps, towers, ladders etc.
- pipe connections.

2.5.7 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.

2.5.8 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 and primary barrier of membrane tanks during the first loading of the cargo tanks subsequent to the renewal survey.

2.5.9 Where findings of [2.5.1] to [2.5.8] or an examination of the voyage records raise doubts as to the structural integrity of a cargo tank 'further investigations for locating the possible defect shall be carried out by a suitable method

2.5.10 For membrane containment systems a tightness test of the primary and secondary barrier shall be carried out in accordance with the system designers' procedures and acceptance criteria as approved by the Society. Low differential pressures tests may be used for monitoring the cargo containment system performance, but are not considered an acceptable test for the tightness of the secondary barrier. (IACS UR Z16, Rev.4).

For membrane containment systems with glued secondary barriers, if the designer's threshold values are exceeded, an investigation shall be carried out and additional testing such as thermographic or acoustic emissions testing shall be carried out. (IACS UR Z16, Rev.4) 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.

2.5.11 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 [2.5.6], 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 tanks saddle supports and anti-flotation arrangements,
— 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.

2.5.12 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. For independent tanks type A 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. For independent tanks type B the partial secondary barrier/small leak protection shall be examined as far as practical.

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

2.5.14 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 3.

Table 3 Cargo tanks – tolerance on set pressure

<table>
<thead>
<tr>
<th>Set pressure ( p ) [bar]</th>
<th>Tolerance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( 0.0 \leq p \leq 1.5 )</td>
<td>±10.0</td>
</tr>
<tr>
<td>( 1.5 &lt; p &lt; 3.0 )</td>
<td>±6.0</td>
</tr>
<tr>
<td>( 3.0 \leq p )</td>
<td>±3.0</td>
</tr>
</tbody>
</table>

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.

2.5.15 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.

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

2.5.17 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.
2.5.18 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.

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

2.5.20 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.

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

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

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

2.5.24 Cargo tanks monitoring including high level alarms and overflow control with automatic closing of loading valves shall be examined and tested. ESD system shall be tested.

2.6 Container carriers and container ships – additional requirements

2.6.1 At the first renewal survey after 10 years of delivery and subsequent renewal surveys, extent of non-destructive testing (NDT) on welds of steel grade with yield strength $460 \text{ N/mm}^2$ and above shall be at least as specified in Table 4. Based on the results of visual inspection (VT) and magnetic particle testing (MT), ultrasonic testing (UT) may be required at additional locations selected by the Society.

<table>
<thead>
<tr>
<th>Testing method</th>
<th>Type of connection</th>
<th>Extent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual inspection (VT)</td>
<td>All weld joints</td>
<td>100%</td>
</tr>
<tr>
<td>Magnetic particle testing (MT)</td>
<td>Weld joints transversely or vertically orientated</td>
<td>100%</td>
</tr>
<tr>
<td>Ultrasonic testing (UT)</td>
<td>Butt-joints of full penetration of hatch side coaming top plate at the location of block joints</td>
<td>100% ¹)</td>
</tr>
</tbody>
</table>

¹) Only required if there is access from one side only.

2.7 Oil recovery vessels – additional requirements

2.7.1 For oil recovery vessels periodical survey requirements are given in Sec.6 [3].
3 Machinery and systems

3.1 General – all ships

3.1.1 The survey shall cover:

a) propulsion system, see [3.1.2]

b) steering and manoeuvring systems, see Sec.2

c) auxiliary systems, see [3.1.3]

d) boilers and thermal oil heaters, see Sec.5

e) electrical power production systems including power management systems, see [3.1.4]

f) electrical installations, see [3.1.5]

g) electrical equipment in gas-dangerous spaces and zones, see [3.1.6]

h) control and monitoring system of main and auxiliary machinery including equipment for periodically unattended machinery space and machinery centralised operated, see [3.1.7]

i) equipment and systems related to carriage of special cargoes:
   — inert gas plants, see [3.1.8]
   — low flashpoint liquids, see [3.1.9]
   — potable water, see [3.1.11]

j) 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 [3.1.12]

k) gas fuelled engine installations, see [3.1.13]

l) fuel cell installations, see [3.1.14]

m) gas turbine installations, see [3.1.15]

n) water ingress detection system and their alarms, for ships with single cargo hold and for bulk carriers

o) exhaust gas cleaning systems for the reduction of SOx or NOx see [3.1.16].

3.1.2 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 26.

3.1.3 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 26.

A reduction in the scope of survey may be agreed to upon examination of the maintenance protocols.

3.1.4 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 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.

Protection relays in generator and bus tie circuit breakers shall be tested with secondary current injection, or with suitable apparatus made for testing of the installed protection units.

For battery powered vessels (class notation Battery) the surveyor shall, for all relevant battery systems, witness a battery capacity (state of health – SOH) test.

3.1.5 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.

Review of service report issued by competent personnel having serviced main switchboard and generator circuit breakers.

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.

The requirement for insulation resistance (“megger”) test record shall be presented at renewal survey is waived if:

— testing of all individual motors is included and logged in the planned maintenance system, and
— the insulation monitoring alarms required by rules are integrated in the machinery alarm system and being logged at every occurrence.

3.1.6 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
— protection devices of electric motors in gas dangerous areas shall be tested. The motors shall be selected by the surveyor.
Guidance note 1:
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 2:
Reference is made to IACS Rec. No.35 - Inspection and maintenance of electrical equipment installed in hazardous areas.

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3.1.7 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.
For ships with notation AUT, E0 or ECO, see Sec.6 [25].

3.1.8 For ships with inert gas plant, 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 shall be verified.
It shall be verified that pipe blanking arrangements and portable O2-analysers are on board and in order.

3.1.9 For ships arranged for carriage of low flash point liquids (including ships with class notation LFL or LFL*), the survey shall include examination and testing of equipment and arrangement as detailed in approved LFL operation manual. Heating coils shall normally be pressure tested.

3.1.10 For ships arranged for carriage of toxic chemicals holding the CHEM notation, the following shall be examined:
— systems for cargo heating and cooling. Heating coils are normally to be pressure tested
— tank cleaning apparatus and other equipment in cargo tanks, cofferdams and pipe tunnels within the cargo area shall be examined
— inert gas lines shall be tightness tested
— checking of spare parts for the mechanical ventilation fans in the cargo area
— verification of the cargo system and equipment required in connection with the vessel’s special features
— verification of marking of cargo tanks, pumps, pipelines, valves etc.

3.1.11 For ships arranged for carriage of potable water, the following shall be examined:
— instruments for pH and conductivity
— cargo tank vents.

### 3.1.12 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.

### 3.1.13 For ships with gas fuelled engine installation (class notation **Gas fuelled** or **GF**), 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.

### 3.1.14 For ships with fuel cell installations, 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.

### 3.1.15 For ships with gas turbine installations the survey shall include verification of records and major overhaul reports onboard.

Major overhaul on gas turbines shall be performed by either the original equipment manufacturer (OEM) or an OEM authorized company.

### 3.1.16 For ships with exhaust gas cleaning system for the reduction of SOx or NOx, the survey shall include:

— the internals of the scrubber or catalyst block of the selective catalyst reduction (SCR) unit shall be visually inspected to the extent possible without disassembling

— SOx scrubber units designed with bottom exhaust inlets, e.g inline scrubbers, or otherwise designed such that failure of the inlet pipe weld or other welded connections, or inlet pipe corrosion, may cause water ingress into the exhaust line below, shall be inspected internally and externally for corrosion and cracks, particularly on and in vicinity of the exhaust inlet

— where a by-pass arrangement is installed the by-pass valves shall be visually examined

— where the exhaust pipes of multiple engine installations are combined into one cleaning system, the isolation valves shall be visually examined and their functionality verified

— cleaning devices installed to prevent build-up of soot, shall be visually inspected and verified free of leakages

— survey of functionality and calibration of all sensors in the safety system
Guidance note:
Calibration shall be carried out once per class period or as specified by the supplier whichever is the shorter interval.

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— verification of the function of the exhaust gas cleaning system's control and monitoring system.

Guidance note:
Verification of the exhaust gas emission levels as specified in IMO Res. MEPC.259(68) will be performed where the Society is authorized to survey IAPP compliance under MARPOL Annex VI.

---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---

3.2 Oil and chemical tankers – additional requirements

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

For inert gas systems the deck water seal and the scrubber shall be opened for internal inspection. Inert gas lines shall be tightness tested.

3.2.2 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.

3.2.3 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.
3.2.4 For ships with centralised cargo control arrangement, the survey shall include:
— examination and testing of all remotely controlled operations related to cargo handling and ballasting
— checking of alarms and remote readings
— control of relevant requirements 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.

3.2.5 For ships with vapour processing and recovery plant the survey shall include a VOC (volatile organic compounds) plant running test.

3.3 Liquefied gas tankers – additional requirements

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

3.3.2 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.

3.3.3 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.

3.3.4 For ships having a gas fuel forwarding system, survey and testing as required for intermediate survey shall be carried out.
In addition fuel gas heaters and vaporizers shall be opened for internal inspection as found necessary.

3.3.5 For equipment for use of gases evaporated from LNG cargo as fuel, the pipe or duct enclosing the gas fuel line shall be inspected for leaks. The ventilation system of that pipe or duct as well as the inert equipment of a double wall piping system shall be checked for their operability.

4 Tables of close-up examination and thickness measurements

4.1 General – all ships

4.1.1 Minimum thickness measurements, all ships are given in Table 5, for passenger ships in Table 6 and for ships with class notation Great lakes bulk carriers in Table 7.

4.1.2 Thickness measurements, extent and pattern in way of areas with substantial corrosion, all ships are given in Table 8.

4.1.3 Thickness measurement of suspect areas shall be carried out as deemed necessary by the surveyor.
4.2 General dry cargo ships subject to extended hull survey requirements

4.2.1 Close-up examination, general dry cargo ships are given in Table 9.

4.2.2 Minimum thickness measurements, general dry cargo ships are given in Table 10.

4.3 Single skin bulk carriers subject to enhanced survey programme (class notation **ESP**)

4.3.1 Close-up examination, single skin bulk carriers are given in Table 11.

4.3.2 Minimum thickness measurement, single skin bulk carriers are given in Table 12

4.3.3 Thickness measurements, extent and pattern in way of areas with substantial corrosion, single skin bulk carriers are given in Table 13

4.4 Double skin bulk carriers subject to enhanced survey programme (class notation **ESP**)

4.4.1 Close-up examination, double skin bulk carriers are given Table 14

4.4.2 Close-up examination, ore carriers are given Table 15.

4.4.3 Minimum thickness measurement, double skin bulk carriers and ore carriers are given in Table 16.

4.4.4 Thickness measurement, extent and pattern in way of areas of substantial corrosion, double skin bulk carriers are given in Table 17.

4.5 Single hull oil tankers and single hull chemical tankers subject to enhanced survey programme (class notation **ESP**)

4.5.1 Close-up examination, single hull oil tankers, single hull chemical tankers and ore/oil ships are given in Table 18.

4.5.2 Minimum thickness measurement, single hull oil tankers, single hull chemical tankers and ore/oil ships are given in Table 19.

4.5.3 Thickness measurement, extent and pattern in way of areas of substantial corrosion, single hull oil tankers, single hull chemical tankers and ore/oil ships are given in Table 20

4.6 Double hull oil tankers subject to enhanced survey programme (class notation **ESP**)

4.6.1 Close-up examination, double hull oil tankers and double hull chemical tankers are given in Table 21

4.6.2 Minimum thickness measurement, double hull oil tankers and double hull chemical tankers are given in Table 22.

4.6.3 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 20.
### 4.7 Liquefied gas tankers

#### 4.7.1 Close-up examination, liquefied gas tankers are given **Table 24.**

#### 4.7.2 Minimum thickness measurement, liquefied gas tankers are given in **Table 25.**

**Table 5 Minimum thickness measurements ¹), all ships**

<table>
<thead>
<tr>
<th>Area</th>
<th>Renewal survey no. 1 Age &lt; 5 years</th>
<th>Renewal survey no. 2 Age 5 - 10 years</th>
<th>Renewal survey no. 3 Age 10 - 15 years</th>
<th>Renewal survey no. 4 and subsequent Age &gt; 15 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Transverse section(s) in way of cargo area within 0.5 L amidships ²)⁴)</td>
<td>One section of deck plating only.</td>
<td>Two complete sections - two different spaces. ⁵)</td>
<td>Three complete sections. ⁵)</td>
</tr>
<tr>
<td>1a</td>
<td>Main deck plating ³)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1b</td>
<td>Cargo hold hatch covers and coamings</td>
<td>All - plating and stiffeners.</td>
<td>All - plating and stiffeners.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Wind- and water strakes</td>
<td></td>
<td></td>
<td>All exposed - full length.</td>
</tr>
<tr>
<td>3</td>
<td>Strakes of transverse bulkheads in cargo spaces together with internals in way</td>
<td></td>
<td></td>
<td>All bulkheads - lowest strake and strakes in way of 'tween decks.</td>
</tr>
<tr>
<td>4a</td>
<td>Keel plates and bottom plates</td>
<td></td>
<td></td>
<td>All keel plates full length. Additional bottom plates in way of cofferdams, machinery space and aft end of tanks.</td>
</tr>
<tr>
<td>4b</td>
<td>Plating of sea chests and shell plating in way of overboard discharges</td>
<td></td>
<td></td>
<td>Plating of sea chests. Shell plating as considered necessary by the attending surveyor.</td>
</tr>
<tr>
<td>5</td>
<td>Superstructure deck plating (poop, bridge and forecastle deck)</td>
<td></td>
<td></td>
<td>Representative exposed deck plating.</td>
</tr>
<tr>
<td>6</td>
<td>Internals in peak tanks</td>
<td>Forepeak and aftpeak.</td>
<td>Forepeak and aftpeak.</td>
<td></td>
</tr>
</tbody>
</table>
### 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.

6) Subject to cargo hold hatch covers of approved design which structurally have no access to the internals, thickness measurement shall be done of accessible parts of hatch covers structures.

Source: IACS UR Z7 TABLE I

### Table 6 Minimum thickness measurements ¹), passenger ships with superstructure extending over most of the ship length

<table>
<thead>
<tr>
<th>Area</th>
<th>Renewal survey no. 1 Age &lt; 5 years</th>
<th>Renewal survey no. 2 Age 5 - 10 years</th>
<th>Renewal survey no. 3 Age 10 - 15 years</th>
<th>Renewal survey no. 4 and subsequent Age &gt; 15 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Transverse section(s) within 0.5 L amidships ²³ ¹⁾</td>
<td>.</td>
<td>Two sections of hull plating (keel, bottom &amp; bilge, side) up to the bulkhead deck.</td>
<td>Three sections of hull plating (keel, bottom &amp; bilge, side) up to the bulkhead deck.</td>
</tr>
<tr>
<td>1a</td>
<td>Tank top plating ⁴⁾</td>
<td>Selected plating within machinery and boiler spaces.</td>
<td>Selected plating within machinery and boiler spaces.</td>
<td>Selected plating within machinery and boiler spaces.</td>
</tr>
<tr>
<td>1b</td>
<td>Car decks plating</td>
<td>Selected plating.</td>
<td>All plating.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Wind- and water strakes</td>
<td></td>
<td>All - full length.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Strakes of transverse bulkheads in machinery and cargo spaces as applicable together with internals in way</td>
<td></td>
<td>All bulkheads - lowest strake.</td>
<td></td>
</tr>
<tr>
<td>4a</td>
<td>Keel plates and bottom plates</td>
<td></td>
<td>All keel plates full length. Additional bottom plates in way of cofferdams, machinery space and aft end of tanks.</td>
<td></td>
</tr>
</tbody>
</table>
Survey requirements for fleet in service

### 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 7 Minimum thickness measurements

<table>
<thead>
<tr>
<th>Area</th>
<th>Renewal survey no. 1 Age &lt; 5 years</th>
<th>Renewal survey no. 2 Age 5 - 10 years</th>
<th>Renewal survey no. 3 Age 10 - 15 years</th>
<th>Renewal survey no. 4 and subsequent Age &gt; 15 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>4b Plating of sea chests and shell plating in way of overboard discharges</td>
<td></td>
<td></td>
<td></td>
<td>Plating of sea chests. Shell plating as considered necessary by the attending surveyor.</td>
</tr>
<tr>
<td>5 Superstructure deck plating</td>
<td></td>
<td></td>
<td></td>
<td>Representative exposed deck plating.</td>
</tr>
<tr>
<td>6 Internals in peak tanks</td>
<td></td>
<td></td>
<td></td>
<td>Forepeak and aft peak.</td>
</tr>
</tbody>
</table>

### Table 7 Minimum thickness measurements, great lakes bulk carriers

<table>
<thead>
<tr>
<th>Area</th>
<th>Renewal survey no. 1 and 2</th>
<th>Renewal survey no. 3</th>
<th>Renewal survey no. 4 - 6</th>
<th>Renewal survey no. 7 and subsequent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0a Transverse sections within the cargo area. 2)</td>
<td></td>
<td></td>
<td></td>
<td>One complete section - outside line of cargo hatch openings - within 0.5 L amidships. 3)</td>
</tr>
<tr>
<td>0b Unprotected ballast tanks/possible suspect area/ extensive corrosion</td>
<td>In case extensive corrosion is found, thickness measurements shall be carried out to the extent deemed necessary by the surveyor and may be equal to those required for sea going vessels, i.e. Table 12</td>
<td>In case extensive corrosion is found, thickness measurements shall be carried out to the extent deemed necessary by the surveyor and may be equal to those required for sea going vessels, i.e. Table 12</td>
<td>In case extensive corrosion is found, thickness measurements shall be carried out to the extent deemed necessary by the surveyor and may be equal to those required for sea going vessels, i.e. Table 12</td>
<td>In case extensive corrosion is found, thickness measurements shall be carried out to the extent deemed necessary by the surveyor and may be equal to those required for sea going vessels, i.e. Table 12</td>
</tr>
<tr>
<td>1a Cargo hold hatch covers – plating and stiffeners</td>
<td></td>
<td></td>
<td></td>
<td>Selected hatch covers shall be decided by the surveyor.</td>
</tr>
</tbody>
</table>

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 12
### Table 8 Thickness measurements, extent and pattern in way of areas with substantial corrosion, all ships

<table>
<thead>
<tr>
<th>Area/structural member</th>
<th>Extent of measurement</th>
<th>Pattern of measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plating</td>
<td>Suspect area and adjacent plates</td>
<td>5 points over 1 m²</td>
</tr>
<tr>
<td>Stiffeners</td>
<td>Suspect area</td>
<td>3 points in line across web 3 points in line across flange</td>
</tr>
</tbody>
</table>

Source: IACS UR Z7 TABLE II

### Table 9 Close-up examination, general dry cargo ships subject to EHSR

<table>
<thead>
<tr>
<th>Area</th>
<th>Renewal survey no. 1 Age ≤ 5 years</th>
<th>Renewal survey no. 2 Age 5 - 10 years</th>
<th>Renewal survey no. 3 Age 10 - 15 years</th>
<th>Renewal survey no. 4 and subsequent Age &gt; 15 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a Cargo hold hatch covers and coamings - plating and stiffeners.</td>
<td>All</td>
<td>All</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>1b Deck plating and underdeck structures inside line of hatch openings between cargo hold hatches.</td>
<td>Selected areas</td>
<td>All</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>Area</td>
<td>Renewal survey no. 1 Age ≤ 5 years</td>
<td>Renewal survey no. 2 Age 5 - 10 years</td>
<td>Renewal survey no. 3 Age 10 - 15 years</td>
<td>Renewal survey no. 4 and subsequent Age &gt; 15 years</td>
</tr>
<tr>
<td>------</td>
<td>----------------------------------</td>
<td>--------------------------------------</td>
<td>--------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>2</td>
<td>Cargo hold transverse shell frames. Selected frames in one forward and one aft cargo hold/ ’tween deck space.</td>
<td>Selected frames in all cargo holds/ ’tween deck spaces.</td>
<td>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.</td>
<td>All frames in all cargo holds/’tween deck spaces including upper and lower end attachments and adjacent shell plating.</td>
</tr>
<tr>
<td>3a</td>
<td>Cargo hold transverse bulkheads 1) - plating, stiffeners and girders. One</td>
<td>One in each hold.</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>3b</td>
<td>Ballast tanks transverse bulkheads, including stiffening system. Forward and aft bulkhead in one side tank.</td>
<td>All</td>
<td>All</td>
<td></td>
</tr>
<tr>
<td>4a</td>
<td>Ballast tanks transverse web frames with associated plating and framing. One in two representative tanks of each type within the cargo area 2).</td>
<td>All - in all ballast tanks</td>
<td>All - in all ballast tanks</td>
<td></td>
</tr>
<tr>
<td>4b</td>
<td>Inner bottom plating. Selected areas</td>
<td>All</td>
<td>All</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**

1) Close-up examination of cargo hold transverse bulkheads shall 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.

3) Subject to cargo hold hatch covers of approved design which structurally have no access to the internals, close-up survey/thickness measurement shall be done of accessible parts of hatch covers structures.

