

**PART I CLASS - MANAGEMENT**

**TITLE 02 CLASS - MAINTENANCE**

**SECTION 2 SCOPE OF SURVEYS**

**CHAPTERS**

- A SCOPE - CONDITIONS FOR SURVEY
- B PROCEDURES AND SCOPE OF SURVEYS FOR VESSELS WITH GT < 500
- C PROCEDURES AND SCOPE OF SURVEYS FOR VESSELS WITH GT  $\geq$  500
- D PROCEDURES AND SCOPE OF SURVEYS FOR GENERAL CARGO VESSELS WITH GT  $\geq$  500
- E ADDITIONAL REQUIREMENTS FOR HULL SURVEYS OF SINGLE AND DOUBLE SKIN BULK CARRIERS OF AB  $\geq$  500
- F ADDITIONAL REQUIREMENTS FOR HULL AND CARGO MACHINERY SURVEYS OF SINGLE SKIN AND DOUBLE SKIN OIL TANKERS OF AB  $\geq$  500 IACS UR Z10.1 e UR Z10.4 FOR HULL SURVEYS
- G ADDITIONAL REQUIREMENTS FOR HULL AND MACHINERY SURVEYS OF CHEMICAL TANKERS
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## CHAPTER A APPLICATION AND CONTITIONS FOR SURVEY

### CHAPTER CONTENTS

#### A1. GENERAL

- A2. PREPARATION FOR SURVEY - VESSELS NOT SUBJECT TO ESP PROGRAMS
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- A5. THICKNESS MEASUREMENT
- A6. PASSENGER SHIPS - GUIDELINES FOR PREPARATION OF HULL STRUCTURAL SURVEYS IACS [IACS Rec.111]

#### A1. GENERAL

##### 100. Application

101. The present Title 02 Section 2 comprises detailed requirements regarding the scope of the surveys for the maintenance of Class.

102. Chapter B comprises requirements for surveys in all vessels with  $GT < 500$  for open sea navigation in areas O1 and O2.

103. Chapter C comprises requirements for surveys in all vessels with  $GT \geq 500$  for open sea navigation in areas O1 and O2.

104. Chapter D comprises additional or substitutive requirements for surveys in general cargo vessels, Title 11, having  $GT \geq 500$  for open sea navigation in areas O1 and O2 which have been assigned Mentions of Class in conformity with Part I, Title 1, Section 1 as follows:

##### a. GENERAL CARGO

105. Chapter E comprises additional or substitutive requirements for surveys in bulk carriers of single and double skin, Title 14, having  $GT \geq 500$  for open sea navigation in areas O1 and O2 which have been assigned to Mentions of Class and additional class notations in conformity with Part I, Title 1, Section 1 as follows:

- a. ESP
- b. Special notation for CSR\* vessels:
  - b.1. BC-A ESP
  - b.2. BC-B ESP

#### b.3. BC-C ESP

(\*) CSR – IACS Common Structural Rules, published in separate by RBNA, for bulk carriers over 90 meters and oil and chemical tankers over 150 m in length.

106. Chapter F comprises additional or substitutive requirements for surveys in oil carriers of single and double skin, Title 32, having  $GT \geq 500$  for open sea navigation in areas O1 and O2 which have been assigned to Mentions of Class and additional class notations in conformity with Part I, Title 1, Section 1 as follows:

- a. OIL TANKER K3 ESP
- b. OIL TANKER K2 ESP
- c. For double hull vessels:
  - c.1. OIL TANKER K3 ESP DDC
  - c.2. - OIL TANKER K2 ESP DDC

107. Chapter G comprises additional or substitutive requirements for surveys in chemical tankers, Title 33, for open sea navigation in areas O1 and O2 which have been assigned to Mentions of Class and additional class notations in conformity with Part I, Title 1, Section 1 as follows:

##### a. CHEMICAL TANKER ESP

##### Guidance

*According to NORMAM 02 Chapter 3, item 302, and NORMAM 01 Chapter 3 item 302, the IBC Code is applicable to all vessels for inland and open sea navigation transporting chemical products in bulk. Therefore, the survey procedures of the present Part I, Title 02, Section 2, Chapter G apply to all chemical tankers as required in the IBC Code.*

##### End of guidance

108. Chapter H comprises additional or substitutive requirements for surveys in liquefied gas carriers, Title 34, having  $GT \geq 150$  for open sea navigation in areas O1 and O2 which have been assigned to Mentions of Class and additional class notations in conformity with Part I, Title 1, Section 1 as follows:

##### a. LIQUEFIED GAS CARRIER

##### Guidance

*According to NORMAM 02 Chapter 3, item 302, and NORMAM 01 Chapter 3 item 302, the IGC Code is applicable to all vessels for inland and open sea navigation transporting liquefied gases in bulk. Therefore, the survey procedures of the present Part I, Title 02, Section 2, Chapter G apply to all liquefied gas carriers as required in the IGC Code.*

##### End of guidance

109. Chapter I comprises additional or substitutive requirements for surveys in Ro-Ro cargo vessels, Title 15, and Ro-Ro cargo and passenger vessels, Title 26, having GT  $\geq 500$  for open sea navigation in areas O1 and O2 which have been assigned to Mentions of Class and additional class notations in conformity with Part I, Title 1, Section 1 as follows:

- a. Ro-Ro Cargo
- b. Ro-Ro Cargo and Passengers

#### *Guidance*

*Vessels under 500 GT tonnage fitted with bow and / or shell doors are to comply with the survey requirements of this Part I, Title 02, Section 2, Chapter H concerning the bow and shell doors.*

#### *End of guidance*

110. Chapter L comprises general requirements for allowable limits and tolerances in suveys.

111. The unified requirement IACS UR Z1 identifies the Annual and Intermediate Survey requirements of IMO Res. A.997(25) "Survey Guidelines Under the Harmonized System of Survey and Certification, 2007", as amended by IMO Res. A.1020(26), which are, as a minimum, to be covered by classification surveys. These requirements have been included in the present Rules in the relevant Chapters, whenever applicable. The texts have been based on those of Res. A.997(25) as amended by Res. A.1020(26). In cases where the Administration has delegated authority for the Society to act on its behalf, the remainder of A.997(25) as amended by A.1020(26) is carried out as a statutory requirement by the Society on behalf of the Administration.

112. Reference is made to IACS Rec 99 for vessels under 500 GT. The application of IACS Rec 99 is made explicit in the relevant chapters.

#### *Guidance*

#### **Important note**

*The IACS UR Z are separated according to the type of vessel, and are complete in themselves. In this Rule, all the types of vessels are compacted in the present Title 02 Section 2. Therefore, the following sections:*

#### *Section 1 – General*

*Applications*

*Definitions*

*Repairs*

*Thickness measurements*

*And:*

#### *Section 5 – Preparation for survey*

*Conditions for survey*

*Access to structures*

*Equipment for survey*

#### *Survey at sea or anchorage*

*and additionally:*

#### *Section 6 – Procedures for thickness measurements*

##### *General*

*Certification of thickness measurement company  
Reporting*

*have all been included in the present Chapter A in the following subchapters:*

A2. *PREPARATION FOR SURVEY - VESSELS NOT SUBJECT TO ESP PROGRAMS*

A3. *PREPARATION FOR SURVEY – VESSELS SUBJECT TO ESP PROGRAMMES*

A4. *THICKNESS MEASUREMENT*

A5. *PROCEDURES FOR IMPOSING AND CLEARING RECOMMENDATIONS / CONDITIONS OF CLASS*

*Whenever there are differences in text inside a subchapter (e.g., oil tankers, bulk carriers and chemical tankers are all in subchapter A3) the different texts are separate and clearly identified for the type of vessel.*

*In this last case, the IACS reference is indicated in the subchapter, and the respective sections in the items.*

#### *End of guidance*

#### **200. Definitions**

201. The definitions presented below are general and taken from IACS UR Z 7. Additional definitions according to the type of vessel are given in the relevant Chapters.

202. **Ballast Tank:** A Ballast Tank is a tank that is being used primarily for salt water ballast

203. **Spaces:** Spaces are separate compartments including holds and tanks.

204. **Close-Up Survey:** A Close-Up Survey is a survey where the details of structural components are within the close visual inspection range of the surveyor i.e. normally within reach of hand.

205. **Overall survey:** a survey intended to report on the overall condition of the hull structure and determine the extent of additional Close-up Surveys

206. **Transverse Section:** A Transverse Section includes all longitudinal members such as plating, longitudinals and girders at the deck, sides, bottom, inner bottom, and longitudinal bulkhead. For transversely framed vessels, a transverse section includes adjacent frames and their end connections in way of transverse sections.

207. **Representative Space:** Representative Spaces are those which are expected to reflect the conditions of other spaces of similar type and service and with similar corrosion

prevention systems. When selecting representative spaces, account is to be taken of the service and repair history on board and identifiable Critical Structural Areas and/or Suspect Areas.

**208. Critical Structural Area:** Critical Structural Areas are locations which have been identified from calculations to require monitoring or from the service history of the subject ship or from similar ships or sister ships, if applicable, to be sensitive to cracking, buckling or corrosion which would impair the structural integrity of the ship.

**209. Suspect Area:** Suspect Areas are locations showing Substantial Corrosion and/or are considered by the Surveyor to be prone to rapid wastage.

**210. Substantial Corrosion:** Substantial Corrosion is an extent of corrosion such that assessment of corrosion pattern indicates a wastage in excess of 75% of allowable margins, but within acceptable limits.

**211. Corrosion Prevention System:** A Corrosion Prevention System is normally considered a full hard protective coating. Hard Protective Coating is usually to be epoxy coating or equivalent. Other coating systems, which are neither soft nor semi-hard coatings, may be considered acceptable as alternatives provided that they are applied and maintained in compliance with the manufacturer's specifications.

**212. Coating Condition:** Coating condition is defined as follows:

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

**213. Cargo Length Area:** Cargo Length Area is that part of the ship which contains all cargo holds and adjacent areas including fuel tanks, cofferdams, ballast tanks and void spaces.

**214. Prompt and Thorough Repair:** A Prompt and Thorough Repair is 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 classification.

**215. Special consideration:** Special consideration or specially considered (in connection with close-up surveys and thickness measurements) means sufficient close-up inspection and thickness measurements are to be taken to confirm the actual average condition of the structure under the coating.

**216. '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.

**217. Air pipe head:** Air pipe heads installed on the exposed decks are those extending above the freeboard deck or superstructure decks.

**218. Automatic air pipe head:** air pipe heads fitted with a device which closes automatically, typically a ball or a disk which when submerged by waves floats and presses against a seat, preventing water ingress.

## **A2. PREPARATION FOR SURVEY - VESSELS NOT SUBJECT TO ESP PROGRAMS [IACS UR Z.7, URZ 7.1, IACS URZ 7.2, IACS Rec 78]**

### **100. Conditions for survey – General Cargo Vessels Section 5.1**

101. This Chapter A2 applies to vessels not subject to EPS programmes, and the references are as follows:

- a. Vessels in general: IACS UR Z7
- b. General cargo vessels: IACS UR Z7.1
- c. Liquefied gas carriers: IACS UR Z7.2
- d. Safe use of portable ladders for close-up survey: IACS Rec 78

In this Rule, the chapters 1 and 5 of the above mentioned UR's have been unified to avoid repetition.