Source.: IACS UR Z7.1 TABLE I
### Table 10 Minimum thickness measurements<sup>1)</sup>, general dry cargo ships subject to EHSR

<table>
<thead>
<tr>
<th>Area</th>
<th>Renewal survey no. 1</th>
<th>Renewal survey no. 2</th>
<th>Renewal survey no. 3</th>
<th>Renewal survey no. 4 and subsequent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age ≤ 5 years</td>
<td>Age 5 - 10 years</td>
<td>Age 10 - 15 years</td>
<td>Age &gt; 15 years</td>
</tr>
<tr>
<td>0a</td>
<td>Transverse section(s) in way of cargo area within 0.5 L amidships&lt;sup&gt;2)&lt;sup&gt;3)&lt;/sup&gt;</td>
<td>One section of deck plating only.</td>
<td>Two complete sections - two different cargo spaces.</td>
<td>Three complete sections. &lt;sup&gt;4)&lt;/sup&gt;</td>
</tr>
<tr>
<td>0b</td>
<td>Structural members subject to close-up examination according to Table 9.</td>
<td>Measurements, for general assessment and recording of corrosion pattern.</td>
<td>Measurements, for general assessment and recording of corrosion pattern.</td>
<td>Measurements, for general assessment and recording of corrosion pattern.</td>
</tr>
<tr>
<td>1</td>
<td>Main deck plating</td>
<td>All - outside line of cargo hatch openings within the cargo area.</td>
<td>All - within the cargo area. Selected outside the cargo area.</td>
<td>All - full length.</td>
</tr>
<tr>
<td>2</td>
<td>Wind- and water strakes.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Transverse bulkheads</td>
<td>See item 0b</td>
<td>See item 0b</td>
<td>See item 0b</td>
</tr>
<tr>
<td>4a</td>
<td>Keel plates and bottom plates.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4b</td>
<td>Sea chests and shell plating in way of overboard discharges.</td>
<td>Plating of sea chests. Shell plating as considered necessary by the attending surveyor.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4c</td>
<td>Duct keel or pipe tunnel.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Superstructure deck plating (poop, bridge and forecastle deck).</td>
<td>Representative exposed deck plating.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Internals in peak tanks.</td>
<td>Forepeak and aftpeak.</td>
<td>Forepeak and aftpeak.</td>
<td></td>
</tr>
</tbody>
</table>
### Rules for classification: Ships — DNVGL-RU-SHIP Pt.7 Ch.1. Edition January 2017

**Survey requirements for fleet in service**

<table>
<thead>
<tr>
<th>Area</th>
<th>Renewal survey no. 1 Age ≤ 5 years</th>
<th>Renewal survey no. 2 Age 5 - 10 years</th>
<th>Renewal survey no. 3 Age 10 - 15 years</th>
<th>Renewal survey no. 4 and subsequent Age &gt; 15 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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 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.

Source: IACS UR Z7.1 TABLE II

### Table 11 Close-up examination, single skin bulk carriers

<table>
<thead>
<tr>
<th>Area</th>
<th>Renewal survey no. 1 Age &lt; 5 years</th>
<th>Renewal survey no. 2 Age 5 - 10 years</th>
<th>Renewal survey no. 3 Age 10 - 15 years</th>
<th>Renewal survey no. 4 and subsequent Age &gt; 15 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Cargo hold hatch covers and coamings - plating and stiffeners.</td>
<td>All</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>1b</td>
<td>Deck plating and underdeck structures inside line of hatch openings between cargo hold hatches.</td>
<td>All</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>2</td>
<td>Cargo hold transverse shell frames.</td>
<td>25% of frames in the forward cargo hold at representative positions. Selected frames in remaining cargo holds.</td>
<td>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.</td>
<td>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.</td>
</tr>
</tbody>
</table>
### Area

<table>
<thead>
<tr>
<th>Area</th>
<th>Renewal survey no. 1</th>
<th>Renewal survey no. 2</th>
<th>Renewal survey no. 3</th>
<th>Renewal survey no. 4 and subsequent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age ≤ 5 years</td>
<td>Age 5 - 10 years</td>
<td>Age 10 - 15 years</td>
<td>Age &gt; 15 years</td>
</tr>
<tr>
<td>3a</td>
<td>Cargo hold transverse bulkheads 1) - plating, stiffeners and girders, including internal structures of upper and lower stools, where fitted.</td>
<td>Two selected bulkheads.</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>3b</td>
<td>Ballast tanks transverse bulkheads, including stiffening system.</td>
<td>Forward and aft bulkhead in one side tank.</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>4a</td>
<td>Ballast tanks transverse web frames with associated plating and longitudinals.</td>
<td>One in two representative tanks of each type (i.e. top side tank, hopper side tank, double bottom tank).</td>
<td>One in all ballast tanks</td>
<td>All - in all ballast tanks</td>
</tr>
</tbody>
</table>

### Notes:

1) Close-up examination of cargo hold transverse bulkheads shall 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) Subject to cargo hold hatch covers of approved design which structurally have no access to the internals, close-up survey/thickness measurement shall be done of accessible parts of hatch covers structures.

Source.: IACS UR Z10.2 TABLE I

### Table 12 Minimum thickness measurements 1), single skin bulk carriers

<table>
<thead>
<tr>
<th>Area</th>
<th>Renewal survey no. 1</th>
<th>Renewal survey no. 2</th>
<th>Renewal survey no. 3</th>
<th>Renewal survey no. 4 and subsequent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age ≤ 5 years</td>
<td>Age 5 - 10 years</td>
<td>Age 10 - 15 years</td>
<td>Age &gt; 15 years</td>
</tr>
<tr>
<td>0a</td>
<td>Transverse sections within the cargo area. 2)</td>
<td>Two sections of deck plating only - outside line of cargo hatch openings - at least one within 0.5 L amidships. 3)</td>
<td>Two complete sections - outside line of cargo hatch openings - at least one within 0.5 L amidships. 3)</td>
<td>Three complete sections - outside line of cargo hatch openings - at least one within 0.5 L amidships. 3)</td>
</tr>
<tr>
<td>Area</td>
<td>Renewal survey no. 1 Age ≤ 5 years</td>
<td>Renewal survey no. 2 Age 5 - 10 years</td>
<td>Renewal survey no. 3 Age 10 - 15 years</td>
<td>Renewal survey no. 4 and subsequent Age &gt; 15 years</td>
</tr>
<tr>
<td>------</td>
<td>----------------------------------</td>
<td>--------------------------------------</td>
<td>--------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>0b</td>
<td>Structural members subject to close-up examination according to Table 11.</td>
<td>Measurements, for general assessment and recording of corrosion pattern.</td>
<td>Measurements, for general assessment and recording of corrosion pattern.</td>
<td>Measurements, for general assessment and recording of corrosion pattern.</td>
</tr>
<tr>
<td>1</td>
<td>Main deck plating</td>
<td>All - outside line of cargo hatch openings within the cargo area.</td>
<td>All - outside line of cargo hatch openings within the cargo area.</td>
<td>All - full length.</td>
</tr>
<tr>
<td>2</td>
<td>Wind- and water strakes.</td>
<td>In way of the transverse sections considered in item 0a. Selected outside the cargo area.</td>
<td>All - within the cargo area. Selected outside the cargo area.</td>
<td>All - full length.</td>
</tr>
<tr>
<td>3</td>
<td>Transverse bulkheads</td>
<td>See item 0b</td>
<td>See item 0b</td>
<td>See item 0b</td>
</tr>
<tr>
<td>4a</td>
<td>Keel plates and bottom plates.</td>
<td></td>
<td></td>
<td>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.</td>
</tr>
<tr>
<td>4b</td>
<td>Sea chests and shell plating in way of overboard discharges.</td>
<td></td>
<td></td>
<td>Plating of sea chests. Shell plating as considered necessary by the attending surveyor.</td>
</tr>
<tr>
<td>5</td>
<td>Superstructure deck plating (poop, bridge and forecastle deck).</td>
<td></td>
<td></td>
<td>Representative exposed deck plating.</td>
</tr>
<tr>
<td>6</td>
<td>Internals in peak tanks.</td>
<td></td>
<td></td>
<td>Forepeak and aftpeak.</td>
</tr>
<tr>
<td>8</td>
<td>Vertically corrugated transverse watertight bulkhead between cargo hold Nos. 1 and 2 - Ships subject to compliance with the requirements given in IACS UR S19</td>
<td>Additional requirements as given in [2.3.6]</td>
<td>Additional requirements as given in [2.3.5]</td>
<td>Additional requirements as given in [2.3.5]</td>
</tr>
<tr>
<td>Area</td>
<td>Renewal survey no. 1 Age ≤ 5 years</td>
<td>Renewal survey no. 2 Age 5 - 10 years</td>
<td>Renewal survey no. 3 Age 10 - 15 years</td>
<td>Renewal survey no. 4 and subsequent Age &gt; 15 years</td>
</tr>
<tr>
<td>------</td>
<td>---------------------------------</td>
<td>---------------------------------</td>
<td>---------------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>9.7</td>
<td>Side shell frames and brackets - Ships subject to compliance with the requirements given in IACS UR S31.</td>
<td>Additional requirements as given in [2.3.6]</td>
<td>Additional requirements as given in [2.3.6]</td>
<td>Additional requirements as given in [2.3.6]</td>
</tr>
</tbody>
</table>

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.

Source.: IACS UR Z10.2 TABLE II

Table 13 Thickness measurements, extent and pattern in way of areas with substantial corrosion, single skin bulk carriers

<table>
<thead>
<tr>
<th>Area/structural member</th>
<th>Extent of measurement</th>
<th>Pattern of measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a Main deck structures</td>
<td>Deck plating.</td>
<td>Suspect plate(s) and four adjacent plates.</td>
</tr>
<tr>
<td></td>
<td>Deck longitudinals.</td>
<td>Three longitudinals in way of suspect area.</td>
</tr>
<tr>
<td></td>
<td>Web frames or transverses.</td>
<td>Suspect plate(s)</td>
</tr>
<tr>
<td>1b Deck cross strips</td>
<td>Plating.</td>
<td>Suspect plate(s).</td>
</tr>
<tr>
<td></td>
<td>Underdeck stiffeners.</td>
<td>Transverse members.</td>
</tr>
<tr>
<td></td>
<td>Longitudinal members.</td>
<td>5 points on both web and flange.</td>
</tr>
<tr>
<td>1c Hatch covers and coamings</td>
<td>Hatch covers.</td>
<td>Three locations on each side and end skirts.</td>
</tr>
<tr>
<td></td>
<td>Two outboard strakes longitudinal bands. One centerline strake longitudinal band.</td>
<td>5 points each band.</td>
</tr>
<tr>
<td></td>
<td>Hatch coamings.</td>
<td>One transverse band at lower 1/3 of each end. One transverse band at upper 2/3 of each end.</td>
</tr>
<tr>
<td></td>
<td>One longitudinal band at lower 1/3 of each side. One longitudinal band at upper 2/3 of each side.</td>
<td>5 points each band.</td>
</tr>
<tr>
<td>Area/structural member</td>
<td>Extent of measurement</td>
<td>Pattern of measurement</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td><strong>1d</strong> Top side ballast tanks</td>
<td>Lower 1/3 of bulkhead.</td>
<td>5 points over 1 m² of plating.</td>
</tr>
<tr>
<td></td>
<td>Upper 2/3 of bulkhead.</td>
<td>5 points over 1 m² of plating.</td>
</tr>
<tr>
<td></td>
<td>Stiffeners.</td>
<td>5 points over 1 m length.</td>
</tr>
<tr>
<td>Swash transverse bulkhead</td>
<td>Lower 1/3 of 2 representative bulkheads.</td>
<td>5 points over 1 m² of plating.</td>
</tr>
<tr>
<td></td>
<td>Upper 2/3 of 2 representative bulkheads.</td>
<td>5 points over 1 m² of plating.</td>
</tr>
<tr>
<td></td>
<td>Stiffeners.</td>
<td>5 points over 1 m length.</td>
</tr>
<tr>
<td>Sloping tank bottom.</td>
<td>Three representative bays at lower 1/3 of tank.</td>
<td>5 points over 1 m² of plating.</td>
</tr>
<tr>
<td></td>
<td>Three representative bays at upper 2/3 of tank.</td>
<td>5 points over 1 m² of plating.</td>
</tr>
<tr>
<td></td>
<td>Longitudinals, suspect and adjacent.</td>
<td>5 points both web and flange over 1 m length.</td>
</tr>
<tr>
<td><strong>2</strong> Single side structures</td>
<td>Side shell plating.</td>
<td>Suspect plate(s) and all adjacent plates.</td>
</tr>
<tr>
<td></td>
<td>Side shell frames.</td>
<td>Suspect frame(s) and each adjacent frame.</td>
</tr>
<tr>
<td><strong>3</strong> Transverse bulkhead structures in cargo holds</td>
<td>Lower stool.</td>
<td>Transverse band within 25 mm of welded connection to inner bottom.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Transverse band within 25 mm of welded connection to shelf plate.</td>
</tr>
<tr>
<td></td>
<td>Bulkhead.</td>
<td>Transverse band at approximately mid height</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Transverse band adjacent to upper deck or shelf plate of upper stool, whichever is applicable.</td>
</tr>
<tr>
<td><strong>4</strong> Double bottom and hopper structures</td>
<td>Bottom, inner bottom and hopper structures plating.</td>
<td>Suspect plate(s) and all adjacent plates.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Three longitudinals where plates measured.</td>
</tr>
<tr>
<td></td>
<td>Longitudinal girders or transverse floors.</td>
<td>Suspect plate(s)</td>
</tr>
</tbody>
</table>
## Table 14 Close-up examination, double skin bulk carriers

<table>
<thead>
<tr>
<th>Area/structural member</th>
<th>Extent of measurement</th>
<th>Pattern of measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Watertight bulkheads (WT floors)</td>
<td>Plating lower 1/3 of tank.</td>
<td>5 points over 1 m² of plating.</td>
</tr>
<tr>
<td></td>
<td>Plating upper 2/3 of tank.</td>
<td>5 points alternate plates over 1 m² of plating.</td>
</tr>
<tr>
<td>Web frames</td>
<td>Suspect plate(s)</td>
<td>5 points over 1 m² of plating.</td>
</tr>
</tbody>
</table>

Source: IACS UR Z10.2 TABLE VIII

### Table

<table>
<thead>
<tr>
<th>Area</th>
<th>Renewal survey no. 1</th>
<th>Renewal survey no. 2</th>
<th>Renewal survey no. 3</th>
<th>Renewal survey no. 4 and subsequent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age &lt; 5 years</td>
<td>Age 5 - 10 years</td>
<td>Age 10 - 15 years</td>
<td>Age &gt; 15 years</td>
</tr>
<tr>
<td>1a</td>
<td>Cargo hold hatch covers and coamings - plating and stiffeners.</td>
<td>All</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>1b</td>
<td>Deck plating and underdeck structures inside line of hatch openings between cargo hold hatches.</td>
<td>All</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>2a</td>
<td>Ordinary transverse frames ¹ in double side tanks.</td>
<td>25% of frames or 25% of longitudinals for longitudinal framing system on side shell and inner side plating at forward, middle and aft parts, in the foremost double side tank.</td>
<td>25% of frames or 25% of longitudinals for longitudinal framing system on side shell and inner side plating at forward, middle and aft parts, in all double side tanks.</td>
<td>All frames or all of longitudinals for longitudinal framing system on side shell and inner side plating at forward, middle and aft parts, in all double side tanks.</td>
</tr>
<tr>
<td>2b</td>
<td>Ballast tanks transverse web frames with associated plating and longitudinals.</td>
<td>One in two representative tanks of each type - to include the foremost top side and double side tank on both sides.</td>
<td>One all ballast tanks</td>
<td>All - in all ballast tanks</td>
</tr>
<tr>
<td>3a</td>
<td>Cargo hold transverse bulkheads ¹ - plating, stiffeners and girders, including internal structures of upper and lower stools, where fitted.</td>
<td>Two selected bulkheads</td>
<td>One in each hold</td>
<td>All</td>
</tr>
</tbody>
</table>
### 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 shall 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) Subject to cargo hold hatch covers of approved design which structurally have no access to the internals, close-up survey/thickness measurement shall be done of accessible parts of hatch covers structures.

Source.: IACS UR Z10.5 TABLE I/ Sheet 1

### Table 15 Close-up examination, ore carriers

<table>
<thead>
<tr>
<th>Area</th>
<th>Renewal survey no. 1 Age ≤ 5 years</th>
<th>Renewal survey no. 2 Age 5 - 10 years</th>
<th>Renewal survey no. 3 and subsequent Age &gt; 10 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Deck transverse including adjacent deck structural members.</td>
<td>One - in all ballast tanks not covered by item 2.</td>
<td></td>
</tr>
<tr>
<td>1a</td>
<td>Cargo hold hatch covers and coamings - plating and stiffeners.</td>
<td>All.</td>
<td>All.</td>
</tr>
<tr>
<td>1b</td>
<td>Deck plating and under deck structures inside line of hatch openings between cargo hold hatches.</td>
<td>All.</td>
<td>All.</td>
</tr>
</tbody>
</table>
Survey requirements for fleet in service

### Rules for classification: Ships — DNVGL-RU-SHIP Pt.7 Ch.1. Edition January 2017

#### Part 7 Chapter 1 Section 4

<table>
<thead>
<tr>
<th>Area</th>
<th>Renewal survey no. 1 Age ≤ 5 years</th>
<th>Renewal survey no. 2 Age 5 - 10 years</th>
<th>Renewal survey no. 3 and subsequent Age &gt; 10 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Transverse web frame rings including adjacent structural members.</td>
<td>One - in a ballast wing tank.</td>
<td>All - in a ballast wing tank.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>One in each wing void space.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Transverse bulkheads including girder system and adjacent structural members.</td>
<td>One, lower part - in a ballast tank.</td>
<td>Both - in a ballast wing tank.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>One, lower part - in each remaining ballast tank.</td>
</tr>
<tr>
<td>3a</td>
<td>Cargo hold transverse bulkheads 1) - plating, stiffeners and girders, including internal structures of upper and lower stools, where fitted.</td>
<td>Two selected bulkheads.</td>
<td>One in each hold.</td>
</tr>
</tbody>
</table>

**Notes:**

1) Close-up examination of cargo hold transverse bulkheads shall 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) Subject to cargo hold hatch covers of approved design which structurally have no access to the internals, close-up survey/thickness measurement shall be done of accessible parts of hatch covers structures.

Source: IACS UR Z10.1 TABLE I and IACS UR Z10.5 TABLE I, Sheet 2 as applicable

### Table 16 Minimum thickness measurements 1), double skin bulk carriers and ore carriers

<table>
<thead>
<tr>
<th>Area</th>
<th>Renewal survey no. 1 Age ≤ 5 years</th>
<th>Renewal survey no. 2 Age 5 - 10 years</th>
<th>Renewal survey no. 3 Age 10 - 15 years</th>
<th>Renewal survey no. 4 and subsequent Age &gt; 15 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>0a</td>
<td>Transverse sections within the cargo area. 2)</td>
<td>Two section of deck plating only - outside line of cargo hatch openings - at least one within 0.5 L amidships. 3)</td>
<td>Two complete sections - outside line of cargo hatch openings - at least one within 0.5 L amidships. 3)</td>
<td>Three complete sections - outside line of cargo hatch openings - at least one within 0.5 L amidships. 3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Survey requirements for fleet in service

<table>
<thead>
<tr>
<th>Area</th>
<th>Renewal survey no. 1</th>
<th>Renewal survey no. 2</th>
<th>Renewal survey no. 3</th>
<th>Renewal survey no. 4 and subsequent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age ≤ 5 years</td>
<td>Age 5 - 10 years</td>
<td>Age 10 - 15 years</td>
<td>Age &gt; 15 years</td>
</tr>
<tr>
<td>0b Structural members subject to close-up examination according to Table 14 and Table 15</td>
<td>Measurements, for general assessment and recording of corrosion pattern.</td>
<td>Measurements, for general assessment and recording of corrosion pattern.</td>
<td>Measurements, for general assessment and recording of corrosion pattern.</td>
<td>Measurements, for general assessment and recording of corrosion pattern.</td>
</tr>
<tr>
<td>1 Main deck plating</td>
<td>All - outside line of cargo hatch openings, within the cargo area.</td>
<td>All - within the cargo area.</td>
<td>All - within the cargo area.</td>
<td>All - full length.</td>
</tr>
<tr>
<td>2 Wind- and water strakes</td>
<td>In the transverse sections considered in item 0a. Selected outside the cargo area.</td>
<td>All - within the cargo area.</td>
<td>All - within the cargo area.</td>
<td>All - full length.</td>
</tr>
<tr>
<td>3 Transverse bulkheads</td>
<td>See item 0b</td>
<td>See item 0b</td>
<td>See item 0b</td>
<td>See item 0b</td>
</tr>
<tr>
<td>4a Keel plates and bottom plates.</td>
<td>See item 0b</td>
<td>All keel plates full length.</td>
<td>All keel plates full length.</td>
<td>All keel plates full length.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All bottom plates, including lower turn of bilge, within the cargo area.</td>
<td>All bottom plates, including lower turn of bilge, within the cargo area.</td>
<td>All bottom plates, including lower turn of bilge, within the cargo area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Additional bottom plates in way of cofferdams, machinery space and aft end of tanks.</td>
<td>Additional bottom plates in way of cofferdams, machinery space and aft end of tanks.</td>
<td>Additional bottom plates in way of cofferdams, machinery space and aft end of tanks.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shell plating as considered necessary by the attending surveyor.</td>
<td>Shell plating as considered necessary by the attending surveyor.</td>
<td>Shell plating as considered necessary by the attending surveyor.</td>
</tr>
<tr>
<td>5 Superstructure deck plating (poop, bridge and forecastle deck).</td>
<td></td>
<td>Representative exposed deck plating.</td>
<td>Representative exposed deck plating.</td>
<td>Representative exposed deck plating.</td>
</tr>
<tr>
<td>6 Internals in peak tanks.</td>
<td></td>
<td>Forepeak and aftpeak.</td>
<td>Forepeak and aftpeak.</td>
<td>Forepeak and aftpeak.</td>
</tr>
</tbody>
</table>

**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.

Source: IACS UR Z10.5 TABLE II
### Table 17 Thickness measurement, extent and pattern in way of areas of substantial corrosion, double skin bulk carriers