102. The Owner is to provide the necessary facilities for a safe execution of the survey.

103. Tanks and spaces are to be safe for access, i.e. gas freed, ventilated and illuminated.

104. In preparation for survey and thickness measurements and to allow for a thorough examination, all spaces are to be cleaned including removal from surfaces of all loose accumulated corrosion scale. Spaces are to be sufficiently clean and free from water, scale, dirt, oil residues etc. to reveal corrosion, deformation, fractures, damages, or other structural deterioration. However, those areas of structure whose Renewal has already been decided by the Owner need only be cleaned and descaled to the extent necessary to determine the limits of the areas to be renewed.

105. Sufficient illumination is to be provided to reveal corrosion, deformation, fractures, damages or other structural deterioration.

106 Where soft or semi-hard coatings have been applied, safe access is to be provided for the surveyor to verify the effectiveness of the coating and to carry out an assessment of the conditions of internal structures which may include spot removal of the coating. When safe access cannot be provided, the soft or semi-hard coating is to be removed.

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

108. In refrigerated cargo spaces the condition of the coating behind the insulation is to 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 is to be extended as deemed necessary by the Surveyor. The condition of the coating is to be reported. If indents, scratches, etc., are detected during surveys of shell plating from the outside, insulations in way are to be removed as required by the Surveyor, for further examination of the plating and adjacent frames.

## 200. Access to structures IACS Section 5.2

201. For survey, means are to be provided to enable the surveyor to examine the hull structure in a safe and practical way.

202. For all vessels (IACS URZ 7/5.2):

- a. For survey, means are to be provided to enable the surveyor to examine the hull structure in a safe and practical way.
- b. For survey in cargo holds and water ballast tanks, one or more of the following means for access, acceptable to the Surveyor, is to be provided:
  - b.1. permanent staging and passages through structures;
  - b.2. temporary staging and passages through structures;
  - b.3. lifts and movable platforms;
  - b.4. boats or rafts;
  - b.4. other equivalent means.

203. For general cargo vessels (IACS URZ 7.1/5.2):

- a. For Overall Survey, means are to be provided to enable the surveyor to examine the hull structure in a safe and practical way.
- b. For Close-up Surveys, one or more of the following means for access, acceptable to the Surveyor, is to be provided:

- b.1. permanent staging and passages through structures;
- b.2. temporary staging and passages through structures;
- b.3. lifts and movable platforms;
- b.4. boats or rafts;
- b.5. other equivalent means.

204 For liquefied gases cargo vessels [IACS UR Z7.2/5.2]

- a. For Overall Survey, means are to be provided to enable the surveyor to examine the hull structure in a safe and practical way.
- b. For Close-up Surveys, one or more of the following means for access, acceptable to the Surveyor, is to be provided:
  - b.1. permanent staging and passages through structures;
  - b.2. temporary staging, e.g. ladders, and passages through structures;
  - b.3. other equivalent means.

## 205. Safe Use of Portable Ladders for Close-up Surveys IACS Rec 78

- a. The Owner should ensure that equipment selected for temporary work affords adequate protection against the risks of falls from a height.
- b. The manner in which portable ladders can most safely be used by workers should be specified.
- c. Portable ladders should rest on a stable, strong, suitably sized, immobile footing so that the rungs remain horizontal. Suspended ladders should be attached in a manner so that they can not be displaced and so that swinging is prevented.
- d. The feet of portable ladders should be prevented from slipping during use by securing the stiles at or near their upper and lower ends, by any anti-slip device or by other arrangements of equivalent effectiveness. Slip resistant feet should not be used as substitute for the care in placing, lashing or holding a ladder upon slippery surface.
- e. Portable ladders should meet the following criteria:
  - e.1. Not more than 5 m in length for freestanding portable ladders.



- e.2. Non-self supporting and self-supporting portable ladders should support at least four times the maximum intended load.
- e.3. The minimum clear distance between side rails for all portable ladders should be according to a recognized standard.
- e.4. The rungs and steps of portable ladders should be designed to minimise slipping, e.g. corrugated, knurled, dimpled, coated with skid resistance material.
- f. Ladders should be maintained free of oil, grease and other slipping hazards.

### 300. Equipment for survey Section 5.3

301. Thickness measurement is normally to be carried out by means of ultrasonic test equipment. The accuracy of the equipment is to be proven to the Surveyor as required. Thickness measurements are to be carried out by a firm approved by the society in accordance with Part I, Title 02, Section 1, Chapter F, F.4 Procedure for Service Suppliers.

302. One or more of the following fracture detection procedures may be required if deemed necessary by the Surveyor:

- a. radiographic equipment;
- b. ultrasonic equipment;
- c. magnetic particle equipment;
- d. dye penetrant.

### 302. Calibration of measuring equipment [IACS UR Z19]

- a. Inspection, measuring and test equipment, which Surveyors rely on to make decisions affecting classification or statutory certification, are to be individually identified and calibrated to a recognized national or international standard.
- b. Simple Measuring Equipment: the Surveyor may accept simple measuring equipment (e.g. rulers, measuring tapes, weld gauges, micrometers) without individual identification or confirmation of calibration, provided they are of standard commercial design, properly maintained and periodically compared with other similar equipment or test pieces.
- c. Shipboard Equipment: the Surveyor may accept equipment fitted on board a ship and used in examination of shipboard equipment (e.g. pressure, temperature or rpm gauges and meters) based either on calibration records or comparison of readings with multiple instruments.
- d. Other Equipment: The Surveyor shall satisfy himself that other equipment (e.g. tensile test machines,

ultrasonic thickness measurement equipment, etc) is calibrated to a recognized national or international standard.

### 303. Safe use of boats or rafts for surveys IACS Rec 39

Surveys of tanks or spaces by means of rafts or boats may only be undertaken with the agreement of the attending surveyor(s), who shall take into account the safety arrangements provided, including weather forecasting and ship response in reasonable sea conditions.

- a. When rafts or boats will be used for close-up survey the following conditions are to be observed:
- b. only rough duty, inflatable rafts or boats, having satisfactory residual buoyancy and stability even if one chamber is ruptured, are to be used;
- c. the boat or raft is to be tethered to the access ladder and an additional person is to be stationed down the access ladder with a clear view of the boat or raft;
- d. appropriate lifejackets are to be available for all participants;
- e. the surface of water in the tank or hold is to be calm (under all foreseeable conditions the expected rise of water within the tank is to not exceed 0.25 m) and the water level stationary. On no account is the level of the water to be rising while the boat or raft is in use;
- f. the tank, hold or space must contain clean ballast water only. Even a thin sheen of oil on the water is not acceptable; and
- g. at no time is the water level to be allowed to be within 1 m of the deepest under deck web face flat so that the survey team is not isolated from a direct escape route to the tank hatch. Filling to levels above the deck transverses is only to be contemplated if a deck access manhole is fitted and open in the bay being examined, so that an escape route for the survey party is available at all times. Other effective means of escape to the deck may be considered.
- h. If the tanks (or spaces) are connected by a common venting system, or inert gas system, the tank in which the boat or raft is to be used shall be isolated to prevent a transfer of gas from other tanks (or spaces).
- i. In addition to the above, rafts or boats alone may be allowed for close-up survey of the under deck areas for tanks or spaces if the depth of the webs are 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.
- j. When the coating of the under deck structure is in GOOD condition and there is no evidence of wastage; or
- k. If a permanent means of access is provided in each bay to allow safe entry and exit. This means:

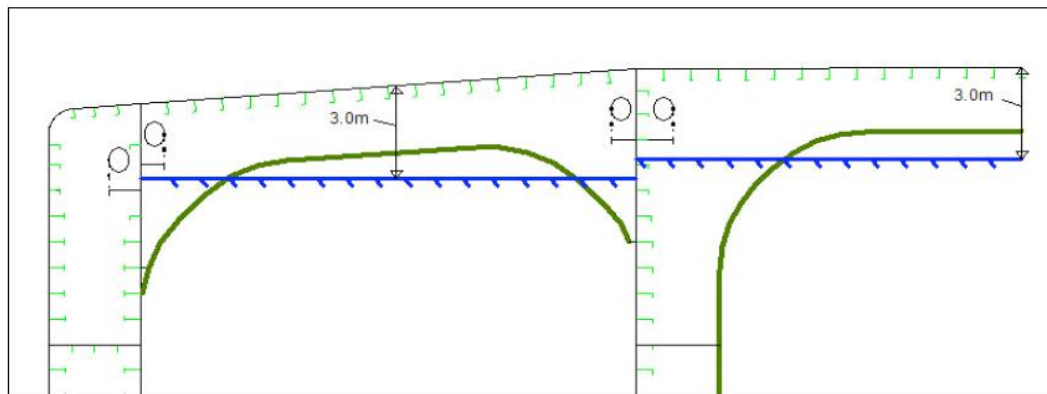
- k.1. access direct from the deck via a vertical ladder and a small platform fitted approximately 2 m below the deck in each bay; or
- k.2. access to deck from a longitudinal permanent platform having ladders to deck in each end of the tank. The platform shall, for the full length of the tank, be arranged 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 is to be assumed not

more than 3m from the deck plate measured at the midspan of deck transverses and in the middle length of the tank. (See Figure F.A2.303.1).

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

Note: Item A2.303.i is a mandatory requirement (Subchapter A3).

**FIGURE F.A2.303.1 – CLEARANCE FOR INSPECTION OF UNDERDECK AREAS BY MEANS OF RAFTS OR BOATS**



#### 304. Safety Meetings

- a. The establishment of proper preparation and the close co-operation between the attending surveyor(s) and the company's representatives onboard prior to and during the survey are an essential part in the safe and efficient conduct of the survey.
- b. Applicable safety procedures and responsibilities shall be discussed and agreed to ensure that the survey is carried out under controlled conditions.
- c. Safety Meetings shall be held prior to entering the tank or space and regularly during the survey on board.
- d. Further reference is made to the RBNA “Guideline for Entrance into Confined Spaces” (IACS Recommendation No.72 Confined Space Safe Practice).

#### 305. Communication Arrangements and Equipment for Survey

- a. The attending surveyor(s) shall always be accompanied by at least one responsible person assigned by the company experienced in tank and enclosed spaces inspection. In addition a backup team of at least two experienced persons shall be stationed at the hatch opening of the tank or space

that is being surveyed. The back-up team shall continuously observe the work in the tank or space and shall keep lifesaving and evacuation equipment ready for use.

- b. A communication system shall be arranged between the survey party in the tank or space being examined, the responsible officer on deck, the navigation bridge and the personnel in charge of handling the ballast pump(s) in the pump control room. These communication arrangements shall be maintained throughout the survey.
- c. Adequate and safe lighting shall be provided for the safe and efficient conduct of the survey.
- d. Adequate protective clothing shall be made available and used (e.g. safety helmet, gloves, safety shoes, etc) during the survey.