<table>
<thead>
<tr>
<th>Area/structural member</th>
<th>Extent of measurement</th>
<th>Pattern of measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a Main deck structures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deck plating.</td>
<td>Suspect plate(s) and four adjacent plates.</td>
<td>5 points over 1 m² of plating.</td>
</tr>
<tr>
<td>Deck longitudinals.</td>
<td>Three longitudinals in way of suspect area.</td>
<td>5 points both web and flange over 1 m length.</td>
</tr>
<tr>
<td>Web frames or transverses.</td>
<td>Suspect plate(s)</td>
<td>5 points over 1 m² of plating.</td>
</tr>
<tr>
<td>1b Deck cross strips</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plating.</td>
<td>Suspect plate(s).</td>
<td>5 points between stiffeners over 1 m length.</td>
</tr>
<tr>
<td>Underdeck stiffeners.</td>
<td>Transverse members.</td>
<td>5 points at each end and midspan.</td>
</tr>
<tr>
<td></td>
<td>Longitudinal members.</td>
<td>5 points on both web and flange.</td>
</tr>
<tr>
<td>1c Hatch covers and coamings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hatch covers.</td>
<td>Three locations on each side and end skirts.</td>
<td>5 points at each location.</td>
</tr>
<tr>
<td></td>
<td>Two outboard strakes longitudinal bands.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>One centerline strake longitudinal band.</td>
<td></td>
</tr>
<tr>
<td>Hatch coamings.</td>
<td>One transverse band at lower 1/3 of each end.</td>
<td>5 points each band.</td>
</tr>
<tr>
<td></td>
<td>One transverse band at upper 2/3 of each end.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>One longitudinal band at lower 1/3 of each side.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>One longitudinal band at upper 2/3 of each side.</td>
<td></td>
</tr>
<tr>
<td>1d Top side ballast tanks.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Watertight transverse bulkhead.</td>
<td>Lower 1/3 of bulkhead.</td>
<td>5 points over 1 m² of plating.</td>
</tr>
<tr>
<td></td>
<td>Upper 2/3 of bulkhead.</td>
<td>5 points over 1 m² of plating.</td>
</tr>
<tr>
<td></td>
<td>Stiffeners.</td>
<td>5 points over 1 m length.</td>
</tr>
<tr>
<td>Swash transverse bulkhead.</td>
<td>Lower 1/3 of 2 representative bulkheads.</td>
<td>5 points over 1 m² of plating.</td>
</tr>
<tr>
<td></td>
<td>Upper 2/3 of 2 representative bulkheads.</td>
<td>5 points over 1 m² of plating.</td>
</tr>
<tr>
<td></td>
<td>Stiffeners.</td>
<td>5 points over 1 m length.</td>
</tr>
<tr>
<td>Sloping tank bottom.</td>
<td>Three representative bays at lower 1/3 of tank.</td>
<td>5 points over 1 m² of plating.</td>
</tr>
<tr>
<td></td>
<td>Three representative bays at upper 2/3 of tank.</td>
<td>5 points over 1 m² of plating.</td>
</tr>
<tr>
<td></td>
<td>Longitudinals, suspect and adjacent.</td>
<td>5 points both web and flange over 1 m length.</td>
</tr>
</tbody>
</table>

Survey requirements for fleet in service
<table>
<thead>
<tr>
<th>Area/structural member</th>
<th>Extent of measurement</th>
<th>Pattern of measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Double side structures.</td>
<td>Side shell and inner side plating.</td>
<td>Upper strakes and strakes in way of horizontal girders - minimum three bays along the tank.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All other strakes - same three bays as above.</td>
</tr>
<tr>
<td>Side shell and inner side frames or longitudinals.</td>
<td>On upper strakes - all frames/ longitudinals in same three bays as above.</td>
<td>3 points across web. 1 point on flange.</td>
</tr>
<tr>
<td></td>
<td>On all other strakes - one frame or every third longitudinal in same three bays as above.</td>
<td>3 points across web. 1 point on flange.</td>
</tr>
<tr>
<td>Brackets on side shell and inner side frames or longitudinals.</td>
<td>Minimum of three at top, middle and bottom of tank in same three bays as above.</td>
<td>5 points over area of bracket.</td>
</tr>
<tr>
<td>Vertical web frames and transverse bulkheads.</td>
<td>Strakes in way of horizontal girders - minimum two webs and both bulkheads.</td>
<td>5 points over 2 m² of plating.</td>
</tr>
<tr>
<td></td>
<td>Other strakes - minimum two webs and both bulkheads.</td>
<td>2 points between each pair of vertical stiffeners.</td>
</tr>
<tr>
<td>Horizontal girders.</td>
<td>Plating on each girder in a minimum of three bays.</td>
<td>2 points between each pair of longitudinal girder stiffeners.</td>
</tr>
<tr>
<td>Panel stiffening.</td>
<td>Where applicable.</td>
<td>1 point measurements.</td>
</tr>
<tr>
<td>3 Transverse bulkhead structures in cargo holds.</td>
<td>Lower stool.</td>
<td>Transverse band within 25 mm of welded connection to inner bottom.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Transverse band within 25 mm of welded connection to shelf plate.</td>
</tr>
<tr>
<td></td>
<td>Bulkhead.</td>
<td>Transverse band at approximately mid height</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Transverse band adjacent to upper deck or shelf plate of upper stool, whichever is applicable.</td>
</tr>
<tr>
<td>Area/structural member</td>
<td>Extent of measurement</td>
<td>Pattern of measurement</td>
</tr>
<tr>
<td>------------------------</td>
<td>------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Double bottom and hopper structures.</td>
<td>Bottom, inner bottom and hopper structures plating.</td>
<td>Three bays across double bottom tank, including aft bay. Around and under all suction bell mouths.</td>
</tr>
<tr>
<td></td>
<td>Bottom, inner bottom and hopper structures longitudinals.</td>
<td>Three - in each bay where bottom plating measured.</td>
</tr>
<tr>
<td></td>
<td>Bottom girders, including watertight girders.</td>
<td>At fore and aft watertight floors and in centre of tanks.</td>
</tr>
<tr>
<td></td>
<td>Bottom floors, including watertight floors.</td>
<td>Three - at bays where bottom plating measured, with measurements at both ends and middle.</td>
</tr>
<tr>
<td></td>
<td>Web frame rings - hopper structures.</td>
<td>Three - at bays where bottom plating measured, with measurements at both ends and middle.</td>
</tr>
<tr>
<td></td>
<td>Transverse watertight bulkheads or swash bulkheads - hopper structures.</td>
<td>Lower 1/3 of bulkhead.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Upper 2/3 of bulkhead.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Three stiffeners.</td>
</tr>
<tr>
<td>Panel stiffening.</td>
<td>Where applicable</td>
<td>1 point measurements.</td>
</tr>
</tbody>
</table>

Source: IACS UR Z10.5 TABLE III
### Table 18 Close-up examination, single hull oil tankers, single hull chemical tankers and ore/oil ships

<table>
<thead>
<tr>
<th>Area</th>
<th>Renewal survey no. 1 Age ≤ 5 years</th>
<th>Renewal survey no. 2 Age 5 - 10 years</th>
<th>Renewal survey no. 3 Age 10 - 15 years</th>
<th>Renewal survey no. 4 and subsequent Age &gt; 15 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Deck transverse including adjacent deck structural members(^1).</td>
<td>One - in a cargo tank.</td>
<td>One - in all ballast tanks not covered by item 2.</td>
<td>For oil tankers: Minimum 30% of all - in each cargo centre tank. For chemical tankers: One in each cargo centre tank.</td>
<td>For oil tankers: Minimum 30% of all - in each cargo centre tank. For chemical tankers: One in each cargo centre tank.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>One - in a cargo wing tank.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>One - in each of two cargo centre tanks.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Transverse web frame rings including adjacent structural members.</td>
<td>One - in a ballast wing tank, if any, or a cargo wing tank used primarily for ballast.</td>
<td>All - in a ballast wing tank, if any, or a cargo wing tank used primarily for ballast.</td>
<td>All - in all ballast tanks.</td>
<td>All - in all ballast tanks.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>All - in a cargo wing tank.</td>
<td>All - in a cargo wing tank.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>For oil tankers: Minimum 30% of all - in each remaining cargo wing tank. For chemical tankers: One in each remaining cargo wing tank.</td>
<td>For oil tankers: Minimum 30% of all - in each remaining cargo wing tank. For chemical tankers: One in each remaining cargo wing tank.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Additional - as considered necessary by the surveyor</td>
<td>Additional - as considered necessary by the surveyor</td>
</tr>
<tr>
<td>3 Transverse bulkheads including girder system and adjacent structural members.</td>
<td>One, lower part - in a ballast tank.</td>
<td>Both - in a ballast wing tank, if any, or a cargo wing tank used primarily for ballast.</td>
<td>All - in all ballast tanks.</td>
<td>All - in all ballast tanks.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>One, lower part - in each remaining ballast tank.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>One, lower part - in a cargo wing tank.</td>
<td>One, lower part - in a cargo wing tank.</td>
<td>All - in all cargo tanks.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>One, lower part - in two cargo centre tank(^2).</td>
<td>One, lower part - in two cargo centre tank(^2).</td>
<td></td>
</tr>
</tbody>
</table>
### Table 19 Minimum thickness measurements ¹), single hull oil tankers, single hull chemical tankers and ore/oil ships

<table>
<thead>
<tr>
<th>Area</th>
<th>Renewal survey no. 1 Age ≤ 5 years</th>
<th>Renewal survey no. 2 Age 5 - 10 years</th>
<th>Renewal survey no. 3 Age 10 - 15 years</th>
<th>Renewal survey no. 4 and subsequent Age &gt; 15 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>0a</td>
<td>Transverse section(s) within the cargo area. ²)</td>
<td>One section of deck plating only - for the full beam of the ship ³)</td>
<td>One complete section ³)</td>
<td>Two complete sections - at least one within 0.5 L amidships ³)</td>
</tr>
<tr>
<td>0b</td>
<td>Structural members subject to close-up examination according to Table 18</td>
<td>Measurements, for general assessment and recording of corrosion pattern.</td>
<td>Measurements, for general assessment and recording of corrosion pattern.</td>
<td>Measurements, for general assessment and recording of corrosion pattern.</td>
</tr>
<tr>
<td>1</td>
<td>Main deck plating</td>
<td>All - within the cargo area.</td>
<td>All - within the cargo area.</td>
<td>All - within the cargo area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>All exposed - outside the cargo area.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Wind- and water strakes.</td>
<td>Selected outside the cargo area.</td>
<td>All - within the cargo area.</td>
<td>All - full length.</td>
</tr>
<tr>
<td>3</td>
<td>Transverse bulkheads</td>
<td>See item 0b</td>
<td>See item 0b</td>
<td>See item 0b</td>
</tr>
</tbody>
</table>

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.
³) Source: IACS UR Z10.1 TABLE I and Z10.3 TABLE I.1

Notes:
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.
### Survey requirements for fleet in service

<table>
<thead>
<tr>
<th>Area</th>
<th>Renewal survey no. 1 Age ≤ 5 years</th>
<th>Renewal survey no. 2 Age 5 - 10 years</th>
<th>Renewal survey no. 3 Age 10 - 15 years</th>
<th>Renewal survey no. 4 and subsequent Age &gt; 15 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>4a</td>
<td>Keel plates and bottom plates.</td>
<td></td>
<td></td>
<td>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.</td>
</tr>
<tr>
<td>4b</td>
<td>Sea chests and shell plating in way of overboard discharges.</td>
<td></td>
<td>Plating of sea chests. Shell plating as considered necessary by the attending surveyor.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Superstructure deck plating (poop, bridge and forecastle deck).</td>
<td></td>
<td>Representative exposed deck plating.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Internals in peak tanks.</td>
<td></td>
<td>Forepeak and aftpeak.</td>
<td></td>
</tr>
</tbody>
</table>

**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, within 0.5 L amidships, as far as applicable.

Source: IACS UR Z10.1 TABLE II and Z10.3 TABLE II

### Table 20 Thickness measurement, extent and pattern in way of areas of substantial corrosion, single hull oil tankers, single hull chemical tankers and ore/oil ships

<table>
<thead>
<tr>
<th>Area/structural member</th>
<th>Extent of measurement</th>
<th>Pattern of measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Deck structures.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deck plating.</td>
<td>Two bands across tank.</td>
<td>3 points per plate per band.</td>
</tr>
<tr>
<td>Deck longitudinals.</td>
<td>Three longitudinals in each of two bays.</td>
<td>3 points in line vertically on webs. 2 points on flange (if fitted).</td>
</tr>
<tr>
<td>Longitudinal girders and brackets.</td>
<td>At fore and aft transverse bulkhead, bracket toes and in centre of tanks.</td>
<td>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.</td>
</tr>
<tr>
<td>Transverse girders.</td>
<td>Two - with measurements at both ends and middle.</td>
<td>5 points over 2 m^2 of web plating. 1 point on flange.</td>
</tr>
<tr>
<td>Panel stiffening.</td>
<td>Where provided.</td>
<td>1 point measurements.</td>
</tr>
<tr>
<td>Area/structural member</td>
<td>Extent of measurement</td>
<td>Pattern of measurement</td>
</tr>
<tr>
<td>------------------------</td>
<td>------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>Side shell and longitudinal bulkhead structures.</td>
<td>Shell and bulkhead plating.</td>
<td>On deckhead and bottom strakes - all longitudinals in same three bays as above.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>On all other strakes - every third longitudinal in same three bays as above.</td>
</tr>
<tr>
<td></td>
<td>Shell and bulkhead longitudinals.</td>
<td>One transverse band at lower 1/3 of each end. One transverse band at upper 2/3 of each end.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>One longitudinal band at lower 1/3 of each side. One longitudinal band at upper 2/3 of each side.</td>
</tr>
<tr>
<td>Brackets on longitudinals.</td>
<td>Minimum of three at top, middle and bottom of tank in same three bays as above.</td>
<td>5 points over area of bracket.</td>
</tr>
<tr>
<td>Web frames and cross ties.</td>
<td>Three webs with minimum of three locations on each web, including in way of cross tie connections.</td>
<td>5 points over about 2 m² web area. 1 point on web frame and cross tie flanges.</td>
</tr>
<tr>
<td>Transverse bulkhead and swash bulkhead structures.</td>
<td>Plane bulkhead plating.</td>
<td>Deckhead and bottom strakes, and strakes in way of stringer platforms - approximately 1/4, 1/2 and 3/4 width of tank.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All other strakes - at middle width of tank.</td>
</tr>
<tr>
<td></td>
<td>Corrugated bulkhead plating.</td>
<td>Strakes for each change of scantling at centre of panel and at flange or fabricated connection.</td>
</tr>
<tr>
<td>Stiffeners</td>
<td>Three typical stiffeners.</td>
<td>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.</td>
</tr>
<tr>
<td>Brackets.</td>
<td>Three at top, middle and bottom of tank.</td>
<td>5 points over area of bracket.</td>
</tr>
<tr>
<td>Deep webs and girders.</td>
<td>At toe of brackets and at centre of span.</td>
<td>5 points over about 2 m² web area. 3 points across flange.</td>
</tr>
<tr>
<td>Stringer platforms.</td>
<td>All - at both ends and middle.</td>
<td>5 points over 1 m² web area. 1 point near bracket toes and on flange.</td>
</tr>
</tbody>
</table>
### Area/structural member

<table>
<thead>
<tr>
<th>Area/structural member</th>
<th>Extent of measurement</th>
<th>Pattern of measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bottom structures.</td>
<td>Bottom plating. Three bays across tank, including aft bay. Around and under all suction bell mouths.</td>
<td>5 points each panel between longitudinals and webs.</td>
</tr>
<tr>
<td></td>
<td>Three longitudinals in each bay where bottom plating measured.</td>
<td>3 points in line across web. 3 points in line across flange.</td>
</tr>
<tr>
<td>Bottom girders and brackets.</td>
<td>At fore and aft bulkhead bracket toes and in centre of tanks.</td>
<td>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.</td>
</tr>
<tr>
<td>Bottom transverse webs.</td>
<td>Three webs at bays where bottom plating measured, with measurements at both ends and middle.</td>
<td>5 points over 2 m² of plating.</td>
</tr>
<tr>
<td>Panel stiffening.</td>
<td>Where provided.</td>
<td>1 point measurements.</td>
</tr>
</tbody>
</table>

Source: IACS UR Z10.1 TABLE IV and Z10.3 TABLE IV

### Table 21 Close-up examination, double hull oil tankers and double hull chemical tankers

<table>
<thead>
<tr>
<th>Area</th>
<th>Renewal survey no. 1</th>
<th>Renewal survey no. 2</th>
<th>Renewal survey no. 3 8)</th>
<th>Renewal survey no. 4 8) and subsequent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age ≤ 5 years</td>
<td>Age 5 - 10 years</td>
<td>Age 10 - 15 years</td>
<td>Age &gt; 15 years</td>
</tr>
<tr>
<td>1</td>
<td>One - in a cargo tank.</td>
<td>One - in each of two cargo tanks.</td>
<td>All - in a cargo tank.</td>
<td>All - in a cargo tank.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>One - in each remaining cargo tank.</td>
</tr>
<tr>
<td>2a</td>
<td>One - in a ballast tank within the cargo area.</td>
<td>All - in a ballast tank within the cargo area.</td>
<td>All - in all ballast tanks.</td>
<td>All - in all ballast tanks.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>One - knuckle area ³) and the upper part (approximately 3 - 5 metres) in each remaining ballast tank.</td>
<td></td>
</tr>
<tr>
<td>2b</td>
<td>All - in a cargo tank.</td>
<td>All - in a cargo tank.</td>
<td>One - in each remaining cargo tank.</td>
<td>One - in each remaining cargo tank.</td>
</tr>
<tr>
<td>Area</td>
<td>Renewal survey no. 1 Age ≤ 5 years</td>
<td>Renewal survey no. 2 Age 5 - 10 years</td>
<td>Renewal survey no. 3 8) Age 10 - 15 years</td>
<td>Renewal survey no. 4 8) and subsequent Age &gt; 15 years</td>
</tr>
<tr>
<td>------</td>
<td>-----------------------------------</td>
<td>---------------------------------------</td>
<td>------------------------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>3</td>
<td>Transverse bulkheads including girder system and adjacent structural members.</td>
<td>One - in a ballast tank 6)</td>
<td>One - in each ballast tank 6)</td>
<td>All - in all ballast tanks.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>One, lower part 6) - in a cargo wing tank.</td>
<td>One, lower part 6) - in a cargo wing tank.</td>
<td>All - in all cargo tanks.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>One, lower part 6) - in a cargo centre tank 7).</td>
<td>One, lower part 6) - in two cargo centre tanks 7).</td>
<td>All - in all cargo tanks.</td>
</tr>
<tr>
<td>4</td>
<td>Double bottom structures.</td>
<td>As covered by item 2a and 2b.</td>
<td>As covered by item 2a and 2b.</td>
<td>As covered by item 2a and 2b.</td>
</tr>
</tbody>
</table>

Notes:

1) Transverse double hull web frame 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 aft. peak 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) Transverses web frame means deck transverse, longitudinal bulkhead structural elements 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) Where no centre cargo tanks are fitted (as in case of centre longitudinal bulkhead), transverse bulkheads in wing tanks shall be examined.
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.2
Table 22 Minimum thickness measurements\(^1\), double hull oil tankers and double hull chemical tankers

<table>
<thead>
<tr>
<th>Area</th>
<th>Renewal survey no. 1</th>
<th>Renewal survey no. 2</th>
<th>Renewal survey no. 3</th>
<th>Renewal survey no. 4 and subsequent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age (\leq 5) years</td>
<td>Age 5 - 10 years</td>
<td>Age 10 - 15 years</td>
<td>Age &gt; 15 years</td>
</tr>
<tr>
<td>0a</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Transverse section(s)</td>
<td>One section of deck plating only - for the full beam of the ship (^2)</td>
<td>One complete section (^3)</td>
<td>Two complete sections - at least one within (0.5) (L) amidships (^3)</td>
</tr>
<tr>
<td></td>
<td>within the cargo area</td>
<td></td>
<td></td>
<td>Three complete sections - at least one within (0.5) (L) amidships (^3)</td>
</tr>
<tr>
<td>0b</td>
<td>Structural members subject to close-up examination according to Table 21.</td>
<td>Measurements, for general assessment and recording of corrosion pattern.</td>
<td>Measurements, for general assessment and recording of corrosion pattern.</td>
<td>Measurements, for general assessment and recording of corrosion pattern.</td>
</tr>
<tr>
<td>1</td>
<td>Main deck plating</td>
<td>All – within the cargo area.</td>
<td>All - within the cargo area.</td>
<td>All - within the cargo area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>All exposed - outside the cargo area.</td>
</tr>
<tr>
<td>2</td>
<td>Wind- and water strakes.</td>
<td>Selected outside the cargo area.</td>
<td>All - within the cargo area.</td>
<td>All - full length.</td>
</tr>
<tr>
<td>3</td>
<td>Transverse bulkheads</td>
<td>See item 0b</td>
<td>See item 0b</td>
<td>See item 0b</td>
</tr>
<tr>
<td>4a</td>
<td>Keel plates and bottom plates.</td>
<td>See item 0b</td>
<td>See item 0b</td>
<td>See item 0b</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>All keel plates full length.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>All bottom plates, including lower turn of bilge, within the cargo area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Additional bottom plates in way of cofferdams, machinery space and aft end of tanks.</td>
</tr>
<tr>
<td>4b</td>
<td>Sea chests and shell plating in way of overboard discharges.</td>
<td></td>
<td></td>
<td>Plating of sea chests.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Shell plating as considered necessary by the attending surveyor.</td>
</tr>
<tr>
<td>5</td>
<td>Superstructure deck plating (poop, bridge and forecastle deck).</td>
<td></td>
<td></td>
<td>Representative exposed deck plating.</td>
</tr>
<tr>
<td>6</td>
<td>Internals in peak tanks.</td>
<td></td>
<td></td>
<td>Forepeak and aftpeak.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Forepeak and aftpeak.</td>
</tr>
</tbody>
</table>
### 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, within 0.5 \( \text{L} \) amidships, as far as applicable.

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

### Table 23 Thickness measurement, extent and pattern in way of areas of substantial corrosion, double hull oil tankers and double hull chemical tankers

<table>
<thead>
<tr>
<th>Area/structural member</th>
<th>Extent of measurement</th>
<th>Pattern of measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Deck structures.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deck plating.</td>
<td>Two bands across tank.</td>
<td>3 points per plate per band.</td>
</tr>
<tr>
<td>Deck longitudinals.</td>
<td>Every third longitudinal in each of two bands with a minimum of one longitudinal.</td>
<td>3 points in line vertically on webs. 2 points on flange (if fitted).</td>
</tr>
<tr>
<td>Longitudinal girders and brackets. (usually in cargo tanks only)</td>
<td>At fore and aft transverse bulkhead, bracket toes and in centre of tanks.</td>
<td>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.</td>
</tr>
<tr>
<td>Transverse girders.</td>
<td>Two - with measurements at both ends and middle.</td>
<td>5 points over 2 ( \text{m}^2 ) of web plating. 1 point on flange.</td>
</tr>
<tr>
<td>Vertical web and transverse bulkhead in wing ballast tank (two metres from deck)</td>
<td>Minimum of two webs, and both transverse bulkheads.</td>
<td>5 points over 1 ( \text{m}^2 ) of plating/ web.</td>
</tr>
<tr>
<td>Panel stiffening.</td>
<td>Where provided.</td>
<td>1 point measurements.</td>
</tr>
<tr>
<td><strong>Double side structures.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Side shell and inner side plating.</td>
<td>Upper strakes and strakes in way of horizontal girders - minimum three bays along the tank.</td>
<td>1 point each panel between pair of longitudinals in each bay.</td>
</tr>
<tr>
<td>All other strakes - same three bays along the tank as above.</td>
<td>1 point every third panel between pair of longitudinals.</td>
<td></td>
</tr>
<tr>
<td>Side shell and inner side longitudinals.</td>
<td>On upper strakes - all longitudinals in same three bays along the tank as above.</td>
<td>3 points across web. 1 point on flange.</td>
</tr>
<tr>
<td>On all other strakes - every third longitudinal in same three bays along the tank as above.</td>
<td>3 points across web. 1 point on flange.</td>
<td></td>
</tr>
<tr>
<td>Area/structural member</td>
<td>Extent of measurement</td>
<td>Pattern of measurement</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Brackets on side shell and inner side longitudinals.</td>
<td>Minimum of three at top, middle and bottom of tank in same three bays along the tank as above.</td>
<td>5 points over area of bracket.</td>
</tr>
<tr>
<td>Vertical web frames and transverse bulkheads.</td>
<td>Strakes in way of horizontal girders - minimum two webs and both bulkheads.</td>
<td>5 points over 2 m² of plating.</td>
</tr>
<tr>
<td></td>
<td>Other strakes - minimum two webs and both bulkheads.</td>
<td>2 points between each pair of vertical stiffeners.</td>
</tr>
<tr>
<td>Horizontal girders</td>
<td>Plating on each girder in a minimum of three bays.</td>
<td>2 points between each pair of longitudinal girder stiffeners.</td>
</tr>
<tr>
<td>Panel stiffening.</td>
<td>Where applicable.</td>
<td>1 point measurements.</td>
</tr>
<tr>
<td>2b</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Longitudinal bulkhead structures (other than inner side longitudinal bulkheads).</td>
<td>Bulkhead plating.</td>
<td>Deckhead and bottom strakes, and strakes in way of horizontal girders (also where girders on transverse bulkheads only) – minimum 3 bays along the tank.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All other strakes – same three bays as above.</td>
</tr>
<tr>
<td></td>
<td>Bulkhead longitudinals.</td>
<td>On deckhead and bottom strakes – all longitudinals in same three bays as above.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 points across web.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 point on flange.</td>
</tr>
<tr>
<td></td>
<td>On all other strakes – every third longitudinal in same three bays as above.</td>
<td>3 points across web.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 point on flange.</td>
</tr>
<tr>
<td>Brackets on longitudinals.</td>
<td>Minimum of three at top, middle and bottom of tank in same three bays as above.</td>
<td>5 points over area of bracket.</td>
</tr>
<tr>
<td>Web frames and cross ties.</td>
<td>Three webs with minimum of three locations on each web, including in way of cross tie connections.</td>
<td>5 points over about 2 m² web area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 point on web frame and cross tie flanges.</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transverse bulkhead and swash bulkhead structures in cargo tanks.</td>
<td>Upper and lower stool, where fitted.</td>
<td>Transverse band within 25 mm of welded connection to inner bottom or deck plating.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Transverse band within 25 mm of welded connection to shelf plate.</td>
</tr>
<tr>
<td></td>
<td>Plane bulkhead plating.</td>
<td>Deckhead and bottom strakes, and strakes in way of stringer platforms – approximately ¼, ½ and ¾ width of tank.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All other strakes – at middle width of tank.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 points each panel between pair of stiffeners over 1 m length.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 point each panel between pair of longitudinal stiffeners.</td>
</tr>
<tr>
<td>Area/structural member</td>
<td>Extent of measurement</td>
<td>Pattern of measurement</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------</td>
</tr>
<tr>
<td>Corrugated bulkhead plating.</td>
<td>Strakes for each change of scantling at centre of panel and at flange or fabricated connection.</td>
<td>5 points over 1 m² of plating.</td>
</tr>
<tr>
<td>Stiffeners</td>
<td>Three typical stiffeners.</td>
<td>2 points in line across web at each end.</td>
</tr>
<tr>
<td></td>
<td>1 point on web at centre of span.</td>
<td>1 point on flange at each end and at centre of span.</td>
</tr>
<tr>
<td>Brackets</td>
<td>Three at top, middle and bottom of tank.</td>
<td>5 points over area of bracket.</td>
</tr>
<tr>
<td>Horizontal girders</td>
<td>All at both ends and middle.</td>
<td>5 points over 1 m² web area.</td>
</tr>
<tr>
<td>4 Double bottom and hopper structures.</td>
<td>Bottom, inner bottom and hopper structures plating. Three bays across double bottom tank, including aft bay. Around and under all suction bell mouths.</td>
<td>5 points each panel between longitudinals and floors.</td>
</tr>
<tr>
<td></td>
<td>Bottom, inner bottom and hopper structures longitudinals. Three - in each bay where bottom plating measured.</td>
<td>3 points in line across web.</td>
</tr>
<tr>
<td></td>
<td>Bottom girders, including watertight girders. At fore and aft watertight floors and in centre of tanks.</td>
<td>3 points in line across flange.</td>
</tr>
<tr>
<td></td>
<td>Bottom floors, including watertight floors. Three - at bays where bottom plating measured, with measurements at both ends and middle.</td>
<td>5 points over 2 m² of plating.</td>
</tr>
<tr>
<td></td>
<td>Web frame rings - hopper structures. Three - at bays where bottom plating measured, with measurements at both ends and middle.</td>
<td>5 points over 1 m² of web plating.</td>
</tr>
<tr>
<td></td>
<td>Transverse watertight bulkheads or swash bulkheads - hopper structures. Lower 1/3 of bulkhead.</td>
<td>5 points over 1 m² of plating.</td>
</tr>
<tr>
<td></td>
<td>Upper 2/3 of bulkhead.</td>
<td>5 points over 2 m² of plating.</td>
</tr>
<tr>
<td></td>
<td>Three stiffeners.</td>
<td>2 points in line across web at each end.</td>
</tr>
<tr>
<td></td>
<td>1 point on web at centre of span.</td>
<td>1 point on flange at each end and at centre of span.</td>
</tr>
<tr>
<td></td>
<td>Panel stiffening. Where applicable.</td>
<td>1 point measurements.</td>
</tr>
</tbody>
</table>

Source: IACS UR Z10.4 TABLE IV and Z10.3 TABLE IV
### Table 24 Close-up examination, liquefied gas tankers

<table>
<thead>
<tr>
<th>Area</th>
<th>Renewal survey no. 1 Age ≤ 5 years</th>
<th>Renewal survey no. 2 Age 5 - 10 years</th>
<th>Renewal survey no. 3 and subsequent Age &gt; 10 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Ballast tanks transverse bulkheads, including girder system and adjacent structural members.</td>
<td>One, lower part – in a tank</td>
<td>One in each tank</td>
<td>All – in all ballast tanks</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Ballast tanks transverse web frames, including adjacent structural members.</td>
<td>One in a representative tank of each type</td>
<td>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</td>
<td>All – in all ballast tanks</td>
</tr>
</tbody>
</table>

**Notes:**

1) Ballast tanks include top side tank, double hull side tank, hopper side tank, double bottom tank or any combined arrangement of the aforementioned, and peak tanks where fitted.

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 25 Minimum thickness measurements\(^1\), \(^4\), liquefied gas tankers

<table>
<thead>
<tr>
<th>Area</th>
<th>Renewal survey no. 1 Age ≤ 5 years</th>
<th>Renewal survey no. 2 Age 5 - 10 years</th>
<th>Renewal survey no. 3 Age 10 - 15 years</th>
<th>Renewal survey no. 4 and subsequent Age &gt; 15 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>0a</td>
<td>Transverse sections within the cargo area. (^2)</td>
<td>One section of deck plating only - for the full beam of the ship within 0.5 L amidships. (^3)</td>
<td>One complete section - within 0.5 L amidships. (^3)</td>
<td>Two complete sections - at least one within 0.5 L amidships. (^3)</td>
</tr>
<tr>
<td>0b</td>
<td>Structural members subject to close-up examination according to Table 21, Table 24.</td>
<td>Measurements, for general assessment and recording of corrosion pattern.</td>
<td>Measurements, for general assessment and recording of corrosion pattern.</td>
<td>Measurements, for general assessment and recording of corrosion pattern.</td>
</tr>
<tr>
<td>1</td>
<td>Main deck plating</td>
<td>All - within the cargo area.</td>
<td>All - within the cargo area.</td>
<td>All - within the cargo area. All exposed - outside the cargo area.</td>
</tr>
<tr>
<td>2</td>
<td>Wind - and water strakes.</td>
<td>In way of the transverse sections considered in item 0a. Selected outside the cargo area.</td>
<td>All - within the cargo area. Selected outside the cargo area.</td>
<td>All - full length.</td>
</tr>
<tr>
<td>3</td>
<td>Transverse bulkheads</td>
<td>See item 0b</td>
<td>See item 0b</td>
<td>See item 0b</td>
</tr>
<tr>
<td>4a</td>
<td>Keel plates and bottom plates.</td>
<td>See item 0b</td>
<td>See item 0b</td>
<td>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.</td>
</tr>
<tr>
<td>4b</td>
<td>Sea chests and shell plating in way of overboard discharges.</td>
<td>Plating of sea chests. Shell plating as considered necessary by the attending surveyor.</td>
<td>Plating of sea chests. Shell plating as considered necessary by the attending surveyor.</td>
<td></td>
</tr>
<tr>
<td>4c</td>
<td>Duct keel or pipe tunnel.</td>
<td></td>
<td></td>
<td>Plating and internals.</td>
</tr>
<tr>
<td>5</td>
<td>Superstructure deck plating (poop, bridge and forecastle deck).</td>
<td></td>
<td></td>
<td>Representative exposed deck plating.</td>
</tr>
<tr>
<td>6</td>
<td>Internals in peak tanks.</td>
<td></td>
<td>Forepeak and aft peak.</td>
<td>Forepeak and aft peak.</td>
</tr>
</tbody>
</table>
### Survey requirements for fleet in service

<table>
<thead>
<tr>
<th>Area</th>
<th>Renewal survey no. 1</th>
<th>Renewal survey no. 2</th>
<th>Renewal survey no. 3</th>
<th>Renewal survey no. 4 and subsequent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age ≤ 5 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age 5 - 10 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age 10 - 15 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age &gt; 15 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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.

Source: IACS UR Z7.2 TABLE II

---

## 5 Table of survey methods for machinery

### 5.1 General

**5.1.1** For the systems listed below, components shall be examined as indicated in Table 26.

**5.1.2** Propulsion systems shall be tested as given in [3.1.2] and electric power systems shall be tested as given in [3.1.4].

**5.1.3** Examination method 1: Visual inspection by opening up fully or partly as deemed necessary by the surveyor. Function testing and or pressure testing shall be carried out when relevant.

Examination method 2: Examine visually without dismantling. Performance test shall be carried out. Open up if deemed necessary. Verify last overhaul.
### Table 26 Machinery, ship and cargo systems

<table>
<thead>
<tr>
<th>System</th>
<th>Components</th>
<th>Examination method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propulsion systems</td>
<td>Propulsion drivers: diesel engines</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Propulsion drivers: steam turbines</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Propulsion drivers: gas turbines</td>
<td>See [3.1.15]</td>
</tr>
<tr>
<td></td>
<td>Propulsion drivers: electric power units (electric motors and frequency converters) and hydraulic motors</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Thrust shafts, intermediate shafts, shaft bearings, clutches, couplings and vibration dampers (torsional and axial)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Gears: Shafts, pinions, wheels, power take offs, power take ins</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Controllable pitch propeller servo mechanism</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Controllable pitch propeller hydraulic power system</td>
<td>2</td>
</tr>
<tr>
<td>Main and emergency electric power systems</td>
<td>Generator drivers: diesel engines</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Generator drivers: steam turbines</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Generator drivers: gas turbines</td>
<td>See [3.1.15]</td>
</tr>
<tr>
<td></td>
<td>Generators</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Shafts, clutches, couplings and vibration dampers (torsional and axial)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Gears: Shafts, pinions, wheels, power take offs, power take ins</td>
<td>2</td>
</tr>
<tr>
<td>Feed water, steam and condensate systems</td>
<td>Heat exchangers</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Pipes, valves and filters inside machinery space</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Pumps</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Pump drivers: electric motors</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Pump drivers: steam turbines</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Condensers</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Fresh water generators (only for steam turbine propulsion)</td>
<td>1</td>
</tr>
<tr>
<td>Fuel and lubrication oil systems</td>
<td>Heat exchangers</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Pipes, valves, filters, pumps and pump drivers</td>
<td>2</td>
</tr>
<tr>
<td>Incineration system</td>
<td>Incinerator</td>
<td>1</td>
</tr>
<tr>
<td>Sea water systems</td>
<td>Pumps and heat exchangers</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Pipes, valves, filters and pump drivers</td>
<td>2</td>
</tr>
<tr>
<td>Fresh water systems</td>
<td>Heat exchangers</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Pipes, valves, filters, pumps and pump drivers</td>
<td>2</td>
</tr>
<tr>
<td>Bilge systems</td>
<td>Pumps and ejectors</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Pipes, valves and filters inside machinery space, and pump drivers</td>
<td>2</td>
</tr>
<tr>
<td>System</td>
<td>Components</td>
<td>Examination method</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>----------------------------------------------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Compressed air systems</td>
<td>Compressors</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Air receivers</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Pipes, valves and filters inside machinery space</td>
<td>2</td>
</tr>
<tr>
<td>Exhaust gas NOx and SOx cleaning systems,</td>
<td>Pipes, valves, filters, pumps and pump drivers ¹</td>
<td>2</td>
</tr>
<tr>
<td>treatment fluid circuits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exhaust gas system ²</td>
<td>Fans and fan drivers</td>
<td>1</td>
</tr>
<tr>
<td>Inert gas system</td>
<td>Pumps and fans</td>
<td>2</td>
</tr>
<tr>
<td>Cargo piping system</td>
<td>Compressors</td>
<td>1</td>
</tr>
<tr>
<td>Cargo tanks cleaning system</td>
<td>Pump, fan and compressor drivers: diesel engines and steam turbines</td>
<td>1</td>
</tr>
<tr>
<td>Cargo refrigeration system</td>
<td>Pump, fan and compressor drivers: electric and hydraulic motors</td>
<td>2</td>
</tr>
<tr>
<td>Cargo regasification system</td>
<td>Pump, fan and compressor drivers: hydraulic power systems</td>
<td>2</td>
</tr>
<tr>
<td>Cargo reliquefaction system</td>
<td>Heat exchangers and scrubbers</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Pipes, valves and filters</td>
<td>2</td>
</tr>
</tbody>
</table>

**Notes:**

1) The sides of non-return valves, and pumps exposed to fluids having corrosive or etching properties shall be surveyed according to method 1.
2) Function test of fan only.
SECTION 5 MISCELLANEOUS MAIN CLASS SURVEYS

1 Bottom surveys

1.1 General

1.1.1 Bottom surveys are surveys of the outside of the ship's hull below the deepest load waterline and related items.

1.1.2 The survey shall include examination of:
— hull plating and stern frame
— openings. At alternate bottom surveys all sea valves, including scuppers and sanitary discharges, shall be fully or partly opened up and examined. Sea valves should be overhauled, if deemed necessary by the surveyor
— for ships fitted with box coolers, the connection between the box cooler and the sea chest top plate shall be examined both from sea side and inside (dry side) at alternate bottom surveys
— steering fins, shaft brackets and other appendages fitted
— rudder with attachments and bearings, see [1.2]
— propeller with attachments and propeller shaft external parts, see [1.3]
— thrusters, see [1.4]
— 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.

1.1.3 Examinations of the outside of the ship's bottom and related items of ships shall normally be carried out with the ship in drydock. However, consideration may be given to alternate examination while the ship is afloat as an in-water survey, subject to provisions of [1.5].

1.1.4 At the time of drydocking, a dock trial shall be carried out to confirm satisfactory operation of main and auxiliary machinery.
The function of the controllable pitch propellers shall be verified.

1.2 Rudder with attachments and bearings

1.2.1 Visible parts of the following items shall be examined:
— rudder
— rudder horn
— sole piece
— rudderstock and rudder shafts with couplings
— rudder pintles and gudgeons.
1.2.2 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.

1.2.3 Areas susceptible to fractures shall be checked by an efficient crack detection method at every docking.

1.2.4 For flap rudders, the hinge and link systems shall be examined.

1.2.5 Rudder bearing clearances shall be measured and recorded.

1.3 Propeller with attachments

1.3.1 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.

1.3.2 The propeller shaft external sealing arrangement and the propeller blade sealing arrangement shall be examined for tightness. The propeller shaft bearing clearance shall be ascertained.

1.3.3 The following securing arrangements shall be examined:
— propeller nut
— propeller hub coupling bolts or nuts, if bottom survey afloat, only the securing of the protective arrangement shall be examined
— propeller blade bolts.

1.4 Thrusters

1.4.1 All thrusters shall be externally examined. This comprise examination of gear housing, propeller blades, bolt locking and other fastening arrangements. The sealing arrangement of propeller blades, propeller shaft and steering column shall be verified. Dismantling may be required to the extent found necessary by the surveyor.

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. Acceptance criteria for wear particles and water content as set by the relevant thruster maker shall comply with.

1.5 Bottom survey afloat

1.5.1 Every alternate bottom survey may be permitted afloat 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 a 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.

**Guidance note:**
For oil lubricated propeller, shaft bearing clearance and wear down measurement need not be taken in connection with bottom survey afloat.

---end---of---guidance---note---

Geared and podded thrusters for propulsion and/or dynamic positioning shall not have maintenance intervals that require inspection or maintenance to be carried out in dry-dock, of less than 5 years. A proposal for in-water survey shall be submitted in advance of the survey confirming that rudder, tailshaft and/or thrusters for propulsion and dynamic positioning can be satisfactorily examined - as applicable, including the operating history for these components.

**Guidance note:**
Operating history may consist of, but is not limited to:

— records of lub oil analysis for stern tube bearings
— log book records of stern tube operation.

---end---of---guidance---note---

1.5.2 Bottom surveys afloat may be permitted subject to the following restrictions:

— For general dry cargo ships subject to EHSR (see Sec.1 [1.1] Definitions), for liquefied gas tankers and for ships with class notation ESP the bottom survey in conjunction with the renewal survey shall be carried out with the ship in dry dock.
— For ships of 15 years of age or over bottom surveys afloat will only be permitted after special consideration.
— For ships of 15 years of age or over, with class notation ESP, bottom surveys afloat will not be permitted.

**Guidance note:**
For gas tankers subject to EDD the requirements are given in [1.6].

---end---of---guidance---note---

1.5.3 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.
— the cleanliness of the hull below the waterline shall be clear enough to permit a meaningful examination of the plating, appendages and the welding
— 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 shall be ascertained
— the survey shall be witnessed by a surveyor of the Society.

1.5.4 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.

1.6 Extended interval between bottom surveys in dry-dock

1.6.1 General
Owners and ships eligible for the extended dry docking (EDD) scheme shall meet the requirements and conditions described below. Qualiﬁed ships are allowed to carry out two consecutive bottom surveys afloat,
provided they have satisfactorily results. Furthermore, a minimum of two inspections of the outside of the ship's bottom shall be carried out during the renewal survey period of five years and the intervals between any two inspections shall not exceed 36 months.

1.6.2 Application and qualifications
The dry docking scheme will be as indicated in Figure 1, based on the ship’s age when entering the program. For ships already in service, the extended dry docking scheme may be implemented at any time up until a ship reaches 10 years of age. When the ship reaches 15 years of age, continuation of the scheme will be specially considered.

![Dry docking scheme](image)

* Bottom Survey Afloat (BSA) only after special consideration

Figure 1 Dry docking scheme

Prior to entering the scheme, a written acceptance from the flag administration shall be obtained. The following ships and ship types are not eligible for the extended dry docking scheme:

- passenger vessels
- ships subject to enhanced survey program (ESP)
- general dry cargo ships subject to extended hull survey program (EHSR)
- ships fitted with propulsion thrusters, unless machinery condition monitoring is implemented
- ships where the propeller connection is by means of a keyed taperkey.

1.6.3 Requirements
Ships on the extended dry docking interval scheme shall satisfy the requirements given in this chapter below. The compliance with the requirements shall be verified before the ship enters the scheme.

- The ship shall comply with the in-water survey provisions in accordance with the Society's rules for BIS and/or IW notation, ships built for in-water survey of the ship’s bottom and related items.
- Means, such as hinged gratings, shall be provided on all sea chests to allow divers access for examination of the external sides of through hull connections and sea valves.
- Arrangement allowing for fully or partly opening up of all sea valves, including scuppers, sanitary discharges and box coolers every five years (alternate bottom survey).
- The shafting arrangement shall fulfil requirements for TMON or CM-PS – tailshaft condition monitoring survey arrangement.
- Lub oil analyses from auxiliary thrusters shall be provided at every bottom survey, alternatively auxiliary thrusters shall be arranged for inspection from inside the hull without opening up from the sea side.
- Protective coating in double bottom/double side ballast tanks below the deepest load waterline shall be maintained in GOOD condition.

Equivalent arrangements to the above may be considered.
Guidance note:
Partial scope for oil lubricated shafts as described in [2.1.3] may be an alternative, if accepted by flag.
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1.6.4 Bottom survey afloat (BSA)
As part of the BSA, internal examination of hull plating and adjacent structure shall be carried out, including required thickness measurements. Assessment of coating condition in double bottom and double side water ballast tanks shall be carried out.