#### 400. Survey at sea or at anchorage

401. Survey at sea or at anchorage may be accepted provided the Surveyor is given the necessary assistance from the personnel on board. Necessary precautions and procedures for carrying out the survey are to be in accordance with the present Part I Title 02 section 2 from A2.100 to A2.300.

402. A communication system is to be arranged between the survey party in the tank or space and the responsible officer on deck. This system must also include the

personnel in charge of ballast pump handling if boats or rafts are used.

403. In case the survey of tanks is undertaken at anchorage, surveys of tanks or applicable holds by means of boats or rafts may only be undertaken with the agreement of the Surveyor. The safety arrangements provided including weather forecasting and ship response under foreseeable conditions and provided the expected rise of water within the tank does not exceed 0.25m.

404. When boats or rafts are used, appropriate life jackets are to be available for all participants. Boats or rafts are to have satisfactory residual buoyancy and stability even if one chamber is ruptured. A safety checklist is to be provided.

405. Surveys of tanks by means of boats or rafts may only be undertaken at the sole discretion of the Surveyor, who is to take into account the safety arrangements provided, including weather forecasting and ship response in reasonable sea conditions.

406. Reference is made to item A2.303 above (IACS Recommendation 39 - Guidelines for use of Boats or Rafts for Close-up surveys).

#### **500. Confined spaces entrance RBNA**

501. The entrance in confined spaces is to be in accordance with:

- a. Brazilian regulations NR29
- b. RBNA "Guide for Entrance into Confined Spaces"
- c. RBNA checklist for entrance into confined spaces
- d. IACS and IMO recommendations for entrance into confined spaces

#### **600. Repairs**

601. 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 vessel's structural, watertight or weather tight integrity, is to be promptly and thoroughly repaired. Areas to be considered include:

- a. side shell frames, their end attachments and adjacent shell plating;
- b. deck structure and deck plating;
- c. bottom structure and bottom plating;
- d. watertight or oil tight bulkheads;
- e. hatch covers and hatch coamings;

- f. weld connections between air pipes and deck plating
- g. air pipe heads;
- h. ventilation and closing devices;
- i. bunker and vent piping systems

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

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

604. Where the damage found on structure is isolated and of a localised 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 Recommendation/Condition of Class in accordance with Subchapter A4 below (IACS PR 35), with a specific time limit.

#### **700. Repairs and maintenance during voyage [IACS UR Z13]**

701. Where repairs to hull, machinery or other equipment, which affect or may affect the class, are to be carried out by a riding crew during a voyage, they are to be planned in advance. A complete repair procedure including the extent of proposed repair and the need for the Surveyor's attendance during the voyage is to be submitted to the Society for approval sufficiently in advance. Failure to notify the Society in advance of the repairs may result in the suspension of class of the vessel.

702. Where in any emergency circumstance, emergency repairs are to be effected immediately. The repairs should be documented in the ship's log and submitted thereafter to the Society for use in determining further survey requirements.

703. The above is not intended to include maintenance to and overhaul of the hull, machinery and equipment in accordance with the Manufacturer's recommended procedures and established marine practice, which does not require the Society's agreement. However, any repair resulting from such maintenance and overhauls which affects or may affect the class is to be noted in the ship's log and submitted to the attending Surveyor for use in determining further survey requirements.

**800. Guidelines for pre-planning of surveys in dry dock of ships which are not subject to the enhanced programme of inspections [IMO MSC/Circ. 1223]**

801. This item A2.800 applies to ships which are not subject to the enhanced programme of inspections (IMO ESP Code, as amended).

802. Discretion may be exercised in the application of these Guidelines for smaller sized ships (e.g., cargo ships of less than 100 m in length) where the meeting held between the owner and the surveyor can occur during, rather than in advance of, the survey in dry dock as dry docks for these smaller ships are much more available and the dry docking of these ships occurs more promptly and with much less advanced notice than it does for larger ships.

803. To assure that a survey in dry dock will be effectively and safely carried out in accordance with the relevant rules and regulations applicable to the ship and that major necessary repairs and maintenance will be effectively undertaken, the owner, the attending surveyor and other interested parties (e.g., a representative of the thickness measurement company), should co-operate and meet in advance of the dry-docking survey.

804. Pre-planning meeting

a. A pre-planning meeting should occur in advance to co-ordinate the work to be undertaken during the survey which should include, as a minimum, a review of the following information:

- a.1. survey status and basic ship information;
- a.2. survey records from the previous bottom survey;
- a.3. details of any outstanding recommendations or known damaged areas (due to grounding, lightering, etc) that affect or may affect the dry-docking survey;
- a.4. details of any known structural damage previously suffered by the ship;
- a.5. reports of known structural repairs that will be carried out during the dry-docking survey; and details of any additional items to be surveyed, thickness measurements to be taken and known maintenance work that will be carried out during the dry-docking survey.

**900. Thickness measurements and close-up surveys**

901. The required thickness measurements, if not carried out by the Society itself, are to be witnessed by a surveyor of the Society. The surveyor is to be on board to the extent necessary to control the process.

902. The thickness measurement company is to be part of the survey planning meeting to be held prior to commencing the survey.

903. Thickness measurements of structures in areas where close-up surveys are required shall be carried out simultaneously with close-up surveys.

904. The thickness measurements are to be carried out by a company certified by the RBNA according to principles stated in Part I, Title 01, Section 2, Chapter F.

904. A thickness measurement report is to be prepared. The report is to give the location of measurements, the thickness measured as well as corresponding original thickness. Furthermore, the report is to give the date when the measurements were carried out, type of measurement equipment, names of personnel and their qualifications and has to be signed by the operator.

905. The Surveyor is to review the final thickness measurement report and countersign the cover page.

906. (RBNA) The tables of minimum requirements for close-up surveys and thickness measurement points are in Chapters B, C, D and H below.

907. (RBNA) The guidelines for the surveyor on how to control the thickness measurement process are in Chapter J below.

### A3. PREPARATION FOR SURVEYS - VESSELS SUBJECT TO THE ESP PROGRAMME

[URZ 10.1 – SINGLE HULL OIL TANKERS]

[URZ 10.2 – SINGLE HULL BULK  
CARRIERS]

[UR Z 10.3 – CHEMICAL TANKERS]

[URZ 10.4 – DOUBLE HULL OIL  
TANKERS]

[URZ 10.5 – DOUBLE HULL BULK  
CARRIERS]

#### 100. Survey Programme

101. The Owner in cooperation with the RBNA is to work out a specific Survey Programme prior to the commencement of any part of:

- a. the Renewal Survey;
- b. the Intermediate Survey for bulk carriers , oil tankers or chemical tankers over 10 years of age.

102. The Survey Programme is to be in a written format based on the RBNA Survey Planning Questionnaire. The survey is not to commence until the Survey programme has been agreed.

103. Prior to the development of the survey programme, the survey planning questionnaire is to be sent to and completed by the Owner and returned to RBNA.

104. 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 Renewal Survey and later relevant survey reports.

105. The Survey Programme is to be worked out taking into account any amendments to the survey requirements after the last Renewal Survey carried out.

106. In developing the Survey Programme, the following documentation is to be collected and consulted with a view to selecting tanks, holds, areas, and structural elements to be examined:

- a. Survey status and basic ship information,
- b. Documentation on-board, described in
  - b.1. E5.200 and E5.300 below for bulk carriers;
  - b.2. F5.200 and F5.300 below for oil tankers;
  - b.3. G5.200 and G5.300 below for chemical tankers
- c. Main structural plans (scantlings drawings), including information regarding use of high tensile steels (HTS),
- d. Relevant previous survey and inspection reports from both RBNA and the Owner,

- e. Information regarding the use of the ship's holds and tanks, typical cargoes and other relevant data,
- f. Information regarding corrosion prevention level on the newbuilding,
- g. Information regarding the relevant maintenance level during operation.

107. The submitted Survey Programme is to account for and comply, as a minimum, with the requirements of the relevant tables in Chapters E, F and G below for close-up survey, thickness measurement and tank testing, respectively and is to include relevant information including at least:

- a. Basic ship information and particulars,
- b. Main structural plans (scantling drawings), including information regarding use of high tensile steels (HTS)
- c. Plan of holds and tanks,
- d. List of holds and tanks with information on use, protection and condition of coating,
- e. Conditions for survey (e.g., information regarding hold and tank cleaning, gas freeing, ventilation, lighting, etc.),
- f. Provisions and methods for access to structures,
- g. Equipment for surveys,
- h. Nomination of holds and tanks and areas for close-up survey,
- i. Nominations of sections for thickness measurement,
- j. Nomination of tanks for tank testing,
- k. Damage experience related to the ship in question.

108. The RBNA will advise the Owner of the maximum acceptable structural corrosion diminution levels applicable to the vessel.

109. Use may also be made of:

- a. The Guidelines for Technical Assessment in Conjunction with Planning for Enhanced Surveys of Bulk Carriers Renewal Survey - Hull, contained in subchapter E9.
- b. The Guidelines for Technical Assessment in Conjunction with Planning for Enhanced Surveys of Bulk Carriers Oil Tankers Renewal Survey - Hull, contained in subchapter F9.
- c. The Guidelines for Technical Assessment in Conjunction with Planning for Enhanced Surveys



of Chemical Tankers Renewal Survey - Hull, contained in subchapter G9.

- d. These guidelines are a recommended tool which may be invoked at the discretion of the RBNA, when considered necessary and appropriate, in conjunction with the preparation of the required Survey Programme.

## 200. Conditions for survey Section 5.2

201. The Owner is to provide the necessary facilities for a safe execution of the survey.

202. For bulk carriers:

- a. Proper and safe access, are to be agreed between the owner and the RBNA.
- b. Details of the means of access are to be provided in the survey planning questionnaire.
- c. Tanks and spaces are to be safe for access, i.e. gas freed, ventilated and illuminated.
- d. Cases where the provisions of safety and required access are judged by the attending surveyor(s) not to be adequate, the survey of the spaces involved is not to proceed.
- e. Cargo holds, tanks and spaces are to be safe for access. Cargo holds, tanks and spaces are to be gas free and properly ventilated. Prior to entering a tank, void or enclosed space, it is to be verified that the atmosphere in the tank is free from hazardous gas and contains sufficient oxygen.

203. For oil tankers:

- a. Proper and safe access, are to be agreed between the owner and the RBNA.
- b. Details of the means of access are to be provided in the survey planning questionnaire.
- c. In cases where the provisions of safety and required access are judged by the attending surveyors not to be adequate, the survey of the spaces involved is not to proceed.
- d. Tanks and spaces are to be safe for access. Tanks and spaces are to be gas free and properly ventilated. Prior to entering a tank, void or enclosed space, it is to be verified that the atmosphere in that space is free from hazardous gas and contains sufficient oxygen.

204. In preparation for survey and thickness measurements and to allow for a thorough examination, all spaces are to be cleaned including removal from surfaces of all loose accumulated corrosion scale. Spaces are to be sufficiently clean and free from water, scale, dirt, oil residues etc. to reveal corrosion, deformation, fractures,

damages, or other structural deterioration. However, those areas of structure whose renewal has already been decided by the Owner need only be cleaned and descaled to the extent necessary to determine the limits of the areas to be renewed.