The BSA shall provide the information normally obtained from a docking survey.

A proposal for an BSA survey plan shall be submitted to the Society for review in advance of the survey, points to consider shall include:
— scheduled time and location for survey
— name of approved diving company
— means for cleaning of the hull below waterline
— means of access for examination of sea and sanitary valves and, when applicable, arrangement for complete examination (‘opening up’) of box coolers, sea and sanitary valves
— results of inspections by the owner's personnel of double bottom/double side ballast tanks (during the last 3 years) with reference to structural deterioration in general, leakages in tank boundaries and piping and condition of the protective coating
— conditions for internal examination of double bottom/double side ballast tanks (e.g., information regarding tank cleaning, gas freeing, ventilation, lighting, etc.).

Prior to commencement of the BSA, a survey planning meeting shall be held between the attending surveyor(s), the owner’s representative, the diving company and the master of the ship for the purpose to ascertain that all the arrangements envisaged in the survey plan are in place, so as to ensure the safe and efficient conduct of the survey work to be carried out.

1.6.5 Survey findings
If the BSA reveals damage, deterioration or other conditions that require early attention, the surveyor may require that the ship is dry docked so that a detailed survey can be undertaken and the necessary repairs carried out.

If temporary repairs are accepted carried out to any underwater parts, these must be made permanent within a due date decided by the surveyor.

1.6.6 Application procedure
Owners/managers that would like to have their ship(s) considered for the EDD interval scheme, shall apply to the Society in writing confirming and describing compliance with the requirements and conditions specified in this document.

Prior to entering the scheme, a written approval from the flag administration shall be obtained. The Society may assist in forwarding the application to the flag administration.

The Society will upon review of the submitted documentation and the ship survey records, confirm current condition of the hull and machinery and decide upon acceptance into the scheme.

For vessels accepted into the scheme a memo to owner (MO) will be issued.

1.6.7 Termination of the scheme
The EDD scheme will be terminated in case of change of vessel’s owner, management or flag, or if the requirements are no longer complied with.

Once the conditions for the scheme are no longer present, the ship will return to the normal docking interval and any due dockbottom survey in dock shall be carried out as soon as possible within due date.
2 Propeller shaft survey

2.1 General

2.1.1 Full scope
The propeller shaft shall be drawn to permit examination of the shaft and the following parts:
— propeller shaft bearing areas
— stern bushes or bearings
— liners and corrosion protection where fitted/provided
— shaft sealing arrangement, including lubricant system
— aft bearing clearances shall be measured/calculated and recorded
— level monitoring of lubricant system.

In addition to the above, a propeller connection survey in accordance with [3.1.1] shall be carried out for propeller shafts with a keyway.

Guidance note:
Bearing clearances can be measured or calculated from wear down measurements and clearance from new building or last shaft withdrawal.

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2.1.2 Reduced scope for oil lubricated propeller shafts
For oil lubricated propeller shafts with type approved sealing glands, the withdrawal of the propeller shaft may be exempted provided the following items have been examined with satisfactory result:
— new oil seals for the outboard sealing arrangement shall be fitted
— verification of the effectiveness of the inboard seal
— oil sealing contact surfaces in way of the liner in order
— aft bearing clearances measured/calculated and recorded
— level monitoring of lubricating oil system including oil consumption records
— oil analysis and trend results (6 monthly intervals, latest not older than 3 months) in order
— historic records of tail shaft aft bearing temperature
— shaft grounding device in order
— oil sample examination
— Verification of no reported repairs by grinding or welding of shaft and/or propeller.

In addition to the above, a propeller connection survey in accordance with [3.1.1] shall be carried out for propeller shafts with a keyway.

Guidance note:
Historic records of tail shaft aft bearing temperature may be dispensed with if applicable DNV GL rules do not require monitoring of the bearing temperature.

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Guidance note:
Bearing clearances can be measured or calculated from wear down measurements and clearance from new building or last shaft withdrawal.
The lubricating oil analysis should include as a minimum the following parameters:
- water content
- chlorides content (sodium and magnesium)
- content of bearing metal particles for white metal bearings (aluminium, nickel, chromium, copper, tin, and lead)
- content of particles from corrosion of shaft (iron)
- content of other particles (silicon)
- oil aging, resistance to oxidation (TAN, TBN).
Oil sample should be taken under service conditions from an identified sampling point.

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2.1.3 Partial scope for oil lubricated shafts
For oil lubricated propeller shafts with type approved sealing glands the Society may extend the tailshaft surveys required in accordance with Sec.1 [1.6.6] by 2.5 years provided the following items have been examined with satisfactory result:
- verification of the effectiveness of the inboard and outboard seals
- aft bearing clearances measured/calculated and recorded
- level monitoring of lubricating oil system including oil consumption records
- oil analysis and trend results (6 monthly intervals, latest not older than 3 months) in order
- historic records of tail shaft aft bearing temperature
- verification that the propeller is free of damages
- shaft electrical grounding device in order
- oil sample examination
- verification of no reported repairs by grinding or welding of shaft and/or propeller.

In addition to the above, a propeller connection survey in accordance with [3.1.1] shall be carried out for propeller shafts with a keyway.

Where propeller shaft connection survey in accordance with Sec.1 [1.6.7] for keyless and flanged connections is not due, the Society may, on a case by case basis and evaluation, consider exempting measurement and recording of aft bearing clearances. The partial scope survey method shall not apply in succession and is not subject to postponement.

Guidance note:
Historic records of tail shaft aft bearing temperature may be dispensed with if applicable DNV GL rules do not require monitoring of the bearing temperature.

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Guidance note:
Bearing clearances can be measured or calculated from wear down measurements and clearance from new building or last shaft withdrawal.
The lubricating oil analysis should include the minimum parameters:
- water content
- chlorides content (sodium and magnesium)
- content of bearing metal particles for while metal bearings (aluminium, nickel, chromium, copper, tin, and lead)
- content of particles from corrosion of shaft (iron)
- content of other particles (silicon)
- oil aging, resistance to oxidation (TAN, TBN).

Oil sample should be taken under service conditions from an identified sampling point.

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2.1.4 Reduced scope (closed loop water)

For shafting provided with an approved protection arrangement involving closed loop water lubricated propeller shafts with type approved sealing glands, the withdrawal of the propeller shaft may be exempted at alternate surveys i.e. extended until 10 years, provided the following items have been examined with satisfactory result:

— new seals for the outboard sealing arrangement should be fitted
— verification of the effectiveness of the inboard seal
— sealing contact surfaces in way of the liner
— aft bearing clearances measured/calculated and recorded
— level monitoring of lubricant system including consumption records
— lubricating system arrangement
— lubricant analysis and trend results (6 monthly intervals, latest not older than 3 months)
— shaft electrical grounding device (where installation is a rule requirement)
— fresh water sample test
— verification of no reported repairs by grinding or welding of shaft and/or propeller.

 Guidance note:

Bearing clearances can be measured or calculated from wear down measurements and clearance from new building or last shaft withdrawal.

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 Guidance note:

The lubricant analysis should include the minimum parameters:

— chlorides content (sodium or magnesium)
— content of particles from corrosion of shaft (iron)
— pH or equivalent indication of corrosion inhibition.

Lubricant sample should be taken under service conditions from an identified sampling point.

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3 Propeller connection survey

3.1 General

3.1.1 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.

3.1.2 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.
3.1.3 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.

4 Survey of geared thrusters for main propulsion and dynamic positioning

4.1 General

4.1.1 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 and of "non-traditional" design, such as e.g. Voith Schneider and pump jet, shall be subject to the requirements in this sub-section.

4.1.2 Lubrication oil samples shall be taken and sent to a recognised laboratory for analysis at regular intervals, not exceeding 3 months. Records of lubrication oil analysis shall include trends of previous analysis, and be available onboard 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. Acceptance criteria for wear particles and water content are set by the relevant thruster maker (in case thruster maker criteria are not available due to e.g. bankruptcy of gear thruster maker, 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 in dry-dock.

4.1.3 Outboard (wet) parts of the thruster, accessible from the outside, shall be externally examined during by the bottom surveys.

4.1.4 The thrusters shall be subjected to complete 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 [4.1.2]
2) opening up of protection covers
3) inspection of power transmission gear, bearings, visible parts of shafts and general condition of housing internally. Gear clearance and axial play of bearings shall be measured
4) examination of controllable pitch mechanism oil transmission system and feedback system
5) full stroke ahead and astern shall 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 (max continuous rating).
Provided that an approved thruster condition monitoring (Thr-CM) survey arrangement is in place. See Sec.7 [3.3], the scope described from 1) to 7) is covered by the Thr-CM. Follow up of the thruster is then done during annual Thr-CM surveys and bottom surveys. See class guideline DNVGL-CG-0052 App.B.

4.1.5 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. This will be applicable for e.g. Voith-Schneider and pump type thrusters.

4.1.6 If the thruster is overhauled at the time of the complete survey, NDT for TIFF (tooth interior fatigue fracture) shall be carried out according to maker’s requirements and acceptance criteria. If the thruster is overhauled during the interval between two scheduled surveys, satisfactory documentation for NDT (TIFF) performed according to maker’s requirements and acceptance criteria shall be submitted to the attending surveyor at the next survey. Mounting of the thruster on board shall be verified and function tested.

5 Survey of podded thrusters for main propulsion and dynamic positioning

5.1 General

5.1.1 The requirements in this sub-section apply to thrusters of podded design, hereafter denoted pods, for propulsion and steering of the ship.

5.1.2 Survey of pods implies a survey of the pod’s internal power transmission elements and driving motor enclosed in the pod, strut and steering column.

5.2 Scheduled surveys

5.2.1 Annual survey
The following shall be carried out:
— evaluation of lube oil analysis from recognized laboratory (for slewing gear if applicable)
— 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 inscriptions, maintenance of the slip rings electrical connections, etc.
— visual inspection of pod motor air cooling system
— record of running hours.

5.2.2 Complete survey
The following shall be carried out:
— 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)
— external survey in dry dock, check housing for cracks, corrosion, damage
— verification of seals condition (pod/ship)
— verify condition of slewing gears and bearing.
5.2.3 Re-fitting of the pod onboard after overhaul shall be verified and the pod shall be function tested.

5.2.4 Provided that an approved thruster condition monitoring survey arrangement (Thr-CM) is in place, the scope described in [5.2.2] above, is covered by the Thr-CM. Follow up of the pod is then done during annual Thr-CM surveys and bottom surveys.
See Classification Note 10.2 App.B.

6 Boiler survey

6.1 General

6.1.1 The requirements in this sub-section apply to all boilers, steam drums, steam generators, steam separators and/or pipe arrangements.
Also applicable to steam/thermal oil heated steam generators.

6.1.2 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 shall 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 shall be well ventilated on both steam-water and fire side. Safe work lighting shall be provided.

6.1.3 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 direct visual 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.
(See IACS UR Z18)
6.1.4 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. The test shall include instrumentation, automatic and remote control equipment, and be witnessed by a 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 shall 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 surveyor.

6.1.5 For exhaust boilers fitted with a “bursting disc”, the disc shall be undamaged and comply with the original setting.

6.1.6 Soot-cleaning arrangements is subject to visual inspection and function testing. Drainage of cleaning water shall be in working order.

6.1.7 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.

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

6.2 Damage and repairs to boilers and pressure vessels

6.2.1 All damage shall be reported to the Society for assessment.

6.2.2 The Society will determine necessary accessibility to ensure that the full extent of the damage is ascertained.

6.2.3 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.

6.2.4 The requirements in relevant newbuilding rules apply to all repair work.

6.3 Emergency repairs

6.3.1 To retain the ship’s manoeuvrability, reach safe- or scheduled port, emergency measures/repairs to pressure parts may have to be performed without the Society’s attendance. Information about such emergency measures planned or initiated shall however, always be submitted to the Society 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 be 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.

---end of guidance note---

6.3.2 A surveyor shall be called to survey repairs performed according to [6.3.1], when completed.

Guidance note:
It is the owner’s responsibility to document that the agreed repair plan has been adhered to.

---end of guidance note---

6.4 Repairs

6.4.1 A repair proposal shall detail:
   a) full extent of damage to be repaired
   b) material certification
   c) type approval of welding consumables
   d) welding procedure specification
   e) welding procedure qualification record
   f) welders qualification and certification
   g) scope, extent and procedures for NDT
   h) testing schedule
   i) access work, including procedures for “buttering up” (welding up) of material lost when cutting out the temporary opening.

6.4.2 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.

6.4.3 Cracked steel boiler shell plating, tube plates, corroded welding and pitting shall be repaired through plate replacement.

6.4.4 Heat affected zones of insert welding shall not interfere with heat affected zones of original welding and previous repairs.

6.4.5 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 relevant newbuilding rules.

---end of guidance note---

6.4.6 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.

---end of guidance note---

6.4.7 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.

---end of guidance note---
6.4.8 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.

6.4.9 Boiler armature/valve replacement
Safety valves shall be designed and manufactured according to a recognized standard.

Guidance note:
Acceptable standard could be e.g. ASME, DIN or equivalent.

---end---of---guidance---note---

The Society’s product certificate is required for valves with \( D > 100 \) mm having a design pressure, \( p > 16 \) bar. For other valves, manufacturers’ certificate is acceptable.
In addition, the Society’s material certificate is required when operating temperature > 400ºC.

6.4.10 Post weld heat treatment
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 VL1Cr0.5Mo and VL2.25Cr1Mo, where all thicknesses shall be subject to heat treatment.

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.

---end---of---guidance---note---

6.4.11 Testing
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 shall 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 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.

6.4.12 Hydraulic pressure testing shall be carried out at 1.5 times the design pressure, and be witnessed by a surveyor.
7 Thermal oil heater survey

7.1 General

7.1.1 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
— soot blowing arrangements including automatic operation
— exhaust gas bypass arrangement
— firefighting arrangement
— drainage of firefighting/cleaning water.

7.1.2 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.

7.2 Testing

7.2.1 Testing shall be witnessed by a surveyor.

7.2.2 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.

7.2.3 Hydraulic pressure testing
For coils in thermal oil installations heated by oil or gas burner(s) or by exhaust gases, which are not accessible for visual external inspection, survey shall 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

1 Fire fighting installations and equipment

1.1 General

1.1.1 The requirements in this sub-section apply to vessels with class notation: Fire fighter and FF.

1.2 Annual survey

1.2.1 Water spray plant for self protection, including pumps, pipes and nozzles, shall be surveyed and tested.
1.2.2 Hoses with their equipment shall be surveyed and tested.
1.2.3 Compressors for charging the air bottles for fire fighters’ outfits shall be surveyed.
1.2.4 Floodlights shall be tested.
1.2.5 It shall be verified that the required operation manual is in order.
1.2.6 For ships with class notation qualifiers FF2, FF3, II, III or Capability the survey shall include examination of the mobile generator for foam production with its equipment.
1.2.7 For ships with class notation FF3, III or Capability the survey shall include examination of the fixed foam monitors with foam production equipment and remote control.

1.3 Complete survey

1.3.1 Pumps for water monitors including their drivers shall be surveyed and tested at maximum capacity. Remote control of monitors including valve operation shall be tested.

2 Well stimulation vessels

2.1 General

2.1.1 The requirements in this sub-section apply to ships with class notation: Well stimulation vessel and WSV.

2.2 Annual survey

2.2.1 The flexible high pressure hose including end connectors shall be hydraulically pressure tested to 1.25 times its maximum working pressure.
2.2.2 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 gas detection and alarm system
— oxygen indication system
— decontamination showers and eye washes
— personnel protective equipment.

2.3 Complete survey (5 years)

2.3.1 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).

2.3.2 Acid tanks shall be examined internally.

2.3.3 All pressure relief valves shall be opened for survey, adjusted, sealed and function tested.

2.3.4 Pressure/vacuum relief valves for the acid tanks shall be surveyed and tested for proper function.

2.3.5 Spot checking by NDT of the high pressure piping shall be carried out.

2.3.6 The nitrogen vaporiser shall be opened for internal inspection and hydraulically tested to 1.25 times its
maximum working pressure after reassembly.

2.3.7 The high pressure piping shall be hydraulically tested to 1.25 times its maximum working pressure.

2.3.8 The emergency depressurisation and disconnecting of the transfer hose shall be tested.

3 Reception systems for recovered oil

3.1 General

3.1.1 The requirements in this sub-section apply to oil recovery vessels and ships with class notation:
OILREC.

3.2 Annual survey

3.2.1 The survey is normally to include examination of the following components and arrangements:
— piping system for oil recovery operations and pump rooms with equipment. 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,
— portable hydrocarbon gas-measuring instrument,
— electrical equipment certified for use in gas dangerous areas,
— oil recovery operation manual.
3.3 Complete survey

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.

3.4 Oil recovery vessel (without class notation OILREC) - additional requirements

3.4.1 General

The surveys shall cover installations, outfit and equipment for:
— operation in oil covered waters
— recovering oil floating on the water
— the carriage and handling of oil cargo.

3.4.2 Annual survey

Equipment for operation in oil-covered waters.

The following equipment for operation in oil-covered waters shall be function verified:
— air locks
— arrangements for effecting the closures necessary for explosion protection
— ventilation system for pressurizing accommodation, workshops and machinery spaces (test operation)
— vapour detection and alarm systems and portable gas detection equipment
— drainage of cargo tank vent lines.

Irrespective of the vessel's age the condition of the cargo, oil recovery, tank cleaning, bunkering, ballast, steam and venting systems, as well as of the ventilation and ventilator heads shall be checked. In cases of doubt pressure tests and/or wall thickness measurements may be demanded.

Cargo tank high velocity vent valves and pressure/vacuum valves shall be function tested, and if deemed necessary by the surveyor, to be opened up and re-adjusted.

3.4.3 Renewal survey

The renewal survey of cargo handling installations and related control, alarm and safety devices cannot normally be carried out during loading or discharging operations and is preferably to be carried out with the ship in gas-free condition.

Hull

The scope of close-up surveys shall be as for oil tankers, depending on the age of the vessel and the operational profile of the vessel during the last period of class.

The scope of thickness measurements shall be as for oil tankers.

Cargo area equipment

Cargo, oil recovery and ballast piping systems, including valves and fittings, shall be internally inspected for corrosion as deemed necessary by the surveyor. Subsequently, a pressure test shall be carried out.

Cargo, stripping, oil recovery, and ballast pumps shall be examined and checked. Pressure relief valves of pumps shall be function tested.

Cargo tank high velocity vent and pressure/vacuum valves shall be overhauled, adjusted by makers/recognized firms and tested under supervision of a surveyor.

Cargo tank heating systems shall be examined and pressure-tested to 1.5 times the operating pressure.

All ventilation systems in the cargo area including portable fans shall be examined and function-tested.
The following equipment shall be function-tested:
— level indicators of cargo tanks
— liquid level alarms
— overflow controls
— pressure and temperature alarms
— remote-control systems of cargo pumps
— sampling arrangements of cargo tanks, if fitted
— cargo hoses shall be examined and tested as deemed necessary.

4 Refrigerated cargo plants

4.1 General

4.1.1 The requirements in this sub-section apply to ships with class notation: Reefer, RM, RM CONTAINER, KMC, CA, CRS, RIC, CA mob and KAZ.

4.2 Annual survey

4.2.1 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.

4.2.2 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.

4.2.3 The freezing point (density) and acidity (pH value) of the brine shall be checked.

4.2.4 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.

4.2.5 CO₂ detectors, if required installed, shall be checked.

4.2.6 For ships with class notation CA and CA mob 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 pre-alarm
— 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.

4.3 Complete survey (5 years)

4.3.1 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.

4.3.2 The insulation shall be examined for cold spots when the chambers are at the lowest design temperature.

4.3.3 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.

4.3.4 At the second and all subsequent complete surveys pressure vessels should be internally examined. Special attention to be paid to pressure vessels with R717 with regard to possible ammonia stress corrosion cracking.

4.3.5 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.

4.3.6 Air coolers, freezing tunnels and plate freezers shall be examined.

4.3.7 Condenser cooling water pumps, brine pumps and RSW pumps shall be opened up and examined.

4.3.8 Brine and RSW piping systems shall be examined at working pressure.

4.3.9 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.

4.3.10 Pressure gauges, thermometers and automatic controls and alarms shall be tested.

4.3.11 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.
4.3.12 For ships with class notation **CA** and **CA mob** 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.

4.4 Survey in loading port, upon request

4.4.1 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.

The proper operation of air duct couplings for connecting refrigerated containers to the ship’s own refrigerating installation shall be checked, as is the intactness of the air ducts. If refrigerated cargo containers are coupled to the air ducts during the onboard survey, the tight sealing effect of the couplings shall also be checked.

5 Arrangement for carriage of dangerous solid bulk cargoes and dangerous goods in packaged form

5.1 General

5.1.1 The requirements in this sub-section apply to ships with class notation: **DBC** and/or **DG** including class notation qualifiers **P** and **B**.

5.2 Complete survey (5 years)

5.2.1 It shall be verified that the following documents are available onboard:

— current Medical First Aid Guide for Use in Accidents Involving Dangerous Goods (MFAG).

5.2.2 The following shall be surveyed and tested as applicable:

— fixed CO₂ fire extinguishing system in enclosed cargo spaces or fire extinguishing system which, in the opinion of the Administration, gives equivalent protection (e.g. foam)
— main fire pumps (quantity of water delivered shall be capable of supplying four nozzles)
— electrical equipment in cargo spaces
— ventilation system for cargo spaces including wire mesh guards fitted over fan openings on deck
— separate/additional bilge pumping system or drainage for cargo spaces, including isolating valves and warning signs
— full protective clothing resistant to chemical attack
— additional sets of self-contained breathing apparatuses including spare charges
— A-60 insulation bulkheads and decks between cargo spaces and machinery space of category A
— remote starting arrangements for the main fire pumps.

5.2.3 For ships with class notation DG except class notation qualifier B the survey shall include additionally:
— water-spraying system in open ro-ro spaces having a deck above it and closed ro-ro cargo spaces not capable of being sealed
— water cooling system for cargo spaces
— fire detection or sample extraction smoke detection and alarm system for cargo spaces
— additional portable fire extinguishers for cargo spaces
— means of separation for ro-ro spaces to minimize passage of dangerous vapours and liquids.