205. Sufficient illumination is to be provided to reveal corrosion, deformation, fractures, damages or other structural deterioration.

206. Where soft or semi-hard coatings have been applied, safe access is to be provided for the surveyor to verify the effectiveness of the coating and to carry out an assessment of the conditions of internal structures which may include spot removal of the coating. When safe access cannot be provided, the soft or semi-hard coating is to be removed.

207. The surveyor(s) are to always be accompanied by at least one responsible person, assigned by the owner, experienced in tank and enclosed spaces inspection. In addition a backup team of at least two experienced persons is to be stationed at the hatch opening of the tank or space that is being surveyed. The back-up team is to continuously observe the work in the tank or space and is to keep lifesaving and evacuation equipment ready for use.

208. A communication system is to be arranged between the survey party in the cargo hold, tank or space being examined, the responsible officer on deck and, as the case may be, the navigation bridge. The communication arrangements are to be maintained throughout the survey.

## 300. Access to structures Section 5.3

301. For overall surveys, means are to be provided to enable the surveyor to examine the hull structure in a safe and practical way.

302. For close-up surveys of the hull structure, other than cargo hold shell frames, one or more of the following means for access, acceptable to the Surveyor, is to be provided:

- a. permanent staging and passages through structures;
- b. temporary staging and passages through structures;
- c. lifts and movable platforms;
- d. portable ladders;
- e. boats or rafts;
- e.1. other equivalent means.

303. For close-up surveys of the cargo hold shell frames of **bulk carriers** less than 100,000 dwt, one or more of the following means for access, acceptable to the Surveyor, is to be provided:

- a. permanent staging and passages through structures;

- b. staging and passages through structures;
- c. ladder restricted to not more than 5 m in length may be accepted for surveys of lower section of a shell frame including bracket;
- d. arm vehicles such as conventional cherry pickers, lifts and movable platforms;
- e. boats or rafts provided the structural capacity of the hold is sufficient to withstand static loads at all levels of water;
- f. other equivalent means.

304. For close-up surveys of the cargo hold shell frames of **bulk carriers** 100,000 dwt and above, the use of portable ladders is not accepted, and one or more of the following means for access, acceptable to the surveyor, is to be provided:

- a. Annual Surveys, Intermediate Survey under 10 years of age and Renewal Survey No. 1
  - a.1. permanent staging and passages through structures;
  - a.2. temporary staging and passages through structures;
  - a.3. hydraulic arm vehicles such as conventional cherry pickers, lifts and movable platforms;
  - a.4. boats or rafts provided the structural capacity of the hold is sufficient to withstand static loads at all levels of water;
  - a.5. other equivalent means.

- b. Subsequent Intermediate Surveys and Renewal Surveys:

- b.1. Either permanent or temporary staging and passage through structures for close-up survey of at least the upper part of hold frames;
- b.2. Hydraulic arm vehicles such as conventional cherry pickers for surveys of lower and middle part of shell frames as alternative to staging;
- b.3. lifts and movable platforms;
- b.4. boats or rafts provided the structural capacity of the hold is sufficient to withstand static loads at all levels of water;
- b.5. other equivalent means.

305. (**For bulk carriers**) Notwithstanding the above requirements, the use of a portable ladder fitted with a mechanical device to secure the upper end of the ladder is acceptable for the "*close-up examination of sufficient extent, minimum 25% of frames, to establish the condition of the lower region of the shell frames including approx. lower one third length of side frame at side shell and side frame end attachment and the adjacent shell plating of the forward cargo hold*" at Annual Survey, and the "*one other selected cargo hold*".

#### 400. Equipment for survey Section 5.4

401. Thickness measurement is normally to be carried out by means of ultrasonic test equipment. The accuracy of the equipment is to be proven to the Surveyor as required. Thickness measurements are to be carried out by a firm approved by the society in accordance with Part I, Title 02, Section 1, Chapter F, Procedures for Service Suppliers.

402. One or more of the following fracture detection procedures may be required if deemed necessary by the Surveyor:

- a. radiographic equipment;
- b. ultrasonic equipment;
- c. magnetic particle equipment;
- d. dye penetrant.

403. Additionally, for oil and chemical tankers, the following is required:

- a. Explosimeter, oxygen-meter, breathing apparatus, lifelines, riding belts with rope and hook and whistles together with instructions and guidance on their use are to be made available during the survey. A safety check-list is to be provided.

- b. Adequate and safe lighting is to be provided for the safe and efficient conduct of the survey.
- c. Adequate protective clothing is to be made available and used during the survey (e.g. safety helmet, gloves, safety shoes, etc.).

404. Surveys of tanks or applicable holds (in oil tankers) by means of boats or rafts may only be undertaken with the agreement of the Surveyor, who is to take into account the safety arrangements provided, including weather forecasting and ship response under foreseeable conditions and provided the expected rise of water within the tank does not exceed 0.25m.

405. When rafts or boats will be used for close-up survey (in oil tankers) the following conditions are to be observed:

- a. only rough duty, inflatable rafts or boats, having satisfactory residual buoyancy and stability even if one chamber is ruptured, are to be used;
- b. the boat or raft is to be tethered to the access ladder and an additional person is to be stationed down the access ladder with a clear view of the boat or raft;
- c. appropriate lifejackets are to be available for all participants;
- d. the surface of water in the tank or hold is to be calm (under all foreseeable conditions the expected rise of water within the tank is to not exceed 0.25 m) and the water level stationary. On no account is the level of the water to be rising while the boat or raft is in use;
- e. the tank, hold or space must contain clean ballast water only. Even a thin sheen of oil on the water is not acceptable; and
- f. at no time is the water level to be allowed to be within 1 m of the deepest under deck web face flat so that the survey team is not isolated from a direct escape route to the tank hatch. Filling to levels above the deck transverse is only to be contemplated if a deck access manhole is fitted and open in the bay being examined, so that an escape route for the survey party is available at all times. Other effective means of escape to the deck may be considered.

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

407. 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:

- b.1. access direct from the deck via a vertical ladder and a small platform fitted approximately 2 m below the deck in each bay; or

- b.2. 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 is to be assumed not more than 3m from the deck plate measured at the midspan of deck transverse and in the middle length of the tank.

- c. If neither of the above conditions are met, then staging or an “other equivalent means” is to be provided for the survey of the under deck areas.

408. The use of rafts or boats as mentioned above does not preclude the use of boats or rafts to move about within a tank during a survey.

409. Reference is made to item A2.304 to A.307 above (IACS Recommendation 39 - Guidelines for use of Boats or Rafts for Close-up surveys).

## **500. Survey at sea or at anchorage Section 5.5**

501. Survey at sea or at anchorage may be accepted provided the Surveyor is given the necessary assistance from the personnel onboard. Necessary precautions and procedures for carrying out the survey are to be in accordance with the present Part I Title 02 section 2 from A2.100 to A2.300.

502. A communication system is to be arranged between the survey party in the tank or space and the responsible officer on deck. This system must also include the personnel in charge of ballast pump handling if boats or rafts are used.

## **600. Entrance into enclosed spaces RBNA**

601. The entrance in confined spaces is to be in accordance with:

- a. Brazilian regulations NR29
- b. RBNA Guide for Entrance into Confined Spaces
- c. RBNA checklist for entrance into confined spaces
- d. IACS and IMO recommendations

## **700. Repairs Section 1.3**

701. 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 vessel's structural, watertight or weather tight integrity, is to be promptly and thoroughly repaired. Areas to be considered include:

- a. side shell frames, their end attachments and adjacent shell plating;
- b. deck structure and deck plating;
- c. bottom structure and bottom plating;
- d. watertight or oil tight bulkheads;
- e. hatch covers and hatch coamings;
- f. weld connections between air pipes and deck plating
- g. air pipe heads;
- h. ventilation and closing devices;
- i. bunker and vent piping systems

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

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

704. Where the damage found on structure is isolated and of a localised 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 Recommendation/Condition of Class in accordance with Subchapter A4 below (IACS PR 35), with a specific time limit.

#### **800. Repairs and maintenance during voyage [IACS UR Z13]**

See A2. 700 above.

#### **900. Survey planning meeting Section 5.6**

901. The establishment of proper preparation and the close co-operation between the attending surveyor(s) and the owner's representatives onboard prior to and during the survey are an essential part in the safe and efficient conduct of the survey. During the survey on board safety meetings are to be held regularly.

902. Prior to commencement of any part of the renewal and intermediate survey, a survey planning meeting is to be held between the attending surveyor(s), the owner's

representative in attendance, the thickness measurement company representative, where involved, and the master of the ship or an appropriately qualified representative appointed by the master or Company for the purpose to ascertain that all the arrangements envisaged in the survey programme are in place, so as to ensure the safe and efficient conduct of the survey work to be carried out.

903. The following is an indicative list of items that are to be addressed in the meeting:

- a. schedule of the vessel (i.e. the voyage, docking and undocking manoeuvres, periods alongside, cargo and ballast operations, etc.)
- b. provisions and arrangements for thickness measurements (i.e. access, cleaning/de-scaling, illumination, ventilation, personal safety);
- c. extent of the thickness measurements;
- d. acceptance criteria (refer to the lists of minimum thicknesses for each type of vessel in Chapters E, F and G of the present Title 02 Section 02).
- e. extent of close-up survey and thickness measurement considering the coating condition and suspect areas/areas of substantial corrosion;
- f. execution of thickness measurements;
- g. taking representative readings in general and where uneven corrosion/pitting is found;
- h. mapping of areas of substantial corrosion; and
- i. communication between attending surveyor(s) the thickness measurement company operator(s) and owner representative(s) concerning findings.

#### **A4. PROCEDURE FOR IMPOSING AND CLEARING RECOMMENDATIONS/CONDITIONS OF CLASS [IACS PROCEDURE NO.35]**

##### **100. Purpose**

101. The purpose of this Procedural Requirement is to set unified procedures for imposing, clearing and controlling Recommendations/Conditions of Class which Classification Societies are to follow.

##### **200. Definition**

201. "Recommendations" and "Conditions of Class" are to be read throughout this Procedural Requirement as being different terms used by Classification Societies for the same thing, i.e. requirements to the effect that specific measures, repairs, surveys are to be carried out within a specific time limit to retain Classification.

**300. Procedures for imposing, clearing and controlling Recommendations/Conditions of Class**

301. Recommendations/Conditions of Class shall be imposed for the following:

- a. Repairs and/or renewals related to damages that affect Classification (e.g. grounding, structural damages, machinery damages, wastage over the allowable limits, etc.)
- b. Supplementary survey requirements
- c. Temporary repairs

302. For repairs not completed at the time of survey, a Recommendation/Condition of Class is to be imposed. In order to provide adequate information to the surveyor attending for survey of the repairs, the Recommendation/Condition of Class is to be sufficiently detailed with identification of items to be repaired. For identification of extensive repairs, reference may be given to the survey report.

303. Recommendations/Conditions of Class may require imposing limitations related to navigation and operation that are deemed necessary for continued operation under Classification (e.g. loss of anchor and/or chain, etc).