5.2.4 For ships with class notation DBC the following shall be checked additionally:
It shall be verified that the following documents are available on board:
— approved loading manual
— approved trim and stability information
— bulk cargo/carrier booklet including all information required by SOLAS VI/7.2 (as an alternative to a separate booklet the information may be contained in the intact stability booklet).

The following shall be surveyed and tested as applicable:
— cable penetrations between cargo and machinery spaces
— condition of machinery bulkhead
— boundaries of the cargo spaces (at least A-0 standard)
— temperature measuring equipment for cargo spaces
— equipment to measure acidity in the bilge for cargo spaces
— “NO SMOKING” signs in cargo space area
— weather tightness of weather deck closures and closures for ventilators and all other openings leading through the cargo spaces
— temperature measuring devices for heated fuel tanks adjacent to the cargo spaces
— gas sampling points for cargo spaces
— self-unloading equipment for cargo spaces.

6 Cranes

6.1 General

6.1.1 The requirements in this sub-section apply to ships with class notations: 
**Crane vessel, Floating crane** or **Crane**.

6.2 Annual survey

6.2.1 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.

6.2.2 Slewing system (slewing bearing or hook rollers) including tightness of bolts shall be examined as found necessary by the surveyor.

6.2.3 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.

6.2.4 It shall be verified that the load charts, marking and components certificates are available and in order.

6.3 Complete survey (5 years)

6.3.1 Thickness measurements of structural parts shall be carried out as far as deemed necessary.

6.3.2 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.

6.3.3 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, or if relevant accepted non-destructive examination checking for defects in fillets and raceways is carried out, opening up is not required. However, in any case at least 50% of the holding down bolts shall be drawn and subjected to MPI.

6.3.4 Flatness and condition of bearing mounting flanges shall be checked.

6.3.5 A load test, as outlined on form no. CG2 in the DNVGL-ST-0377 Standard for certification of shipboard lifting appliances, shall be carried out.

7 Cable laying installations

7.1 General

7.1.1 The requirements in this sub-section apply to ships with class notation:
Cable laying vessel/Barge.
7.2 Annual survey

7.2.1 An overall survey shall be carried out and shall include:
— hydraulic systems
— function testing.

7.3 Complete survey (5 years)

7.3.1 Bearings and shafts of revolving equipment shall be opened up for examination.
7.3.2 Gear wheel and pinions of cable winch shall be checked.
7.3.3 Resistance measurements of electrical systems related to cable laying systems shall be carried out.

8 Helicopter decks

8.1 General

8.1.1 The requirements in this sub-section apply to ships with class notation:
HELDK, HELIL and HELILF.

8.2 Complete survey (5 years)

8.2.1 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.

For class notation HELILF helicopter fuelling system to be examined and tested in addition to the above requirements.

9 Diving systems

9.1 General

9.1.1 The requirements in this sub-section apply to ships with class notation:
Diving support vessel DSV or Diving systems.

9.1.2 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 [9.5] are carried out.
9.1.3 Survey requirements by a recognised classification society apply to all diving systems on vessels classed by the Society.

9.1.4 A survey planning document shall be part of the documentation on board for the lifetime of the diving system.

9.1.5 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).

9.1.6 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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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.

9.2 Annual survey

9.2.1 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 rules.
9.3 Intermediate survey

9.3.1 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.

9.4 Complete survey (5 years)

9.4.1 Bell buoyancy materials, heat protection, penetrators, windows and attached members shall be
dismounted for inspection for possible corrosion and deterioration.

9.4.2 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 [9.4.6] and [9.4.7].
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 BS EN 13099:2003 Transportable
gas cylinders. Conditions for filling gas mixtures into receptacles 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/mm$^2$) Transportable Gas Containers or Code of Federal Regulations Title 49 Ch.I Part 178 Subpart C

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9.4.3 Proof test or volumetric expansion test shall be carried out according to that which is required by the
design code or regional requirements.

9.4.4 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.

9.4.5 Pneumatic testing shall not be carried out at pressures above the design working pressure.
9.4.6 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.

9.4.7 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 [9.4.4].

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 [9.4.4].

9.4.8 The working weight of the bell shall be checked.

9.4.9 A test of the bell handling system with a static load equal to the design load shall be carried out.

9.4.10 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.

9.4.11 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 - 2012 Safety Standard for Pressure Vessels for Human Occupancy: In-Service Guidelines.

9.5 Survey of diving systems 'out of commission'

9.5.1 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.

9.5.2 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.
9.5.3 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.

10 De-icing or anti-icing systems

10.1 General

10.1.1 The requirements in this sub-section apply to ships with class notation: DEICE.

10.2 Annual survey

10.2.1 Visual inspection of anti-icing and de-icing switchboards and confirm heating load on each circuit according to marking on the switchboards.

10.2.2 Examination of equipment for de-icing and anti-icing including:
— heaters
— covers
— equipment for manual de-icing
— radar equipment
— heating coils
— steam tracing lines.

11 Additional fire protection arrangements

11.1 General

11.1.1 The requirements in this sub-section apply to ships with class notation: F

11.2 Complete survey (2.5 years)

11.2.1 Fire pumps including emergency fire pump and prime movers shall be examined and tested.

11.2.2 Compressors for charging of air bottles for firefighters' outfit shall be examined.

11.2.3 For class notation qualifier A (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.

11.2.4 For ships with class notation qualifier 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
Survey requirements for fleet in service

12 Dynamic positioning systems

12.1 General

12.1.1 The requirements in this sub-section apply to vessels with class notations: DYNPOS(AUTS), DYNPOS(AUT), DYNPOS(AUTR), DYNPOS(AUTRO), DP(0), DP(1), DP(2), DP(3), DPS(0), DPS(1), DPS(2), DPS(3), DYNPOS(E) or DYNPOS(ER).

Guidance note:
Class entry vessels coming from other class societies with class notation DPS or DP may have deviations from the DNV GL rules, which may make some of the items listed below, inapplicable.

12.1.2 These rules do not include verification of requirements or recommendations in regard to the vessels operation or other characteristics.

12.1.3 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. a 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
— changes to the thruster system
— software changes
— structural changes
— changes in power system.

12.1.4 For all vessels with additional class notation qualifier (A) attached to the dynamic positioning class notation, both the annual survey and the complete survey shall be carried out in accordance with the requirement for complete survey, as given in [12.3]. An updated FMEA report with a corresponding FMEA test program shall be kept onboard, and shall be used as basis for the testing.

12.2 Annual survey

12.2.1 Unless the vessel have additional qualifier (A) attached to the class notation the annual survey shall be carried out according to the requirements in this sub-section.

Guidance note:
For vessels with additional qualifier (A) attached to the DP class notation see [12.1.4] for requirements to the annual survey.

12.2.2 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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12.2.3 The following data shall be recorded during survey:
— the DP control system(s) SW version(s)
— the DP FMEA and FMEA test program issue date(s) and version(s)
— number and type of position reference systems installed.

12.2.4 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, independent joystick and thrusters, position references systems, heading reference systems, wind sensors, other sensors and mode change system. When relevant also mechanical parts of position reference systems and sensors shall be inspected.

12.2.5 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.

12.2.6 Emergency stop of thrusters from the DP-control centre shall be tested.

12.2.7 Correct normal functioning of the thruster control mode selection system shall be verified. In addition the following shall be verified:
— transfer of control to independent joystick upon power failure to the DP control system
— transfer of control to manual thruster levers in case of power failure to the DP control system and independent joystick control system
— test emergency to manual function if installed.

12.2.8 Test manual control of pitch, speed and azimuth for all thrusters. Verify correct functioning of the feedback displays.

12.2.9 For all DP related operator stations and displays: Verify all relevant views and mimics. Perform lamp test and examine night view functions and dimming facilities.

12.2.10 The technical condition and function of the DP system shall be verified by performing automatic position and heading keeping function at sea.

Guidance note:
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. Testing should preferably be done during a sea trial. When it is not feasible to leave the port for sea trials, the survey may be credited based on limited testing in the port and reporting from the master confirming that the DP system is capable of positioning the vessel. The reporting should be done on the standardised owners reporting form. This way of arranging the survey will generally not be accepted two years in a row.

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12.2.11 During the testing of the automatic DP function required in [12.2.12] spot-checks shall also be performed to verify the following (as applicable to the installation):
— verification of views and the information displayed on them, including position reference systems, other sensors and power views
— selection and deselecting of reference systems when more than one system is available
— selection and deselecting of heading reference sensors, wind sensors vertical reference sensors and other sensors when installed
— selection and deselecting of thrusters
— alarms for loss of position and heading out of limits
— verification of different operational modes as applicable to the installation, e.g.: thruster allocation modes, different rotation centres, tracking modes, different combinations of surge/yaw/sway control, etc.

12.2.12 Automatic position and heading keeping shall be verified using available position reference systems as single input to the DP control system, and in different combinations. Minimum one position reference system shall be made available. Verification of the position data shall be made by comparison of different reference systems. Correct functioning of position reference system operator stations and displays shall be verified. When relevant also electrical and mechanical functions of position reference systems shall be verified.

12.2.13 Automatic position and heading keeping shall be verified using all heading reference systems as input to the DP control system. Verification of the heading data shall be made by comparison of different systems. This can be done as part of the testing in [12.2.11].

12.2.14 Verification of all wind sensors, vertical reference sensors and all other sensors providing input to the automatic DP control system shall be performed by doing automatic position and heading keeping with each available sensor as input to the DP control system. This can be done as part of the testing in [12.2.11].

12.2.15 For all notations except DYNPOS(AUTS), DP(0) and DPS(0) Test correct functioning of the independent joystick system, including automatic heading control, at all control locations.

12.2.16 For all notations except DYNPOS(AUTS), DP(0) and DPS(0) the capacity of all UPSs and other battery systems serving the main, alternative and back-up DP-control system(s), including its peripherals, shall be verified. The alarm for loss of charging power and UPS on bypass shall be verified.

12.2.17 For class notations DYNPOS(AUTRO) and DP(3) and DPS(3) monitoring of the availability of the back-up DP control system at the main DP control centre shall be verified.

12.2.18 For class notations DYNPOS(AUTRO), DP(3) and DPS(3) change-over to the back-up DP control system shall be verified. Normal working condition of the back-up DP-control system shall be verified by performing relevant parts of the tests required in [12.2.10], [12.2.11], [12.2.11], [12.2.13] and [12.2.14].

Guidance note:
If the survey is carried out during regular operations, then control need not be transferred to the back-up DP-control system.

---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---

12.2.19 For class notations DYNPOS(E) and DYNPOS(ER) monitoring of the availability of the alternative DP control system at the main DP control centre shall be verified.

12.2.20 For class notations DYNPOS(E) and DYNPOS(ER) test change-over to the alternative DP control system. Normal working condition of the alternative DP-control system shall be verified by performing relevant parts of the tests required in [12.2.10], [12.2.11], [12.2.11], [12.2.13] and [12.2.14].

Guidance note:
If the survey is carried out during regular operations, then control need not be transferred to the alternative DP-control system.

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12.2.21 Based on test results and inspections additional testing may be required.

12.3 Complete survey (5 years)

12.3.1 For the complete survey a sea trial shall be performed. The vessel shall be in automatic DP mode when the testing is performed.
12.3.2 The complete DP system shall be tested in all operational modes. The testing described for annual survey shall be performed in addition to the testing described in this sub-section. The complete survey shall include simulation of different failure conditions to verify switching of modes, back-up systems and the alarm system.

Guidance note:
Survey of the thruster units shall be carried out as for thrusters for propulsion and DP, see Sec. 5 [5]. 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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12.3.3 The different modes of thruster control from the DP control centre(s) shall be tested:
— manual control
— independent joystick control, if installed
— DP control
— transfer of control (thruster control mode selection).

Manual override i.e. by thruster lever control and independent joystick control shall be demonstrated during normal operation and during failure conditions.

12.3.4 The automatic DP system shall be tested by performing automatic DP operation. During this testing the following shall be verified:
— verification of views and the information displayed on them
— position keeping and position moves, both longitudinal and sideways. See also [12.3.5] and [12.3.7]
— heading keeping and changes. See also [12.3.5] and [12.3.7]
— selection and deselecting of reference systems when more than one system is installed
— selection and deselecting of sensor systems, heading reference sensors, vertical reference sensors and other sensors when installed
— selection and deselecting of thrusters
— alarm for loss of position and heading out of limits shall be demonstrated
— verification of all operational modes as applicable to the installation, e.g.: thruster allocation modes, different rotation centres, tracking modes, different combinations of surge/yaw/sway control, etc.

12.3.5 All position reference systems shall be tested in order to verify:
— correct operation and adequate accuracy of all installed sensors. This shall be done as part of the test in [12.3.4]. Each position reference systems shall be tested as single input to the DP control system, and in different combinations
— when more than one sensor is installed: switch-over between reference systems as input to controller shall be carried out to assure that warnings, alarms and information to operator are satisfactory. This shall be done as part of the test in [12.3.4]
— failure of reference systems shall be simulated to check the alarm system.

Guidance note:
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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12.3.6 On systems with more than one position reference system the programmed off-set of the position reference input in to the DP control system shall be checked by performing a rotation test.
12.3.7 All heading reference sensors, wind sensors, vertical reference sensors and other peripheral equipment shall be tested in order to verify:

— correct operation and adequate accuracy of all installed sensors. This shall be done as part of the test in [12.3.4]
— when more than one sensor is installed: switch-over between sensors as input to controller shall be carried out to assure that warnings, alarms and information to operator are satisfactory. This shall be done as part of the test in [12.3.4]
— failure of sensors shall be simulated to check the alarm system.

12.3.8 Overload prevention functionality 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.

12.3.9 For class notations DYNPOS(AUTR), DYNPOS(AUTRO), DP(2), DP(3), DPS(2), DPS(3), DYNPOS(E) and DYNPOS(ER) correct functioning of the consequence analysis facility shall be verified as far as possible.

12.3.10 For class notations DYNPOS(AUTRO), DP(3) and DPS(3) change-over to the back-up DP control system shall be verified. Normal working condition of the back-up DP-control system shall be verified by performing tests as required in [12.3.4], [12.3.5], [12.3.7], [12.3.7] and [12.3.8] as applicable.

12.3.11 For class notations DYNPOS(E) and DYNPOS(ER) test change-over to the alternative DP control system. Normal working condition of the alternative DP-control system shall be verified by performing tests as required in [12.3.4], [12.3.5], [12.3.7], [12.3.7] and [12.3.8] as applicable.

12.3.12 Single failure testing in the thruster control mode selection system shall be performed in order to verify alarms and the availability of manual control (individual thruster lever control) after failure:

— loop failures
— power failures in mode change systems dependent on power
— controller failure when based upon controllers
— communication/network failures when based on communication networks.

Guidance note:
In case of class notations DYNPOS(AUTR), DYNPOS(AUTRO), DP(2), DP(3), DPS(2), DPS(3), DYNPOS(E) and DYNPOS(ER) the test in [12.3.12] shall in addition verify that maximum one redundancy group is lost from automatic DP control in case of a single failure. This testing may be combined with the FMEA testing required by [12.3.17].

12.3.13 Single failures in the 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.

Guidance note:
This testing may be combined with the FMEA testing required by [12.3.17].

12.3.14 For class notations DYNPOS(AUTR), DYNPOS(AUTRO), DYNPOS(E) and DYNPOS(ER) the loop monitoring alarm for the individual thruster emergency stops shall be verified.
12.3.15 Single failure testing in independent joystick control systems (except for notations DYNPOS(AUTS), DPS(0), DYNPOS(E) and DYNPOS(ER)) and DP control systems shall be carried out as listed, in order to verify that a failure will not cause a drive of (significant increase in thrust or change in the thrust direction) and that manual control (individual thruster lever control) is still available after complete failure of these control systems:

— power failure
— communication/network failures when based on communication networks
— verify that it is possible to take manual control on the individual thruster levers upon complete failure of the independent joystick control system
— verify that it is possible to take manual control on the individual thruster levers upon complete failure of the DP control system
— verify that any portable operator units are arranged so that it is possible to have them in a fixed location where UID and HMI are arranged in accordance with the vessel axis when they are in use.

Guidance note:
For notations DYNPOS(AUTR), DYNPOS(AUTRO), DP(2), DP(3), DPS(2), DPS(3), DYNPOS(E) and DYNPOS(ER) failure testing of the DP control systems can be combined with the test required in [12.3.17].

12.3.16 For notations DYNPOS(AUTR), DYNPOS(AUTRO), DP(2), DP(3), DPS(2), DPS(3), DYNPOS(E) and DYNPOS(ER) the redundancy in the main DP control systems shall be verified. As a minimum the following tests shall be tested:

— power failures, by disconnection of all outputs from each UPS and battery systems serving the DP control system, one UPS/battery system at a time
— communication/network failures when based on communication networks
— operator station failure
— automatic dynamic positioning controller failure.

Guidance note:
This testing may be combined with the FMEA testing required by [12.3.17].

12.3.17 For class notations DYNPOS(AUTR), DYNPOS(AUTRO), DP(2), DP(3), DPS(2), DPS(3), DYNPOS(E) and DYNPOS(ER) the required redundancy and failure tolerance in the DP system, with respect to defined single failures modes relevant for the specific class notation, shall be verified by simulation or introduction of relevant failure modes. For vessels required to carry an updated FMEA test program this program shall be used as the basis for the testing.

Guidance note:
Also in the case that the vessel is carrying an updated FMEA test program even if this is not required by DNV GL, this should be used as basis for the redundancy testing. For vessels with class request date prior to 1. July 2004 and which do not carry an FMEA test program, testing must be based on other documentation and inspection. The scope of testing will depend on the actual installation and will vary from vessel to vessel. In general, the following groups of tests will be required:

— 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.
For class notation qualifiers **DYNPOS(AUTR)**, **DYNPOS(AUTRO)**, **DP(2)**, **DP(3)**, **DPS(2)**, **DPS(3)**, **DYNPOS(E)** and **DYNPOS(ER)** the FMEA report and FMEA test program shall be verified to ensure that they have been updated to reflect alterations made to the DP system.

**Guidance note:**
Unless the vessel have additional qualifier (A) attached to the class notation (see [12.1.4]), the following vessels are excepted from this requirement:

- vessels with class request before 1. July 2004
- class entries to the class notations **DPS(2)** and **DPS(3)**.

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**12.3.19** Based on test results and inspections additional testing may be required.

### 13 Nautical safety

#### 13.1 General

**13.1.1** The requirements in this sub-section apply to vessels with class notation:

- **NAUT** including class notation qualifiers **NAV**, **AW**, **OC**, **OSV**, **OSV(A)**, **OSV(T)**, **Navy**, **Q**, **A**, **B** and **C**
- **W1** including class notation qualifiers **OC** and **Q**
- **NAV**, **NAV-INS**
- **NAV-O**, **NAV-OC** for 100A5, item [13.2] only
- **NAV-O** for 1A1 ships item [13.2.1] only.

#### 13.2 Annual survey

**13.2.1** Navigation related requirements of the cargo ship safety equipment annual survey shall be performed.

**13.2.2** The functional status of the navigational equipment shall be verified, including information of any changes to software and hardware which have been logged.

**13.2.3** 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 by required.

**13.2.4** For vessels with class notation qualifier **Q**, the qualification assurance system, operational procedures and certificates of competence shall be examined to verify compliance with relevant rules.

#### 13.3 Complete survey (5 years)

**13.3.1** 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.
13.3.2 The bridge alarm management system shall be tested for:
— automatic reset of monitoring system (only for NAV, NAV-INS and class notation 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.

13.3.3 For vessels with class notation qualifier AW or class notation W1, NAV and NAV-INS, 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 class notation qualifier NAVY)
— verification of chart radar function (also for class notation qualifiers OSV(A) or OSV(T)).

13.3.4 For vessels with notation NAV and NAV-INS the survey shall include:
— verification of consistent common reference system to ensure the consistency and integrity of data.
  A single consistent common reference point shall be used for all spatially related information. For consistency of measured ranges and bearings, the recommended reference location should be the conning position. Alternative reference locations e.g. the pivot point for heading or track control systems may be used.

14 Hull monitoring systems

14.1 General

14.1.1 The requirements in this sub-section apply to ships with class notation: HMON

14.2 Renewal survey and sea trial

14.2.1 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 is required for electro-mechanical strain sensors. For optical strain sensors, calibration shall be carried out (or confirmed still valid) at renewal survey or as specified by the supplier.
14.2.2 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 10% (without cargo) and 15% (with cargo) 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.
If data from the loading computer is not available for the present condition, historical data from last month may be used. Even with proper calibration of the global strain sensors a deviation of 5% from the loading computer should be anticipated, since the loading computer disregard minor physical effects. Uncertainties in ballast and cargo weights, e.g. for ore, bulk and container weights, may increase this deviation further.

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15 Vapour control systems

15.1 General

15.1.1 The requirements in this sub-section apply to ships with class notation: VCS and VEC.

15.1.2 Survey requirements for class notation qualifiers:

1, 2 and 3

are partly covered by the main class requirements for tankers for oil and chemicals.

15.2 Complete survey (5 years)

15.2.1 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 [2.5.8].

— examination, testing and sealing of deck tank safety relief valves
— examination and testing of cooling machinery and equipment.

15.2.2 For ships with class notation qualifiers 1B and 2B or notation VEC 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.
16 Environmental class

16.1 General

16.1.1 The requirements in this sub-section apply to ships with class notation: 
Clean, EP-D.

16.1.2 For class notation Clean, the survey requirements for ballast water management by exchange methods given by [22.2] to [22.4] or by treatment systems given by [22.5] to [22.7] apply.

For class notation Clean(Design) the survey requirements for ballast water management by treatment systems given by [22.5] to [22.7] apply.