304. Recommendations/Conditions of Class shall be given in writing with a time limit for completion to the owner's representatives/Ship's Master, and are to be clearly stated on the Certificate of Class or an attachment to the Certificate of Class and/or class survey status or report.

305. Owners will be notified of these dates and that the vessel's class will be subject to a suspension procedure if the item is not dealt with, or postponed, by the due date.

306. Clearance of Recommendations/Conditions of Class shall be supported by a survey report giving details of all associated repairs and/or renewals, or of the supplemental surveys carried out. Repairs carried out shall be reported with identification of:

- a. Compartment and location
- b. Structural member
- c. Repair method
- d. Repair extent
- e. NDT/Tests

307. Partially dealt with Recommendations/Conditions of Class shall be supported by a survey report giving details of repairs and/or renewals, or of that part of the supplemental surveys carried out and those parts remaining outstanding.

308. Where RBNA is acting under the Agreement of Delegation signed with the Maritime Authority in Brazil, the maximum periods for conditional and provisory statutory certificates is to be in accordance with NORMAM 06, i.e., 90 days for conditional certificates and 180 days for provisory certificates. After this deadline, the certificates cannot be renewed and a final certificate is to be issued or reinstated. Exceptions to this Rule can only be handled by the Maritime Authority.



## A5. THICKNESS MEASUREMENTS

### 100. Thickness measurements [IACS PR 19]

101. Thickness Measurements required in the context of hull structural classification surveys, if not carried out by the Society itself shall be witnessed by a surveyor. The attendance of the surveyor shall be recorded. Reference is made to Part I, Title 02, Section 2, Chapter J.

102. This requires the surveyor to be on board, while the gaugings are taken, to the extent necessary to control the process.

103. Prior to commencement of the Intermediate or Renewal Survey, as required by Part I, Title 02, Section 2, Chapters C to I, a meeting is to be held between the attending surveyor(s), the master of the ship or an appropriately qualified representative appointed by the master or Company, the owner's representative(s) in attendance and the thickness measurement firm's representative(s) so as to ensure the safe and efficient execution of the surveys and thickness measurements to be carried out onboard.

104. Communication with the thickness measurement operator(s) and owner's representative(s) is to be agreed during the meeting, with respect to the following:

- a. reporting of thickness measurements on regular basis
- b. prompt notification of the surveyor in case of findings
  - b.1. excessive and/or extensive corrosion or pitting/grooving of any significance
  - b.2. - structural defects like buckling, fractures and deformed structures
  - b.3. - detached and/or holed structure
  - b.4. - corrosion of welds.

105. The thickness measurement survey report is to indicate where and when the meeting took place and who attended (the name of the surveyor(s), the owner's representative(s) and the thickness measurement firm's representative(s)).

106. When thickness measurements are taken in association with Intermediate or Renewal Survey, a documented record indicating where and when the meeting took place and who attended (the name of the surveyor(s), the master of the ship or an appropriately qualified representative appointed by the master or Company, the owner's representative(s) and the representative(s) of the thickness measurement firm(s)) is to be maintained.

107. Monitoring of the thickness measurement process onboard

- a. The surveyor is to decide final extent and location of thickness measurements after overall survey of representative spaces onboard.
- b. In case the owner prefers to commence the thickness measurements prior to the overall survey then the surveyor is to advise that the planned extent and locations of thickness measurements are subject to confirmation during the overall survey.
- c. Based on findings, the surveyor may require that additional thickness measurements have to be taken.
- d. The surveyor is to direct the gauging operation by selecting locations such that readings taken represent, on average, the condition of the structure for that area.
- e. Thickness measurements taken mainly to evaluate the extent of corrosion, which may affect the hull girder strength, are to be carried out in a systematic manner of all longitudinal structural members that are required to be gauged by the relevant Rule(s).
- f. Where thickness measurements indicate substantial corrosion or wastage in excess of allowable diminution, the surveyor is to direct locations for additional thickness measurements in order to delineate areas of substantial corrosion and to identify structural members for repairs/renewals.
- g. Thickness measurements of structures in areas where close-up surveys are required shall be carried out simultaneously with close-up surveys.

### 108. Review and verification

- a. Upon completion of the thickness measurements, the surveyor is to confirm that no further gaugings are needed, or specify additional gaugings.
- b. If, where special consideration is allowed by the Rule(s), the extent of thickness measurements is reduced, the surveyor's special consideration is to be reported.
- c. In case thickness measurements are partly carried out, the extent of remaining thickness measurements is to be reported for the use of the next surveyor.

## **A6. PASSENGER SHIPS - GUIDELINES FOR PREPARATION OF HULL STRUCTURAL SURVEYS**

[IACS Rec 111]

### **100. Introduction**

101. This Chapter provides guidelines for preparation of hull structural surveys on passenger ships, with focus on areas with accessibility problems.

102. Within the scope of ship's classification, the periodical surveys are of prime importance as far as structural assessment of the ship is concerned.

103. The purpose of hull classification periodical surveys is to confirm that the hull and equipment comply with the applicable Classification requirements and will remain in satisfactory condition, based on the understanding that ships are to be maintained and operated at all times at the diligence of the Owners in proper condition complying with the relevant requirements and regulations.

104. This Chapter includes a review of survey preparation guidelines which cover the safety aspects related to the performance of the survey, the necessary access facilities, and the preparation necessary before the surveys can be carried out.

105. An important feature of this guideline is the section on accessibility to different parts of the ship structures for passenger ships due to the wide variety of configurations and possible limited access.

106. This Chapter has been developed using the best information currently available. It is intended only as guidance in support of the sound judgment of owners, and is to be used at the owners' discretion, except for A62.200 and A6.300, which are extracts from Parts and below are extracts from, Part I, Title 02, Section 2, Chapter A (IACS UR Z7), and, as such, are mandatory requirements. Should there be any doubt with regard to interpretation or validity in connection with particular applications, clarification should be obtained from the Classification Society concerned.

107. The owner's representative should be aware of the scope of the coming survey and instruct those who are responsible, such as the Master or the Superintendent, to prepare the necessary arrangements. Execution will naturally be heavily influenced by the type and scope of the survey to be carried out. If there is any doubt, the Classification Society concerned should be consulted.

### **200. Condition for Survey**

201. The Owner is to provide necessary facilities for a safe execution of the survey.

202. Tanks and spaces are to be safe for access, i.e. gas freed, ventilated and illuminated.

203. In preparation for survey and thickness measurements and to allow for a thorough examination, all spaces are to be cleaned including removal from surfaces of all loose accumulated corrosion scale. Spaces are to be sufficiently clean and free from water, scale, dirt, oil residues etc. to reveal corrosion, deformation, fractures, damages, or other structural deterioration. However, those areas of structure whose renewal has already been decided by the Owner need only be cleaned and descaled to the extent necessary to determine the limits of the areas to be renewed.

204. Sufficient illumination is to be provided to reveal corrosion, deformation, fractures, damages or other structural deterioration.

205. Where soft or semi-hard coatings have been applied, safe access is to be provided for the surveyor to verify the effectiveness of the coating and to carry out an assessment of the conditions of internal structures which may include spot removal of the coating. When safe access cannot be provided, the soft or semi-hard coating is to be removed.

### **206. Access to structures**

- a. For survey, means are to be provided to enable the surveyor to examine the hull structure in a safe and practical way.
- b. For survey in cargo holds and water ballast tanks, one or more of the following means for access, acceptable to the Surveyor, is to be provided:
  - b.1. permanent staging and passages through structures;
  - b.2. temporary staging and passages through structures;
  - b.3. lifts and movable platforms;
  - b.4. boats or rafts;
  - b.5. other equivalent means.

## 207. Survey planning meeting

- a. The survey planning meeting is a requirement in A.2 for intermediate and renewal surveys.
- b. It is however good practice to hold such a meeting also before commencing annual survey and any other periodical and non-periodical survey.
- c. During this meeting, issues described in A6.201 through 205 and A6.206 above and in A6.402 should be addressed accordingly, in particular access to the areas mentioned in A6.303 through A6.310, using the accessibility document described in A6.302
- d. Also refer to IACS Part I, Title 32, Section 6 (Recommendation 44), "Survey Guidelines for tanks in which soft coatings have been applied".

## 208. Documentation on Board

- a. The following documentation should be readily available when planning the survey.
  - a.1. structural plans of the areas to be surveyed;
  - a.2. accessibility document as detailed in A6.302 below.
  - a.3. Prior to survey, it is recommended that the documents on board the ship be reviewed as a basis for the current survey.

## 300. Accessibility to ship structure

### 301. General accessibility

The areas relevant for structural surveys depend on the design and there are large differences between different ship configurations. The structural survey of a passenger ship may involve a large variety of differing access problems due to the complexity of the structure.

Surveyable items are not specifically confined to tank examination, but will involve access to various other parts of the internal structure and the shell plating.

### 302. Access and inspection planning

- a. It is recommended that an accessibility document is developed for each ship or class of ship containing the relevant information for accessing the structures indicated in A6.303 through A6.310 below.
- b. The document should be retained onboard for use by owner's representatives and surveyors intending to examine the relevant spaces, structure and items.
- c. This document should also be referred to in the owners planned maintenance scheme.

- d. The accessibility document should refer to the operator's Safety Management System and should include the following as applicable:
  - d.1. discontinuities and/or openings in continuous longitudinal bulkheads
  - d.2. manhole/inspection opening arrangement and location(s)
  - d.3. ladders and hand-holds
  - d.4. specific safety issues for the individual item where extra precaution or procedures for access is required
  - d.5. damage stability subdivision zones/boundaries
  - d.7. location of and means for inspection of ventilation duct valves and fire flaps with controls

## 303. Longitudinal bulkheads

- a. The continuous longitudinal bulkheads are, together with the ship sides, the webs of the hull girder, carrying the shear loads created by the differences in buoyancy and weight distribution along the ship as well as those created by sea loads. The longitudinal bulkheads also contribute to resisting the longitudinal bending, particularly near the upper decks and the bottom structure.
- b. Wherever there are discontinuities/openings in the longitudinal bulkheads the stresses from the loads above will have to flow "around" these discontinuities resulting in stress concentrations at the corners. It should be noted that fractures may be observed, particularly at the upper and lower zones of the bulkheads.
- c. Examples of discontinuities include fire-screen door openings, cable and pipe penetrations, elevator access arrangements and ventilation duct openings. (An example of such fractures is shown in Figure F.A6.303.1).
- d. Access to these areas may be required in connection with Class Renewal or Continuous Surveys, or more often where considered necessary.

**FIGURE F. A6.303.1 - OPENINGS IN LONGITUDINAL BULKHEAD – A FRACTURE IN WAY OF A DOOR FRAME**



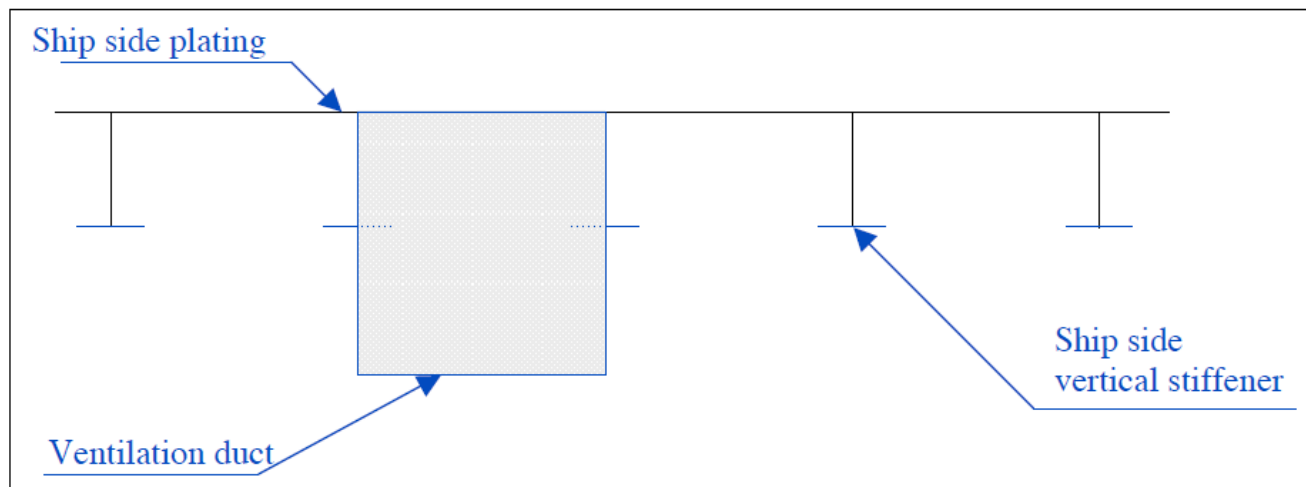
**304. Downflooding ducts**

- a. Downflooding ducts are fitted in order to meet the SOLAS damage stability criteria. Their purpose is to transfer water to a lower compartment in case of water ingress and thereby improve stability in the damaged condition.
- b. Downflooding ducts are normally found on the ship sides, integrated into the structure by using the side shell plating as one of their boundaries.
- c. Under certain conditions accelerated corrosion can take place to the internal structure and associated shell plating in way of these ducts. Maintenance and regular inspection is of vital importance to ensure the watertight integrity of the ship.

**305. Ventilation ducts**

- a. The ventilation ducts may in general be categorized in two groups, structural and nonstructural.
  - a.1. **Structural** ventilation ducts are stiffened in such a way that the boundaries can withstand loads other than just the loads from air pressure and may be integrated with the ship structure or self supporting. These ducts are used in cases where a ventilation duct is crossing a watertight bulkhead, or in spaces that may be filled in case of damages according to the damage scenarios calculated for the ship.
  - a.2. **Non-structural** ventilation ducts are “thin” compared to the structural ducts and are normally only designed to withstand the air pressure. They are thus only used within one vertical division and for areas above the waterline where water filling is not likely to occur in case of damages.
- b. Of the two types of ventilation ducts, access to and inspection of the structural ventilation ducts is considered particularly important as a potential transfer of water along a ventilation duct from one compartment to another may have severe consequences for the ship.
- c. The condition of the ventilation ducts using the ship’s side shell plating as one of the duct boundaries, both structural and non-structural (layout is shown in Figure F.A6.305.1, is particularly important for both maintenance and regular inspection.

**FIGURE F.16.305.1 - PLAN VIEW OF VENTILATION DUCT USING SHIP SIDE SHELL AS ONE OF THE BOUNDARIES**



### 306. Air Pipes

307. All internal tanks will have air pipes to prevent overpressure or vacuum in case of filling or discharging. Air pipes may end in the engine room for smaller tanks, but are normally extended to higher external decks or led directly overboard above the waterline.

308. Where extended to higher decks or led overboard, the air pipes may be crossing other compartments and will, in service or accommodation decks, often be hidden behind panels.

309. Some of the air pipes will be subject to a corrosive environment adversely affecting the pipe itself and also the vent heads.

310. Also refer to IACS Unified Requirement Part III, Title 62, Section 6, Chapter T, T.8 (UR Z22), "Survey Requirements for Automatic Air Pipe Heads".

### 311. Grey and black water tanks, including biological treatment system tanks

- a. The main challenges with these tanks are the corrosive environment, the lack of access and time window for routine internal inspection and maintenance whilst the ship is in service.
- b. If the internal structures are kept unprotected, the corrosive environment may cause leaks and water ingress/egress, giving rise to a risk of pollution or a reduced tank capacity as a result.
- c. Surveys of these tanks are recommended to be planned well in advance to coincide with planned dockings. Some biological treatment systems may require a lead time to re-establish operational capability.

### 312. Stabiliser housings

- a. Due to the limited access opportunities for inspection, it is recommended that during dry docking survey, the fin housings and in particular the welds in the fin/hull connection, with the fin extended, should be surveyed.

### 313. Structures adjacent to refrigerated rooms

- a. Structures adjacent to refrigerated rooms may have an increased risk of condensation leading to deterioration of the structures. In particular, the structures below the refrigerated rooms may be subject to deterioration.
- b. In cases where refrigerated stores are located adjacent to the side shell, there may be an increased risk of condensation leading to deterioration of the side shell structure.
- c. As the access to the side shell structure in these areas will be restricted, it is recommended that, in

addition to the deck below, the surrounding structure also be examined as far as practicable, in particular the connection to the ship side structure below the refrigerated store.

### 314. Permanent ballast

315. In some ships, permanent or fixed ballast may be fitted in some of the ballast tanks. Such ballast may be of a corrosive or non-corrosive type. When corrosive ballast is used, it should be protected from the main factors causing corrosion and kept under observation.

316. For a type of ballast that needs to be kept under observation, a manual describing these procedures should be retained onboard.

317. In cases of liquid permanent ballast, a material test piece may be fitted to the access cover of the tank, hanging into the liquid for monitoring of the corrosion activities in the tank. In addition, a chemical test of the ballast fluid from mid-depth should be done to confirm that the inhibitors are still effective.

318. In cases of non-liquid ballast, sample areas may be required to be cleared to enable access for survey and ballast material should be visually examined for shifting or settling and excessive moisture.

## 400. Tank corrosion

### 401. General

- a. In tanks with a corrosive environment, the corrosion of the structure may be accelerated where the tank is not coated or where the protective coating has not been properly maintained, and can lead to fractures of the internal structures and the tank boundaries.
- b. When corrosion occurs, it may be accelerated by factors like higher temperatures, humidity, salinity and presence of oxygen.
- c. In water ballast tanks, wastage of the internal structure can be a major problem, in particular on older ships.
- d. Whilst corrosion may be found in all parts of a tank, the ullage space of tanks with a corrosive environment is known to be prone to accelerated rates of corrosion.

### 402. Tanks with constant water levels

401. In order to ensure a proper survey onboard, it is important to take into account operational information such as constant water levels of certain ballast tanks.

402. For tanks with a "typical" or stable filling level, and in particular those with a corrosive environment, e.g. water ballast tanks, high corrosion rates may normally be found

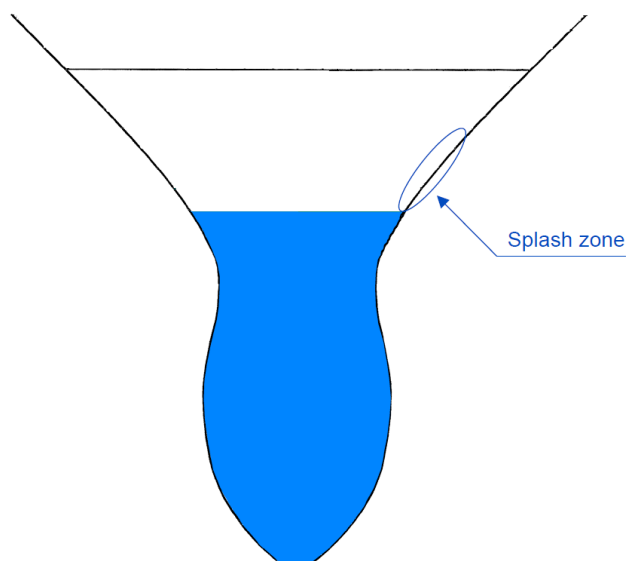


in the splash zone right above the filling level (see figure F.A6.402.1)

403. At the survey planning meeting, it should be established if any of the tanks to be surveyed have a normal/stable working level of liquid content, and the surveyor is to be made aware of this level.

404. The surveyor is further to be made aware of any previous problems associated with the tanks to be examined.

**FIGURE F.A6.402.1 - FORE PEAK TANK WITH  
“TYPICAL” FILLING LEVEL**



## CHAPTER B PROCEDURES AND SCOPE OF SURVEYS IN VESSELS HAVING GT < 500

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#### B1. PREPARATION FOR SURVEY

#### B2. ITEMS SUBJECT TO INSPECTION IN SURVEYS FOR MAINTENANCE OF CLASS IN SHIPS WITH GT < 500

#### B3. RENEWAL SURVEYS FOR SHIPS WITH GT < 500

#### B4. BOILER SURVEYS

### B1 PREPARATION FOR SURVEY

#### 100. Readiness

101. The parties responsible for the vessel shall request the presence of a surveyor in order to carry out the due surveys, providing the conditions for the surveys and tests as described in this Chapter. The conditions for survey contained in Part I, Title 02, Section 2, Chapter A are to be complied with as far as possible.

#### 200. Documentation and approved plans

201. At the commencement of each survey, the parties responsible for the vessel shall make available to the surveyor all the legal documentation and the approved design relevant to the requested survey.