16.2 Annual survey for class notation Clean

16.2.1 Verify that there is a responsible environmental officer on board.

16.2.2 Verify that required class notations, certificates and declarations are maintained. See also [16.1.2].

16.2.3 On board documentation

— verify that the ‘Oil/water interface log’ is maintained with respect to consumption figures
— verify that the ‘Fuel oil management plan’ is on board and approved
— verify that ‘Bunker delivery notes’ are retained on board for three years
— verify by ‘Fuel oil log’ entries that the maximum sulphur content is acceptable
— verify that the ‘Fuel change-over record’ is on board
— verify that the ‘Bunkering procedure’ is on board
— verify that the ‘Sewage management plan’ is on board and approved
— examine the ‘Sewage discharge log’ and verify that untreated sewage is not discharged
— verify that the ‘Garbage management plan’ is on board and approved
— verify that the ‘Garbage record book’ is maintained
— verify that the ‘Refrigerant management plan’ is on board and approved
— examine the ‘Refrigerant consumption logs’ and verify that the annual leakage is less than 10% of the initial charge
— verify that the ‘Biofouling management plan’ is on board.

Additional requirements for Clean(Design):

— verify that the ‘Bilge water and sludge management plan’ is on board and approved
— examine the ‘Exhaust gas SOx cleaning washwater discharge log’ and verify that the pH of discharged washwater measured at the overboard discharge is not less than 6
— inform the environmental officer and relevant crew members that the ‘Inventory of hazardous materials (IHM)’ must be maintained. In case of new installations, material declarations shall be requested from the supplier or manufacturer for hazardous materials contained in their products. When removing outdated equipment, the inventory shall be updated to reflect deletion of the hazards as applicable by updating part 1.

16.2.4 Fuel and lubrication oil systems:

— examine fuel oil samples and verify that samples as required are retained on board and labels duly completed or otherwise retained under the vessel's control
— verify function of high level alarms for fuel oil, lubrication oil and hydraulic oil tanks
— verify function of low level alarm for fuel overflow tank
— verify that all bunkering lines are fitted with a remotely operated closing valve.

16.2.5 Oily bilge water system, requirements applicable for Clean(Design):
— verify that all parts of the systems are fitted with labels or colour codes for identification
— verify that the bilge oil content alarm is set to 5 ppm
— verify that effluent with an oil content exceeding 5 ppm is returned to the oily bilge water tanks
— verify that drip trays and coamings of sufficient height are provided under all equipment where oil spill may occur.

16.2.6 Grey water system, requirements applicable for Clean(Design):
— verify that untreated grey water is not discharged
— verify function of high level alarms for grey water holding tanks.

16.2.7 Sewage system:
— verify that drains from the galley are fitted with grease traps.
Additional requirements for Clean(Design):
— verify function of high level alarms for sewage holding tanks.

16.2.8 Refrigeration systems for provision, centralized air conditioning and cargo refrigeration:
— verify function of refrigerant leak detection arrangement
— verify that recovery units and associated equipment to facilitate evacuation of system into existing liquid receivers or into suitable reservoirs are fitted.

16.2.9 Exhaust gas cleaning systems for SOx, requirement applicable for Clean(Design):
— verify that dedicated holding tanks with arrangement for delivering to shore facility are fitted on board for sludge or residue generated by treating wash water.

16.2.10 Cargo piping system for oil and chemicals tankers:
— verify that means to adequately support hoses in way of the vessel's side abreast of manifolds are fitted. The support shall preferably be arranged as a horizontal curved plate or pipe section.
Additional requirements for Clean(Design):
— verify that for the collection of oil spills during cargo operations, the tank deck area is fitted with a closed drainage system with discharge to a deck collecting tank or a slop tank. The drainage system may be arranged either with a manually operated valve, or with an automatic deck scupper drainage system.

16.3 Intermediate survey for class notation Clean
See [16.1.2].

16.4 Complete survey for class notation Clean
16.4.1 See [16.1.2]
16.4.2 For class notation Clean(Design), the survey requirements for recycling apply, see [35].
16.4.3 For class notations Clean, Clean(Design), the renewal survey requirements for garbage pollution prevention statement of compliance apply.
16.5 Complete survey for class notation **EP-D**

16.5.1 The following requirements apply for vessels with class notation **EP-D**:
- satisfactory verification of MARPOL convention requirements and certificates
- ballast water management plan has been checked and found in order
- valid anti-fouling certificate is available onboard
- ballast water treatment plant has been checked and found in order.

17 Tailshaft monitoring

17.1 General

17.1.1 The requirements in this sub-section apply to ships with class notation **TMON**, **TMON(Oil lubricated)**, **CM-PS**, **TMON(Closed loop water)** or **TMON(Open loop water)**.

17.1.2 A propeller shaft condition monitoring arrangement class notation **TMON(Oil lubricated)** for oil lubricated propeller shafts or **TMON(Closed loop water)** or **TMON(Open loop water)** for water lubricated propeller shafts may be granted in connection with a propeller shaft survey for shafts that are monitored to ascertain the condition of the propeller shaft system during operation, and that fulfils the design requirements of Pt.6 Ch.9 Sec.5 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.

Propeller connection surveys shall be carried out in accordance with survey intervals defined in Sec.1.

17.1.3 For oil lubricated propeller shafts on ships with more than 3 years since the last propeller shaft withdrawal shall normally carry out a propeller shaft survey as described in Sec.5 [2] in connection with the **TMON(Oil lubricated)** 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
- for vessels with alternative water in oil analysis performed by an accredited laboratory, results from 3 monthly analysis can be accepted
- 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 (see [17.3.1] d).

17.1.4 Lubricant quality for **TMON(Closed loop water)**

17.1.4.1 General
The lubricant quality shall be strictly maintained within pre-defined limits Pt.6 Ch.9 Sec.5 [2.2.1.1] at all times and tested and documented periodically Pt.6 Ch.9 Sec.5 [2.2.2.9].

17.1.4.2 Onboard weekly testing
The following parameters shall be tested, monitored and documented as a minimum;
- chloride content
— pH or an equivalent indication of degree of passivation of the medium
— anti freeze
— rate of make up water volume.
The lowest and highest values shall be recorded in the record file each month.

17.1.4.3 Quarterly shore analysis
— iron, copper and other relevant elements of the shaft material i.e. nickel, chromium as designed
— chloride content
— pH or an equivalent indication of degree of passivation of the medium.
If trending of parameters indicate deterioration of the integrity, passivation or shaft condition (corrosion), appropriate action shall be taken and documented.
In the event of unavoidable circumstances, eg. contaminated conditions, where the pre-defined limits are not expected to be complied with, this shall be immediately brought to the notice of DNV GL.

17.1.5 Onboard follow up
For closed and open loop water lubricated systems, respective onboard procedure as described in Pt.6 Ch.9 Sec 5 [2.2.1.9] and Pt.6 Ch.9 Sec 5 [2.2.1.10] shall be followed to document and trend the rate of bearing wear on a monthly basis. The bearing wear down measurement, rate of wear and the remaining operational time to reach the wear limits shall be recorded in the record file.
The procedure shall also include identification of prospective deterioration of bearing performance with subsequent remedial actions within a pre-defined safe operating margin before exceeding the wear limits or failure.
If monitoring indicates that the rate of wear or the deterioration in bearing performance requires immediate remedial actions, this shall be brought to the attention of DNV GL.

17.2 Initial survey

17.2.1 TMON(Oil lubricated)
All design documentation shall be approved and reviewed as applicable in Pt.6 Ch.9 Sec.5 Table 1 before the initial survey is carried out.
The survey in accordance with [17.1.2] or [17.1.3] where applicable 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
— verify the water in oil checking arrangement (water-in-oil test kit used by the crew or alternative solution with analysis performed by an accredited laboratory)
— confirmation that the record file is completed with relevant initial entries.

17.2.2 TMON(Closed loop water)
All design documentation shall be approved and reviewed as applicable in Pt.6 Ch.9 Sec.5 Table 2 before the initial survey is carried out.
The survey in accordance with [17.1.2] shall include:
a) a general inspection of shafting, piping and sealing arrangement
b) verification of alignment of the shafting in accordance with approved drawings
c) verification of correct installation of remote monitoring devices for lubricant system and test of alarms with respect to set points, see Pt.6 Ch.9 Sec.5 Table 5
— lubricant low flow
— lubricant low pressure
— lubricant high temperature at inlet
— differential temperature across bearings
— function testing and initial setting for remote wear down sensor with evidence of type or case by case approval and calibration
— lubricant header tank low/high level
— differential pressure alarm in filters (where applicable)
— salinometer
— automatic start of st/by lubricant supply pumps upon detection of low flow

d) verification that the lubricant sampling point is identified with a signboard
e) verification that a written procedure for taking representative lubricant samples is present onboard
f) verification that shaft grounding device is fitted on the propulsion shafting
g) verify the water testing arrangement onboard (availability of testing programme and chemicals)
h) verify that lubricant systems in multi-shaft installations are isolated
i) confirmation that the record file is completed with relevant initial entries.

17.2.3 TMON(Open loop water)
All design documentation shall be approved and reviewed as applicable in Pt.6 Ch.9 Sec.5 Table 3 before the initial survey is carried out.
The survey in accordance with [17.1.2] shall include:
a) general survey of shafting, piping and sealing arrangement
b) verification of alignment of the shaft in accordance with approved drawings
c) verification of correct installation of remote monitoring devices for lubricant system and test of alarms with respect to set points Pt.6 Ch.9 Sec.5 Table 6
   — lubricant low flow at inlet
   — lubricant low pressure at inlet
   — lubricant high temperature at inlet
   — function testing and initial setting for wear down sensor with evidence of type or case-by-case approval and calibration
   — automatic start of st/by lubricant supply pumps upon detection of low flow of lubricant
d) verification that shaft grounding device is fitted on the propulsion shafting
e) confirmation that the Record file is completed with relevant initial entries.

17.3 Annual survey

17.3.1 TMON, TMON(Oil lubricated) and CM-PS
The survey shall include:
a) examination of the 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 (see [17.3.1] 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 record file on the overhaul page
— verify functionality of propeller shaft grounding device, where applicable
— verification that wear down measurements have been taken at every dry-docking

b) testing of stern tube aft bearing temperature 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, natrium or chloride 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.

17.3.2 TMON(Closed loop water)
The survey shall include:

a) examination of the record file and documentation:
   — verification that the aft stern tube bearing wear down measurements have been recorded every month (1000 hour interval maximum) with respective wear rate calculations and remaining operational time to reach wear limit
   — verification of documentation of satisfactory testing and results of weekly onboard water analysis test results for chlorides, pH, antifreeze and consumption of lubricant, see Pt.6 Ch.9 Sec.5 [1.4]
   — verification that record file has been maintained by the chief engineer by recording the monthly lubricant make up, high/low values of chlorides and pH results obtained from weekly onboard lubricant tests
   — if there are performed any overhauls, complete lubricant changes or similar, this shall be recorded in the record file on the overhaul page
   — verification that manual wear down measurements have been taken and recorded at every dry-docking

b) testing of alarm and automation functions covering the below;
   — lubricant low flow
   — lubricant low pressure
   — automatic start of stand-by lubricant supply pumps upon detection of low flow of lubricant
   — lubricant high temperature at inlet
   — differential lubricant temperature across aft stern tube bearing
   — initial setting for wear down gauge and evidence of calibration
   — lubricant header tank low/high level
   — differential pressure alarm in filters (where applicable)
   — salinometer
   — remote wear down monitoring sensor function

c) visual inspection of inboard shaft seal for leakage, as far as practicable and outboard seals when vessel is in dry dock

d) verification that documentation of laboratory analysis of the lubricant is kept on board:
   — at least four lubricant samples per year shall be submitted to an accredited laboratory for analysis testing of iron, chromium, copper, chloride and pH (degree of passivation)
e) verify:
   — functionality of propeller shaft grounding device
   — the manual wear down measurements and remote wear monitoring readings are the same
   — evidence that lubricant flow has been maintained during all operating conditions including stopped conditions of the shaft
   — that the lubricant filtering units are in satisfactory condition.

17.3.3 **TMON (Open loop water)**
The survey shall include:

a) examination of the record file and documentation:
   — verification that the aft stern tube bearing wear down measurements have been recorded every month (1000 hour interval maximum) with respective wear rate calculations and remaining operational time to reach the wear limit
   — if there are performed any overhauls or similar, this shall be recorded in the record file on the overhaul page
   — verification that manual wear down measurements have been taken and recorded at every dry-docking

b) testing of alarm and automation covering the below;
   — lubricant low flow
   — lubricant low pressure
   — automatic start of st/by lubricant supply pumps upon detection of low flow of lubricant
   — lubricant high temperature at inlet
   — remote wear down monitoring sensor function

c) visual inspection of inboard shaft seal for leakage, as far as practicable

d) verify:
   — functionality of propeller shaft grounding device
   — the manual wear down measurements and remote wear monitoring readings are the same
   — evidence that lubricant flow has been maintained during all operating conditions including stopped conditions of the shaft
   — that the lubricant filtering units are in satisfactory condition

e) When the vessel is in the dry dock, inspection using alternative means of ascertaining the condition of the shaft, coating, bearing and liners as applicable shall be carried out in accordance with approved procedures, see Pt.6 Ch.9 Sec.5 [2.3.1.2]

   **Guidance note:**
   Alternative means of inspection in the drydock is required only for corrosion resistant steel shafts with PREN less than 34, shafts installed with approved corrosion protection involving a combination of coating and liners and shafts installed with approved corrosion protection using liners not fabricated as one continuous unit.

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   **Guidance note:**
   PREN stands for pitting resistance equivalent number and is a measurement of the corrosion resistance of various types of stainless steel.

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f) If bottom survey is carried out in water, external inspection of accessible parts of the propeller shaft shall be carried out by using remote means with specific attention on the condition of the coating, where applicable.
Guidance note:
This applies for installations with external propeller shaft bearings with parts of tail shaft exposed to sea, e.g. A-brackets and struts etc.

---end-of-guidance-note---

18 Fuel treatment and condition systems

18.1 General

18.1.1 The requirements in this sub-section apply to ships with class notation: FUEL

18.2 Annual survey

18.2.1 General examination of fuel oil separation system with focus on unapproved modifications and cleanliness.

18.2.2 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).

18.2.3 Satisfactory operation of fuel oil separators shall be verified.

18.3 Complete survey (5 years)

18.3.1 Complete overhaul of fuel oil separators shall be carried out.

19 Loading computer systems

19.1 General

19.1.1 The requirements in this sub-section apply to ships with class notation: LCS

19.2 Annual survey

19.2.1 It shall be checked that the approved in-service test programme for all sensors has been followed.
20 Arrangements for carriage of refrigerated containers

20.1 General

20.1.1 The requirements in this sub-section apply to ships with class notation:
RC and RCP x/y.

20.2 Complete survey (5 years)

20.2.1 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.

21 Vibration class

21.1 General

21.1.1 The requirements in this sub-section apply to ships with class notation:
VIBR

21.1.2 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.

21.2 Complete survey (5 years)

21.2.1 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.

22 Ballast water management

22.1 General

22.1.1 The requirements in this sub-section apply to 1A, 1A1 and 100A5 which are to comply with the BWM Convention (2004).

22.1.2 This sub-section provides survey requirements for vessels with ballast water management using exchange methods (class notation qualifier X), see [22.2] to [22.4] or treatment systems, see [22.5] to [22.7]. Other methods acceptable by the BWM Convention are not covered.
22.2 Annual survey - exchange methods

22.2.1 The following documentation shall be checked onboard during the survey:
— approved ballast water management plan
— ballast water record book stating type of exchange (sequential, flow-through, dilution).

22.2.2 The sediment management arrangement and control of all valves and each pump required for ballast water exchange shall be examined and verified.

22.2.3 The function of control system used for dilution method shall be verified, if applicable.

22.3 Intermediate survey - exchange method

22.3.1 Verify that sampling points are accessible.

22.3.2 Verify that the central ballast control station is equipped with tank level indicating system, valve position indicating system, draught indicating system and communication to local control station.

22.4 Complete survey - exchange method - 5 years

22.4.1 Verify that local control is provided at each pump operated during ballast water exchange.

22.4.2 Verify that manually operated independent means of control of all valves required for ballast water exchange is provided

22.4.3 Verify that sampling facilities are arranged to collect representative samples of the ballast water from the ballast water management system intakes, before the ballast discharge point and any other points necessary for sampling.

22.4.4 Examine and verify function of control, monitoring and communication systems on the ballast control station, including:
— tank level indicating system
— valve position indicating system
— draught indicating system and
— communication to local control station.

22.5 Annual survey - treatment system

22.5.1 These survey requirements are applicable for vessels equipped with ballast water treatment systems with the purpose of complying with regulation D-2 in the International Convention for the Control and Management of Ship’s Ballast Water and Sediments adopted by IMO 13 February 2004.

22.5.2 Documentation
The following shall be verified onboard and in practical use:
 a) approved ballast water management plan
 b) ballast water record book
 c) type approval certificate for treatment system
 d) calibration procedures and certificates for sensors on the treatment system
 e) equipment manuals for major components on the treatment system
f) maintenance log for treatment system

22.5.3 For the treatment system environment, the following shall be examined: ventilation, sensors, firefighting and sediments as well as stripping arrangement and separate compartment, if applicable.

22.5.4 Treatment system shall be inspected for safety arrangements and emergency procedures.

22.6 Intermediate survey - treatment system

22.6.1 The operation of sensors and transmitters, bypass operation and alarm system shall be verified on the treatment system control and monitoring system.

22.6.2 Electrolysis
For treatment systems using electrolysis, the hydrogen evacuation system and the shutdown function with regards to low flow, high pressure or high temperature, if applicable, shall be verified.

22.6.3 UV-light
For treatment systems using ultraviolet (UV), the operation parameters shall be verified in accordance with type approval certificate (i.e. flow regulating valve, temperature sensor and UV intensity sensor).

22.6.4 Filter
For treatment systems using filter, the back-flushing operation shall be verified and the filter shall be examined for corrosion.

22.6.5 Cavitation
For treatment systems using cavitation, the correct pressure and flow shall be verified in accordance with type approval certificate.

22.6.6 Ozone
For treatment systems using ozone, safety arrangements and emergency procedures in case of leakage shall be verified as well as verification of function by sensors for ozone dosage and total residual oxidants (TRO) level.

22.6.7 Chemical injection or neutralization tank
For treatment systems using chemical injection and/or neutralization tank, safety and emergency procedures, venting and material used in contact with chemicals and flow meters shall be verified or examined.

22.6.8 De-oxygenation
For treatment systems using de-oxygenation, the inert gas system or nitrogen system installation shall be verified. Safety procedures and low oxygen alarms shall be verified.

22.6.9 Pressure drop
For treatment systems using pressure drop, correct pressure shall be verified to operate within the criteria specified in the type approval certificate.

22.7 Complete survey - treatment system - (5 years)

22.7.1 The ballast water sampling points shall be examined and performance of sediment removal according to BWM plan shall be verified.

22.7.2 The control and monitoring equipment shall operate correctly including audible or visual alarms and bypass operation.
22.7.3 For treatment systems using active substances, coating in tanks, pipes and valves in contact with active substance shall be examined. Dosage instruction shall be examined and that sufficient active substance is provided.

23 Alternative propulsion

23.1 Application

23.1.1 The requirements in this sub-section apply to ships with class notations: AP or EP.

23.2 Complete survey (2.5 years)

23.2.1 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.

23.2.2 Starting-up of the alternative propulsion system shall be demonstrated when simulating failure which makes the main propulsion inoperable.

23.2.3 For class notation qualifiers 2 and 3: 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.

23.2.4 For class notation qualifiers 2 and 3: The FMEA report and FMEA test program shall be verified to ensure that they have been updated when alterations have been done.

24 Winterized vessels

24.1 General

24.1.1 The requirements in this sub-section apply to ships with class notation: Winterized.

24.2 Annual survey

24.2.1 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.

24.2.2 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.
24.2.3 Thermal protection suits including face masks, gloves and boots in sufficient number for all crew members to be verified on board.

24.2.4 For vessels with class notation qualifiers **Cold, Arctic** or **Polar**, the ice search light on wheelhouse top shall be tested.

**25 Periodically unattended machinery spaces and machinery centrally operated**

25.1 General

25.1.1 The requirements in this sub-section apply to ships with class notations: **E0**, **AUT**, **AUT-nh** or **ECO**, **AUT-Z**.

**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, see [25.3].

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25.2 Annual survey

25.2.1 The surveyor shall require checks of alarms and safety functions, as deemed necessary. If the onboard records from periodical test are adequate and according to a maintenance plan, the surveyor may reduce the extent of testing.

25.2.2 Testing of instruments, referring to [25.2.1], 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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25.2.3 The extension alarm - and watch responsibility system shall be verified through spot checks. Duty instructions of how to change between attended and 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**, **AUT** and **AUT-nh** only.

25.2.4 Fire detection and alarming in case of fire in the unattended machinery spaces shall be verified through check/simulation and activation of fire detectors.

25.2.5 Remote start of the main fire pump shall be tested, if provided.
25.3 Complete survey

25.3.1 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.

---end---of---guidance---note---

26 Boiler monitoring

26.1 General

26.1.1 The requirements in this sub-section apply to ships with class notation BMON.

— The notation gives requirements in addition to main class requirements, to allow the inspection of the water/steam side of the boiler to be carried out and documented by the chief engineer at alternate surveys, i.e. the first boiler survey in a class period. The documentation shall be presented to the attending surveyor who shall carry out the remaining scope of the boiler survey.

26.2 Annual survey

26.2.1 In addition to the requirements in the main class annual survey, see Sec.2 [3], the survey shall include:

— review of scheduled jobs conducted, in the maintenance system
— review of the BMON record file
— verification of satisfactory function of warning devices for detecting seawater/oil contamination
— verification of the chief engineer’s formal qualifications.

Guidance note:
Chief engineer’s formal qualifications, see IMO Res. A.741(18) ISM Code, 1995 STCW Section A-III/1 as amended.

---end---of---guidance---note---

26.3 First boiler survey in the class period

26.3.1 The internal survey on the water-steam side may be accepted carried out by the chief engineer provided:

a) BMON annual surveys have been carried out satisfactory.

b) The chief engineer’s internal inspection of the water/steam side has been carried out prior to the attendance of the surveyor, no earlier than the voyage-, or maximum 45 days before the attendance of the surveyor. The inspection of the boiler shall be recorded in the vessel’s official log book.
c) Proper documentation is presented to the attending surveyor, regarding the satisfactory condition of the water-steam side. Good quality photographs/video marked with date and time may be considered as part of the documentation.

d) Documentation is presented to the attending surveyor regarding opened up/overhaul of selected armatures, valves and ancillaries to the boiler. Good quality photographs/video marked with date and time may be considered as part of the documentation.

e) A statement signed by the chief engineer that the internal water-steam side has been satisfactory examined, and that damages, scales or sludge have not been observed.

f) 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.

g) Chief engineer’s formal qualifications are satisfactorily verified by the attending surveyor.