#### 300. Definitions

301. See Part I, Title 02, Section 2, Chapter A item A2.200.

### B2. ITEMS SUBJECT TO INSPECTION IN SURVEYS FOR MAINTENANCE OF CLASS IN SHIPS WITH GT < 500

#### 100. Hull Annual Survey - VAC

101. Annual Hull Surveys are to be held within 3 months before or after each anniversary date of the date of the initial classification survey or the completion of the last Renewal Survey. The survey is to consist of an examination for the purpose of ensuring, as far as practicable, that the hull, hatch covers, hatch coamings, closing appliances, equipment and related piping are maintained in a satisfactory condition. The following parts are to be inspected. However, at surveyor's discretion, the inspection of additional items / áreas may be requested for a more detailed analysis:

a. Hull: all parts;

- b. Outer shell plating above the waterline, relevant shell doors and accessible parts of the rudders;
- c. Plating of the strength deck and exposed decks, including the condition of the welding seams of the deck plating;
- d. Internal structure of the Engine Room, Pump Room and Steering Gear Room, including the bottom below the floor: to ascertain the conditions of plating as to corrosion;
- e. Other areas subject to corrosion
- f. collision and the other watertight bulkheads as far as can be seen:
  - f.1. watertight penetrations as far as practicable;
  - f.2. Examination of and testing (locally and remotely) all the watertight doors in watertight bulkheads
- g. anchoring and mooring equipment as far as can be seen, including tests of operation and performance of the windlass;
- h. superstructure and the means of closure of the openings therein, with special consideration to end bulkheads;
- i. watertight doors, manholes, hatches, side scuttles and deadlights on the freeboard deck, watertight integrity of the closures to any openings in the ship's side below the freeboard deck including watertightness tests;
- j. weather tightness of cargo hatchways, other hatchways and other openings on the freeboard and superstructure decks including watertightness tests;
- k. handrails and bulwarks including the provision of freeing ports, attention being given to any freeing ports fitted with shutters; guardrails, gangways, walkways and other means provided for the protection of the crew and means for safe passage of crew;
- l. examine the fire fighting equipment, such as fire extinguishers, to confirm the general condition. See item B2.201 sub-item "r" below.
- m. fire resistant doors and visual and sound alarms to be inspected to ascertain the condition, operation and effectiveness. See item B2.201 sub-item "s" below;
- n. steering gear: examination of and testing the operation of main and auxiliary steering arrangements, including hydraulic units, sectors, tillers, chains, rudder angle indicators, and accessories such as transmissions and breaks, their

associated equipment and control systems, including tests of alarms and operation:

n.1. Confirmation that the means of communication between the navigation bridge and steering gear compartment and the means of indicating the angular position of the rudder are operating satisfactorily

n.2. Confirmation that with ships having emergency steering positions there are means of relaying heading information and, when appropriate, of supplying visual compass readings to the emergency steering position

n.3. Confirmation that the various alarms required for hydraulic power operated, electric and electro hydraulic steering gears are operating satisfactorily and that the re charging arrangements for hydraulic power operated steering gears are being maintained

o. areas destined to safety of the vessels and its crew to be inspected to ascertain their general condition;

p. drainage from enclosed cargo spaces situated on the freeboard deck is satisfactory

q. functionality of bilge well alarms to all cargo holds and conveyor tunnels, if any

r. garbage chutes, if any

s. for single hull, single hold cargo ships, examination of the cargo hold water level detector and its audible and visual alarm

## **200. Annual Machinery Survey [IACS Rec 99 IACS UR Z18]**

201. Annual Machinery Surveys are to be held within 3 months before or after each anniversary date of the date of the initial classification survey or the completion of the last Renewal Survey. They will normally be performed at the same time as an Annual Hull or Load Line survey. A general examination of the machinery, the boilers, all steam, hydraulic, pneumatic and other systems and their associated fittings to see whether they are being properly maintained and with particular attention to the fire and explosion hazards. Where deemed necessary by the Surveyor, further and/or more detailed inspections may be required.

a. Examination of all Main Engine parts, Auxiliary Engine parts, reduction gears and couplings including bases. Operational and performance tests will be required when deemed necessary.

b. Confirmation that the normal operation of the propulsion machinery can be sustained or restored even though one of the essential auxiliaries becomes inoperative.

c. Examination of the means for the operation of the main and auxiliary machinery essential for the propulsion and the safety of the ship, including, when applicable, the means of remotely controlling the propulsion machinery from the navigating bridge (including the control, monitoring, reporting, alert and safety actions) and the arrangements to operate the main and other machinery from a machinery control room.

d. Examination of the ventilation systems for the spaces below the freeboard deck and closed superstructures to confirm that all means of closure and manual and automatic stops are in working condition;

e. Confirmation of that the machinery, boilers and other pressure vessels, associated piping systems and fittings are installed and protected so as to reduce to a minimum any danger to persons on board, due regard being given to moving parts, hot surfaces and other hazards

f. Auxiliary boilers: see Part I, Title 02, Section 2, subchapter C8 below.

g. Where multiple boilers are fitted, the internal examination is to be carried out in accordance with Part I, Title 02, Section 2, subchapter C8 below.

h. Examination of heat exchanger systems which are part of the essential services to confirm the general operational and maintenance condition. Special consideration is to be given to all the safety devices.

i. Examination, as far as practicable, visual and in operation, of the electrical installations, including the main source of power and the lighting systems.

j. Confirmation that, as far as practicable, the operation of the emergency source(s) of electrical power including their starting arrangements, the systems supplied and, when appropriate, their automatic.

k. Examination, in general, of the precautions provided against shock, fire and other hazards of electrical origin are being maintained.

l. Examination of the arrangements for periodically unattended machinery spaces.

m. Examination of all piping, pumps and accessories of the essential services to confirm the general operational and maintenance condition. Operational tests may be required if deemed necessary.

n. Examination of air vents heads and piping, sounding pipes to confirm the general operational and maintenance condition:

- n.1. Examination of the weld connection between air pipes and deck plating.
- n.2. External examination of all air pipe heads installed on the exposed decks.
- n.3. Examination of flame screens on vents to all bunker tanks.
- n.4. Examination of ventilators, including closing devices, if any.
- o. Examination of scuppers, sounding pipes to confirm general operational and maintenance condition. Where fitted, to confirm means of drainage and means of closure.
- p. Visual examination of the condition of any expansion joints in seawater systems
- q. Confirmation that the engine room telegraph, the second means of communication between the navigation bridge and the machinery space and the means of communication with any other positions from which the engines are controlled are operating satisfactorily. Confirmation of that the engineer's alarm is clearly audible in the engineers' accommodation.
- r. Firefighting equipment – where fitted, the following items are to be inspected at the annual survey:
  - r.1. Examination of the fire pumps, fire main, hydrants, hoses and nozzles and the international shore connection and checking that each fire pump, including the emergency fire pump, can be operated separately so that two jets of water are produced simultaneously from different hydrants at any part of the ship whilst the required pressure is maintained in the fire main.
  - r.2. Verification of the provision and randomly examination of the condition of the portable and non portable fire extinguishers.
  - r.3. Verification of the operational readiness and maintenance of fire-fighting systems.
  - r.4. Examination of the fixed fire-fighting system for the machinery (when fitted), cargo, vehicle, special category and ro-ro spaces, as appropriate, and confirmation of that its means of operation is clearly marked.
- s. Fixed gas fire-extinguishing system, when fitted:
  - s.1. bottles of CO<sub>2</sub> (or other gas) fixed fire-extinguishing systems and their accessories, including the insulation for insulated low pressure CO<sub>2</sub> containers
- s.2. system controls, piping, instructions and marking; proper maintenance and servicing, including date of last system tests which must be engraved on the bottles
- s.3. release alarm triggered before the CO<sub>2</sub> is released
- t. Sprinkler system, when fitted
  - t.1. system, including piping, valves, sprinklers and header tank
  - t.2. test of the automatic starting of the pump activated by a pressure drop alarm system while the above test is carried out
- u. Water-spraying system, when fitted
  - u.1. system, including piping, nozzles, distribution valves and header tank
  - u.2. starting of the pump activated by a pressure drop (applicable only for machinery spaces)
- v. fixed foam systems (low or high expansion), when fitted
  - u.1. examination of the foam system
  - u.2. the minimum number of jets of water at the required pressure in the fire main is obtained when the system is in operation
  - u.3. checking the supplies of foam concentrate and receiving confirmation that it is periodically tested (not later than three years after manufacture and annually thereafter) by the manufacturer or an agent
- w. Dry powder system, when fitted
  - w.1. dry powder system, including the powder release control devices
  - w.2. check the supplies of powder contained in the receivers and that it has maintained its original smoothness
  - w.3. check that the pressure of propelling inert gas contained in the relevant bottles is satisfactory.
- x. Examination of the fire-extinguishing and special arrangements in the machinery spaces and confirmation of, as far as practicable and as appropriate, the operation of the remote means of control provided for the opening and closing of the skylights, the release of smoke, the closure of the funnel and ventilation openings, the closure of power operated and other doors, the stopping of ventilation and boiler forced and induced draft fans

- and the stopping of oil fuel and other pumps that discharge flammable liquids.
- y. Examination of, as far as possible, and testing, as feasible, any fire detection and alarm system.
- z. Examination of the fire-extinguishing systems for spaces containing paint and/or flammable liquids and deep-fat cooking equipment in accommodation and service spaces.
- aa. Examination of the helicopter facilities.
- aa.1. drainage arrangements around the landing area
- aa.2. fire fighting appliances and arrangements
- aa.3. refuelling systems and hangar facilities for cleanliness and absence of leaks, condition of gutters and drainage arrangement.
- bb. Examination of and testing of the general emergency alarm system.
- cc. Examination of the fire protection arrangements in cargo, vehicle and ro-ro spaces and confirmation of, as far as practicable and as appropriate, the operation of the means of control provided for closing the various openings.
- dd. Examination of, when appropriate, the special arrangements for carrying dangerous goods, including checking the electrical equipment and wiring, the ventilation, the provision of protective clothing and portable appliances and the testing of the water supply, bilge pumping and any water spray system.
- ee. Confirmation, as far as practicable, that no changes have been made in the structural fire protection, examination of any manual and automatic fire doors and proving their operation, testing the means of closing the main inlets and outlets of all ventilation systems and testing the means of stopping power ventilation systems from outside the space served.
- ff. Confirmation that the means of escape from accommodation, machinery and other spaces are satisfactory.

202 Where the Annual Machinery Survey coincides with a Propeller Shaft Survey or with an In Water Survey the following additional item is to be measured and operationally tested, as relevant:

- a. fire pumps and emergency fire pumps;
- b. clearance of the thrust bearing of main and auxiliary turbines of the propulsion system;

- c. crankshaft deflexion and axial clearance of the thrust bearing of the Main Engine of the propulsion system;
- d. crankshaft deflexion and axial clearance of the thrust bearing of the Auxiliary Engines; and
- e. isolation of each generator, motor, driver, connection switches, switchboards, electric cables and their connections.