Guidance note:
Chief engineer’s formal qualifications, see IMO Res. 741(18) ISM Code, 1995 STCW Section A-III/1 as amended.

26.3.2 The concluding scope of the boiler survey shall be conducted by the attending surveyor, including an internal visual examination of the fire side to the extent deemed necessary by the surveyor. The safety valve setting and control, monitoring and safety systems shall be tested in the presence of a surveyor.

26.4 Second boiler survey in the class period, in conjunction with main class renewal survey

26.4.1 The survey shall be performed according to boiler survey as described in rules Sec.5 [6].

26.5 Retention of the class notation BMON

26.5.1 It is expected that the boiler(s) is maintained in the same condition as observed and documented when BMON was assigned.

27 Naval vessels

27.1 General

27.1.1 The requirements in this sub-section apply to ships with class notation: Naval or Naval support.

27.2 Annual survey

27.2.1 For ships with class notation Naval and Naval support(System), the survey shall include examination of marking of cables.

27.2.2 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.

27.2.3 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.

27.2.4 For ships with class notation Naval and Naval support(RADHAZ), the following documentation shall be available onboard:
— up to date RADHAZ control document.

27.2.5 For ships with class notation Naval and Naval support(RADHAZ), the following protection measures shall be examined or tested as applicable:
— physical controls (interlocks, fences and locks)
— administrative controls (signs, operational procedures and training).

27.2.6 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).

27.2.7 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.

27.3 Complete survey (5 years)

27.3.1 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.

27.3.2 The following shall be examined and tested as applicable for ships with class notation Naval and Naval support(System):
— 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.
27.3.3 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.

27.3.4 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.

28 NAUTICUS(Operation)

28.1 General

28.1.1 The requirements in this sub-section apply to ships with class notation NAUTICUS(Operation).

28.1.2 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.

28.1.3 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.

28.2 Assignment of the class notation

28.2.1 Ships that have the Nauticus 3D graphic model and the Nauticus ship maintenance toolbox may be given the class notation NAUTICUS(Operation).

28.2.2 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.

28.2.3 It is the responsibility of the Society to develop and maintain the Nauticus ship maintenance toolbox computer program.

28.2.4 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 General Regulations.

28.3 Retention of the class notation

28.3.1 Unless otherwise agreed between the involved parties, the notation NAUTICUS(Operation) is maintained upon change of ownership of a ship.
29 Special purpose ships

29.1 General

29.1.1 The requirements in this sub-section apply to ships with class notation SPS.

29.1.2 Survey requirements for installed equipment, systems and features which are generally covered by classification, are included in the main class surveys.

29.1.3 Annual, intermediate and complete surveys shall be performed as for the annual, periodical and renewal surveys for the special purpose ship safety certificate.

30 Easy cleaning and easy loading

30.1 General

30.1.1 The requirements in this sub-section apply to ships with class notation: EC or EL.

30.2 Annual survey - class notation EC

30.2.1 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.

30.3 Annual survey - class notation EL

30.3.1 The following documentation shall be available onboard:
— documentation of each steps in the loading sequences and corresponding de-ballasting operation.

30.3.2 It shall be verified that the remote tank sounding and draught reading system is maintained and calibrated as recommended by the manufacturers.

31 Nuclear, biological and chemical protection

31.1 General

31.1.1 The requirements apply for ships with the additional class notations: NBC.
The complete survey applies for class notation 2.

31.1.2 The NBC systems are subjected to periodical surveys to ascertain that the condition of the shelter and/or citadel is in order.
31.2 Annual survey

31.2.1 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.).

31.2.2 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.

31.2.3 The survey shall include examination of gas tight zones and divisions.

31.3 Complete survey (5 years)

31.3.1 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).

32 Silent

32.1 General

32.1.1 The requirements in this sub-section apply to vessels with class notation: Silent

32.2 Complete renewal survey (5 years)

32.2.1 Investigate if any modifications which may influence noise radiation, e.g. any modifications to the propeller(s), main machinery or underwater hull have been performed since last survey.

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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32.2.2 The scope of the renewal survey is equivalent to the initial Silent - class notation measurement survey.
33 Enhanced system verification

33.1 General

33.1.1 The requirements in this sub-section apply to ships with class notation: ESV - enhanced system verification.

33.2 Hardware-in-the-loop

33.2.1 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 hardware-in-the-loop (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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33.3 Annual survey

33.3.1 The annual survey shall be based on:

— the ESV test notation document (see HIL test notation document)
— the target system hardware and software version numbers
— change handling documentation for the ESV target system.

33.3.2 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.

33.3.3 In the case of changes in the ESV test notation document, the differences shall be explained by means of change handling documentation.

33.3.4 In the case that major alterations are identified, the Society will require verification of the alterations according to Sec.5 [7.2.2].

33.3.5 In the case that no major alterations are identified, the survey can be credited, and the notation can be continued.
33.3.6 The ESV notation document shall be updated, filed onboard, and in addition submitted to the Society.

33.4 Complete survey (5 years)

33.4.1 The complete survey requires testing by use of an HIL-test simulator.

33.4.2 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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33.4.3 The ESV notation document shall be updated, filed onboard, and in addition submitted to the Society.

34 Towing and anchor handling equipment

34.1 General

34.1.1 The requirements in this sub-section apply to ships with class notations:

- **Tug**
- **Offshore service vessels** with class notation qualifiers **TOW, Towing, AH, Anchor handling** or **AHTS**

34.2 Annual survey

34.2.1 Winch and other equipment for towing and anchor handling 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.

34.3 Renewal survey

As a minimum the equipment shall be tested and surveyed as follows:

- All equipment for towing and anchor handling including towing hooks, winches, towing guide pins and shark jaws shall be thoroughly inspected.
- Inspections shall include foundations. NDE may be required as deemed necessary by the surveyor.
- All safety functions including emergency load releases of the equipment shall be tested.
- Function of equipment intended to be used without power supply shall be verified.
- Load test of the equipment, including emergency release under load shall be done taking manufacturers recommendations with respect to test load into account.
35 Recycling

35.1 General

35.1.1 The requirements in this sub-section apply to vessels with class notation: Recyclable.

35.1.2 The objective of the surveys is to verify that the inventory of hazardous materials (IHM) required by the Hong Kong Convention for the Safe and Environmentally Sound Recycling of Ships, 2009, Reg.5 complies with the requirements of the Convention. For the initial, complete and additional surveys, only Part I of the IHM is relevant. For the final survey, Parts I, II and III are relevant.

35.2 Initial survey

35.2.1 Verify that documentation is available on board:
- an approved copy of IHM Part I
- hazardous materials location plan
- visual sampling check plan (VSCP)
- IHM maintenance manual.

Verify that the crew is aware of the maintenance requirements for the IHM, and that pending comments to the IHM can be closed. Verify the accuracy of the hazardous material location plan.

Locate selected sampling points for hazardous materials, as described in the documents specified in [35.2.1].

35.2.2 Examine components potentially containing asbestos or polychlorinated biphenyls (PCB).

35.2.3 Verify that the type and quantity of ozone depleting substances (ODS) and anti-fouling compounds on board comply with IHM Part I.

35.3 Complete survey

35.3.1 Investigate the on board process to control the IHM Part I, and verify that it has been maintained.

35.3.2 Investigate if any component potentially containing hazardous materials listed in IHM Part I has been deleted and if so, inquire the reasons.

35.3.3 Verify the accuracy of the amounts and locations of hazardous materials listed in IHM Part I.

35.3.4 Verify that changes to the IHM Part I are reflected in the hazardous materials location plan.

35.3.5 Verify that prohibited or restricted materials, i.e. asbestos, PCB, ODS and anti-fouling compounds, have not been installed as part of new components on board.

35.4 Additional survey

35.4.1 Upon significant repairs or changes to the vessel or its equipment, the owner may request an additional survey to be performed. The survey requirements shall be as for the complete survey, adapted to changes on board.
35.5 Final survey

35.5.1 A final survey shall be carried out prior to entering the recycling facility.

35.5.2 Verify that IHM Part I has been maintained during operation.

35.5.3 Examine the ship recycling plan (SRP).

35.5.4 Verify that the vessel has plans to minimize the amount of cargo residues, remaining fuel oil and wastes prior to entering the recycling facility.

35.5.5 Verify that prohibited or restricted materials, i.e. asbestos, PCB, ODS and anti-fouling compounds, have not been installed as part of new components on board.

35.5.6 Verify that the content of IHM Part II Operationally generated wastes and Part III Stores complies with the situation on board.

36 Regasification plants

36.1 General

36.1.1 The requirements in this sub-section apply to ships with class notation REGAS.

36.2 Annual survey

36.2.1 The regasification plant and utility safety systems shall be examined during operation. A review of the maintenance manual or test log shall be carried out. If found necessary by the surveyor correct function shall be tested.

36.3 Complete survey (5 years)

36.3.1 Storage tanks for propane, if fitted, shall be inspected internally. On highly stressed parts, non-destructive testing may be required if considered necessary by the surveyor, alternatively the tanks shall be hydrostatically, hydro pneumatically or otherwise pressure tested to their MARVS (maximum allowable relief valve setting).

36.3.2 All pressure relief valves shall be opened for survey, adjusted, function tested and sealed.

36.3.3 Sea water cooled heat exchangers shall be opened for inspection.

36.3.4 Alarms, PSD and ESD shall be tested.

36.3.5 The emergency blow-down and disconnecting of the transfer hose, if applicable, shall be tested.

36.3.6 Spot checking by NDT of the high pressure piping shall be carried out.

36.3.7 Sea water heated vaporisers shall be opened for internal inspection and hydraulically tested to 1.25 times its maximum working pressure after reassembly.
36.3.8 For permanently moored regasification vessels with continuously operation special tailor-made survey programmes may be agreed upon.

37 Ships built for in-water survey of the ship's bottom and related items

37.1 General

37.1.1 The requirements in this sub-section apply to ships with class notation **BIS** and **IW**.

37.2 Bottom survey

37.2.1 The following documents shall be present:
— arrangement plan of openings in sides and bottom below the deepest load waterline, bottom plugs, echo sounders and other underwater equipment
— arrangement plan of markings for identification of tanks on sides and bottom
— procedure for measurement of bearing clearances
— arrangement plan of the impressed current system (if applicable).

37.2.2 At the time of drydocking, the painting of markings required for the class notation **BIS** and **IW** shall be checked and confirmed in order.
SECTION 7 ALTERNATIVE SURVEY ARRANGEMENTS

1 General

1.1 General overview of survey arrangements

1.1.1 Alternative survey arrangements may be accepted as an option to applicable periodical surveys for main class.

1.1.2 The following survey arrangements may be granted upon written request from the owner:
   — hull continuous, see [2.1]
   — Hull PMS (planned maintenance system), see [2.2]
   — machinery continuous, see [3.1]
   — machinery PMS (planned maintenance system), see [3.2]
   — machinery CM (condition monitoring), a survey arrangement that is based on machinery PMS, but allows for use of condition based maintenance methods on selected parts of the machinery, see [3.3].

1.1.3 Reference is made to owner’s obligation for retention of class, see Pt.1 Ch.1.

2 Hull survey arrangements

2.1 Hull continuous

2.1.1 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 [2]

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.

2.1.2 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 [1]).

2.1.3 The bottom survey in dry dock or on a slipway in accordance with Sec.5 [1] 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 [2] shall normally be carried out during the bottom survey in dry-dock.
The survey planning meeting as specified in Sec.1 [2.1] shall be held prior to commencement of the renewal survey and the bottom survey in dry-dock.

2.2 Hull planned maintenance system

2.2.1 Hull planned maintenance system (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.

2.2.2 Hull PMS is applicable for ships with survey arrangement hull continuous.

2.2.3 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.

2.2.4 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 after internal inspection of spaces randomly selected by attending surveyor.

2.2.5 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.
3 Machinery survey arrangements

3.1 Machinery continuous

3.1.1 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 should 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.

3.1.2 A follow-up system covering the Society’s machinery list in accordance with Sec.4 Table 26 shall be established on board the ship.

3.1.3 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:
See IMO Res. 741 (18) ISM Code, 1995 STCW Section A-III/1 as amended.

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 cannot 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.

3.1.4 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.

3.2 Machinery planned maintenance system requirements

3.2.1 General requirements:

a) Machinery planned maintenance system (MPMS) is a survey arrangement based on audits of an approved and implemented planned maintenance system onboard which shall cover all class relevant component surveys related to machinery as listed in Sec.4 Table 26.

b) The audits shall be in conjunction with the main class annual survey, see Sec.2 [1.2].

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.
Survey requirements for fleet in service

3.2.2 The survey arrangement MPMS shall be operated under the following conditions:

a) The software is subject to approval by the Society, either a type approved software or case-by-case approved software.

b) Change or a major upgrade of the 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.

---end---of---guidance---note---

c) Based on satisfactory audit, the surveyor may credit the survey, with the exemption of the following, which shall be surveyed before crediting:

- main boiler steam piping
- main boiler feed water piping
- steam turbines for propulsion and power generation
- reduction gears in steam driven propulsion plants.

d) The surveyor can, if found necessary, require a re-survey of items reported by the chief engineer.

3.2.3 The planned maintenance system onboard shall comply with the following requirements:

a) The software shall be computer based.

b) The software shall include at least the applicable machinery and equipment listed in Sec.4 Table 26. All these components shall be identified as class items in the software.

c) The software shall be able to produce a maintenance history report of maintenance carried out for a specific time period on class items.

d) It shall be possible to identify and trace corrective maintenance in the software. All damage/break-downs on class related machinery items shall be reported to class.

e) For ships with class notation E0, AUT or ECO, the software shall include the periodical testing of control, alarm and safety components and systems required by relevant rules. These jobs shall be especially identified in the software and include test routines and set-points based on relevant rules.

f) Changes to the software (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.

---end---of---guidance---note---

g) The job descriptions 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-explanatory. When references to maker's manuals are made, these shall be ready available onboard.

h) The job descriptions and maintenance history shall be in English.

i) Back up of the PMS database, making it possible to restore all data, shall be taken at least once a week.
3.2.4 An initial survey shall be carried out onboard the vessel in order to verify that the software has been implemented correctly and is used as intended. It is recommended that the software 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 maintenance software and is able to demonstrate the different functions in the system to the attending surveyor.

b) The general condition and maintenance of the machinery and the machinery systems is good.

c) All the requirements in [3.2.3] except f) are complied with.

Provided the initial survey is carried out with a satisfactory result, the survey arrangement MPMS will be granted and a certificate will be issued stating software name and conditions for the survey arrangement for the specific vessel.

3.2.5 An annual survey shall be carried out onboard the vessel in order to verify that the conditions for maintaining the survey arrangement MPMS are complied with. During the annual survey the following will be verified:

a) The vessel's MPMS 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 software to the attending surveyor.

c) All maintenance on class machinery is carried out according to the maintenance plan.

d) That reported and carried out maintenance is done satisfactorily. This includes an in depth examination of reported maintenance, to the extent deemed necessary by the attending surveyor.

e) Reasons for overdue/ postponed (deferred) jobs shall be explained.

f) Documented changes to the software (maintenance intervals, job descriptions, etc.) shall be presented to the attending surveyor for acceptance.

g) The general condition and maintenance of the machinery and the machinery systems is good.

Provided the annual survey is carried out with a satisfactory result, the survey will be credited.

3.3 Machinery condition monitoring

3.3.1 Machinery condition monitoring (MCM) is a survey arrangement based on audits of an approved and implemented condition based maintenance programme on board. MCM allows the manager to adjust maintenance intervals based on condition monitoring of applicable components on board the ships.

The audits shall be part of the main class annual survey, see Sec.2 [1.2].

See also class guideline DNVGL-CG-0052 for further details of requirements in [3.3.2] to [3.3.4].

3.3.2 The following conditions apply:

— the extent of condition based maintenance is based on the management's own choice
— approved MPMS survey arrangement shall be implemented
— condition based maintenance strategy shall be successfully implemented on board
— condition monitoring shall be an integral part of the planned maintenance system.
3.3.3 Monitoring methods
The approval is based on a documentation review and an initial survey.
For documentation review the following shall be submitted and accepted prior to initial survey:
— documentation outlining the management’s condition based maintenance strategy and responsible personnel (applicable training plans to be included)
— equipment to be monitored (description and schematic sketches with clearly marked measuring points)
  Monitoring technique(s) to be used (detailed description containing technical specifications of monitoring equipment and method(s), see class guideline DNVGL-CG-0052 for further requirements)
— relevant monitoring parameters (e.g. baseline data, frequency ranges, predefined alarm levels, particle count and size, wear limits, measurement intervals, etc.).
Condition based related measurements and analyses shall be carried out by qualified personnel.
Analysis of CM related data shall be carried out by service supplier approved either according to the DNV type approval programme 416 (AoSS) or on a case-by-case basis (see class guideline DNVGL-CG-0052 for further information).

3.3.4 An initial survey shall be carried out on board 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 survey arrangement machinery CM will be granted and a certificate will be issued stating conditions of the survey arrangement for the specific vessel.

3.3.5 An annual survey shall be carried out on board in order to verify that the conditions for maintaining the survey arrangement machinery CM are complied with. Provided the annual survey is carried out with a satisfactory result, the survey will be credited.

3.3.6 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.

3.3.7 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 MPMS survey arrangement.
SECTION 8 SURVEYS PERFORMED BY APPROVED COMPANIES

1 Surveys by approved companies or service suppliers

1.1 Thickness measurements

1.1.1 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.

1.1.2 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.

1.1.3 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.

1.2 Examination of bow, side and stern doors on roll on/roll off ships.

1.2.1 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.

1.2.2 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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1.2.3 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 DNVGL-CP-0484 App.A [8] and IACS UR Z22.

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1.2.4 Upon satisfactory review of the inspection report, the extent of annual surveys may be limited at the discretion of the surveyor.

1.3 Bottom survey afloat

1.3.1 An approved diving company shall be used for the underwater inspection.

1.3.2 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.

1.3.3 Detailed requirements are given in Sec.5 [1.5].
Main changes July 2016, entering into force 1 January 2017

- Sec.1 General requirements
  - Sec.1 Table 2: Conjunction with main class survey set N/A for annual and complete survey for notations; Crane, DP, DPS and DYNPOS.
  - Sec.1 [2.2.5]: Added alternative for structure other than steel to comply with rev.23 of IACS UR Z7.

- Sec.2 Annual surveys extent - main class
  - Sec.2 [1.2.3]: Reference to OMM added.
  - Sec.2 [3.1.21]: CHEM notation, transportation of toxic chemicals for offshore service vessels, has been introduced as a new notation covered by main class surveys.

- Sec.3 Intermediate surveys extent - main class
  - Sec.3 [2.1.10]: Table references updated.
  - Sec.3 [2.2]: Heading title updated for clarification.
  - Sec.3 [2.2.3] f) and g): Table references updated.
  - Sec.3 [2.3.3] f) and g): Table references updated.
  - Sec.3 [2.4.2]: Table references updated.
  - Sec.3 [3.4]: CHEM notation, transportation of toxic chemicals for offshore service vessels, has been introduced as a new notation covered by main class surveys.

- Sec.4 Renewal surveys extent - main class
  - Sec.4 [3.1.10]: CHEM notation, transportation of toxic chemicals for offshore service vessels, has been introduced as a new notation covered by main class surveys.
  - Sec.4 Table 9: Heading title updated for clarification.
  - Sec.4 Table 10: Heading title updated for clarification.
  - Sec.4 Table 14: Table updated to be in compliance with IACS UR Z10.5.

- Sec.5 Miscellaneous main class surveys
  - Sec.5 [1.1.2]: Clarification of survey requirements for box coolers.
  - Sec.5 [1.6.3]: Alternative solution added as guidance note.
  - Sec.5 [2.1.2]: Requirement for historic records of aft propeller shaft bearing temperature is dispensed with for shafts not requiring monitoring of temperature in main class.
  - Sec.5 [2.1.3]: Requirement for historic records of aft propeller shaft bearing temperature is dispensed with for shafts not requiring monitoring of temperature in main class.
  - Sec.5 [2.1.4]: Reference to keyed propeller connection survey removed.

- Sec.6 Optional class notation surveys
— Sec.6 [14.2]: Requirements for HMON-notation updated.
— Sec.6 [17]: New qualifier TMON (oil lubricated) introduced.
— Sec.6 [17.3.3] f): Inspection scope of exposed part of the shaft and coating during in-water bottom surveys clarified.

**January 2016 edition**

This document supersedes October 2015 edition.

**Main changes January 2016, entering into force as from date of publication**

- Sec.4 Renewal surveys extent - main class
  - [5.1.2]: Deletion of erroneously introduced requirement for system testing of machinery systems.

- Sec.6 Optional class notation surveys
  - [17]: Introducing survey requirements for two new qualifiers for TMON. (open loop water) and (closed loop water).

- Sec.7 Alternative survey arrangements
  - [3.2.3]: Replaced "system" with "software" for clarification
  - [3.2.4]:
    - (old) subsection has been deleted. The approval process for MPMS has been simplified, and the requirement for management approval has been lifted
    - changes to reflect lifting of requirement for management approval
    - the requirement for the chief engineer to hold a valid STCW certificate has been removed, as this is considered covered in other surveys
  - [3.2.5]: the requirement for the chief engineer to hold a valid STCW certificate has been removed, as this is considered covered in other surveys

**October 2015 edition**

This is a new document.
The rules enter into force 1 January 2016.
Driven by our purpose of safeguarding life, property and the environment, DNV GL enables organizations to advance the safety and sustainability of their business. We provide classification and technical assurance along with software and independent expert advisory services to the maritime, oil and gas, and energy industries. We also provide certification services to customers across a wide range of industries. Operating in more than 100 countries, our 16 000 professionals are dedicated to helping our customers make the world safer, smarter and greener.