### 300. Hull Intermediate Survey - VIC

301. The Intermediate Survey is to be carried out either at or between the second and third Annual Survey. The Intermediate Survey is to include, in addition to the requirements of the Annual Survey, examination and checks on a sufficiently extensive part of the structure to show that the structures of the ship are in satisfactory condition so that the ship is expected to operate until the end of the current period of class, provided that the ship is properly maintained and other surveys for maintenance of class are duly carried out during this period. Those items which are additional to the requirements of the Annual Surveys may be surveyed either at or between the 2nd and 3rd Annual Survey. The additional items of the Hull Intermediate Survey are listed below:

- a. ship structure – all ships:
- a.1. Internal examination of at least three tanks or void spaces employed in ballasting; and
- a.2. Internal examination of the peak tanks
- b. Windlass and capstan of the anchoring system;
- c. Winches and capstan of the mooring system;
- d. Examination and operation on board of the main steering gear and auxiliary / emergency steering gear;
- e. In bulk carriers under 500 GT and not subject to the ESP programme of age > 5 years:
- e.1. Internal examination of the cargo holds and other cargo spaces, including bilge wells and scuppers; and
- e.2. Detailed close up examination of three complete transverse sections representative of 1/3 of the deck beams and shell frames in each cargo hold, including the end brackets of shell frames, bulkhead stiffeners and side shell longitudinals.
- f. In oil tankers under 500 GT and not subject to the ESP programme of age > 10 years:
- f.1. Internal examination of at least three cargo tanks;



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| <p>f.2. Close up examination of all the web frame rings and associated structural members in one side ballast tank and one side tank frequently used for ballast and cargo;</p> <p>f.3. Close up examination of one transverse bulkhead and associated structural members in one side ballast tank and one side tank used for ballast and cargo;</p> <p>f.4. Close up examination of the bottom plating, and the bottom strake of longitudinal and transverse bulkheads in one ballast tank and one side cargo and ballast tank;</p> <p>f.5. Measurement of the insulation of all electrical equipment and cables installed in hazardous zones and adjacent to the cargo tanks;</p> <p>f.6. Operational test of the fixed devices for monitoring the insulation of electrical devices, if fitted;</p> <p>f.7. Operational test of pressurized equipment, if existing, and associated alarms;</p> <p>f.8. Cargo hoses;</p> <p>f.9. Measurement of the insulation of all electrical equipment and cables installed in the cargo pump room;</p> <p>f.10. Confirming the working condition of the detectors of the oil-water interface;</p> <p>f.11. Confirming the calibration of the crude oil content device for light oil products, heavy oil products and crude oil;</p> <p>f.12. Confirming the operational condition of the shut off valves or blind flanges for the steam heaters; and</p> <p>f.13. Confirming the efficiency of the crude oil washing (COW) system in two tanks</p> | <p>b. Examination of internal areas of the bottom plating, confirming the condition of the structure and coating, and the adherence of the coating to the plating.</p> <p>c. Examination of all structural tanks, peak tanks, duct keels and void spaces to confirm the condition of the structure and coating. Where plate renewal has been carried out, to carry out tests to confirm watertightness.</p> <p>d. Examination of all the watertight bulkheads. Where excessive wear is found, a thickness measurement is to be requested for the affected areas.</p> <p>e. Examination of structural members where lining is fitted by removal of parts and confirmation of the condition of the structural members underneath.</p> <p>f. Examination of the rudder stock in all accessible areas, non destructive tests by an approved method to detect cracks in the flange welding, fixing bolts and keyway. Where deemed necessary, the Surveyor may require the bending deflections are to be measured and controlled. Supervision of the assembling of the system to confirm the tightening and locking of the bolts.</p> <p>g. Rudder stock tube: in all accessible parts, measurement of the bearing clearances;</p> <p>h. Examination of the rudder plating to confirm the watertightness and general condition of the welding seams.</p> <p>i. Internal and external examination of all the bottom valves, including connections with the shell plating, to confirm the contact between the disk and the seating.</p> <p>j. Examination of all side shell overboard and sanitary discharges to confirm the operation, condition and connection with the side shell plating.</p> <p>k. Examination of the gas detection system, eventual leaks and wear in the cargo pump compartment.</p> |
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#### 400. Dry Dock Survey - VDC

401. The Dry Dock survey items to be surveyed are listed below. However, the Surveyor may request further examinations depending upon the condition found.

- a. All external hull plating, deck plating; examination of the welding seams in way of the crossings with special attention to crossings, ascertaining the wear condition. Thickness measurements may be requested by the Surveyor in case it is deemed necessary. Supervision of all the welding stages in the hull areas where plate renewal has been carried out; tests to detect discontinuities;

402. At the Renewal Surveys, the tailshaft is to be removed and the stern tube checked internally. The tailshaft survey is to be carried out in accordance with the requirements of Part I, Title 02, Section 2, subchapter C6.

#### 600. In Water Hull Survey

601. The In-water Survey is to provide the information normally obtained from a docking survey. Special consideration shall be given to ascertaining rudder bearing clearances and stern bush clearances of oil stern bearings based on a review of the operating history, on board testing and stern oil sample reports. These considerations are to be included in the proposals for in-water survey

which are to be submitted in advance of the survey so that satisfactory arrangements can be agreed with the RBNA.

602. The In-water Survey is to be carried out with the ship in sheltered water and preferably with weak tidal streams and currents. The in-water visibility and the cleanliness of the hull below the waterline is to be clear enough to permit a meaningful examination which allows the surveyor and diver to determine the condition of the plating, appendages and the welding. The RBNA is to be satisfied with the methods of orientation of the divers on the plating, which should make use where necessary of permanent markings on the plating at selected points.

603. The equipment, procedure for observing and reporting the survey are to be discussed with the parties involved prior to the In-water Survey, and suitable time is to be allowed to permit the diving company to test all equipment beforehand.

604. The In-water Survey is to be carried out by a qualified diver under surveillance of a Surveyor. The diver is to be employed by a firm approved as a service supplier according to Part I, Title 2, Section 1.

605 The Surveyor is to be satisfied with the method of pictorial representation, and a good two-way communication between the Surveyor and divers is to be provided.

606. 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.

## **700. Hull In-Water Survey VSC**

701. Examination of the following items, which may be extended at Surveyor's discretion depending upon the conditions found:

- a. External hull plating below the waterline, bow, keel, bilge keel, stern post, tailshaft struts and other appendices.
- b. Examination of welding seams with special attention to crossings,
- c. Corrosion protection anodes and their fixing;
- d. Free board markings;
- e. Rudder stock tube, rudder stock, rudder pin at rudder stock and rudder pin bearing clearances;
- f. Rudder plating;
- g. Operational test of the steering gear system
- h. Examination to confirm that there are no alterations in the hull which may affect the freeboard calculations and/or the Rule requirements.

- i. Other hull areas below the waterline subject to corrosion or damage, fundamental for the safety of the vessel and its crew.

## **800. Machinery In-Water Survey - VSM**

801. Examination of the following items, which may be extended at Surveyor's discretion depending upon the conditions found:

- a. Stern tube;
- b. Tailshaft bearing clearances;
- c. Watertightness of the sealing or gaskets;
- d. propellers;
- e. operational test of the propulsion system;
- f. sanitary and overboard discharges and their connections to the side shell plating
- g. sea chests and side thruster tunnels
- h. shell and bottom valves;
- i. dredging system valves for dredgers, when existing.

## **B3. RENEWAL SURVEY FOR SHIPS GT < 500 [IACS Z7]**

### **100. Schedule**

101. Renewal Surveys are to be carried out at 5 years intervals to renew the Classification Certificate.

102. The first Renewal Survey is to be completed within 5 years from the date of the initial classification survey and thereafter 5 years from the credited date of the previous Renewal Survey. However, an extension of class of 3 months maximum beyond the 5th year can be granted in exceptional circumstances. In this case, the next period of class will start from the expiry date of the Renewal Survey before the extension was granted.

103. For surveys completed within 3 months before the expiry date of the Renewal Survey, the next period of class will start from the expiry date of the Renewal Survey. For surveys completed more than 3 months before the expiry date of the Renewal Survey, the period of class will start from the survey completion date.

104. The Renewal Survey may be commenced at the 4th Annual Survey and be progressed with a view to completion by the 5th anniversary date. When the Renewal Survey is commenced prior to the 4th Annual Survey, the entire survey is to be completed within 15 months if such work is to be credited to the Renewal Survey.

105. A survey planning meeting is to be held prior to the commencement of the survey.

106. Concurrent crediting to both Intermediate Survey (VIC) and Renewal Survey (VRC, VRM) for surveys and thickness measurements of spaces are not acceptable.

**200. Scope of hull Renewal surveys for vessels of GT < 500**

201. The Renewal Survey is to include, in addition to the requirements of the Annual Survey, examination, tests and checks of sufficient extent to ensure that the hull, equipment and related piping are in satisfactory condition and fit for the intended purpose for the new period of class of five years to be assigned, subject to proper maintenance and operation and the periodical surveys being carried out at the due dates.

202. The examinations of the hull are to be supplemented by thickness measurements and testing to ensure that the structural integrity remains effective. The aim of the examination is to discover Substantial Corrosion, significant deformation, fractures, damages or other structural deterioration, that may be present.

203. The Renewal Survey is to include examination of a bottom survey in dry condition as per item B2.400above.

204. The anchors and chain cables are to be ranged, examined and the required complement and condition verified. The chain locker, holdfasts, hawse pipes and chain stoppers are to be examined and pumping arrangements of the chain locker tested. At Renewal Survey No. 2 and subsequent Renewal Surveys, chain cables are to be gauged and renewed in cases where their mean diameter is worn below the limits allowed by the Society.

205. All spaces including holds and their 'tween decks where fitted; double bottom, deep, ballast, peak and cargo tanks; pump rooms, pipe tunnels, duct keels, machinery spaces, dry spaces, cofferdams and voids are to be completely emptied, thoroughly cleaned and, when necessary gas freed, and then internally examined including the plating and framing, bilges and drain wells, sounding, venting, pumping and drainage arrangements. Internal examination of fuel oil, lube oil and fresh water tanks is to be carried out in accordance with Table T.B3.205.1. When plate Renewal is required, the affected tanks are to be tested by water column or any other alternative method of checking their water tightness. When inspecting ballast tanks, special attention is to be given to the area near the peak tank bulkheads;

206. Engine room structure is to be examined. Particular attention is to be given 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. Particular attention is to be given to the sea suction, sea water cooling pipes and overboard discharge valves and their connections to the shell plating. Where wastage is evident or suspect, thickness measurements are

to be carried out, and Renewals or repairs made when wastage exceeds allowable limits.

207. Where provided, the condition of corrosion prevention system of ballast tanks is to be examined. For ballast tanks, excluding double bottom tanks, where a hard protective coating is found in POOR condition and it is not renewed, where soft or semi-hard coating has been applied, or where a hard protective coating was not applied from time of construction, the tanks in question are to be examined at annual intervals. Thickness measurements are to be carried out as deemed necessary by the surveyor.

208. When such breakdown of hard protective coating is found in double bottom ballast tanks and it is not renewed, where a soft or semi-hard coating has been applied, or where a hard protective coating was not applied from the time of construction, the tanks in question may be examined at annual intervals. When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurements are to be carried out.

209. Boundaries of double-bottom, deep, ballast, peak, and other tanks, including holds adapted for the carriage of salt water ballast, are to be tested with a head of liquid to the top of air pipes or to near the top of hatches for ballast/cargo holds. Boundaries of fuel oil, lube oil and fresh water tanks are to be tested with a head of liquid to the highest point that liquid will rise under service conditions. Tank testing of fuel oil, lube oil and fresh water tanks 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. The Surveyor may extend the testing as deemed necessary.

210. Decks are to be examined, particular attention being given to the areas where stress concentration or increased corrosion is likely to develop, such as hatch corners and other discontinuities of structure.

- a. Deck erections such as hatch coamings, deckhouses and superstructures are to be examined.
- b. The sheathing of wood-sheathed steel decks may be removed, at the Surveyor's discretion, in the case of doubt as to the condition of plating underneath.
- c. Due attention is to be given to the examination in way of end and side openings and related shell and inner doors.
- d. Hatch covers: this survey shall, as a minimum, consist of:
  - d.1. a thorough inspection of the items listed above; and in addition:
  - d.2. checking of the satisfactory operation of all mechanically operated hatch covers:

- i. stowage and securing in open condition;
  - ii. proper fit, locking and efficiency of sealing in closed condition;
  - iii. operational testing of hydraulic and power components, wires, chains, and link drives;
- d.3. checking the effectiveness of sealing arrangements of all hatch covers by hose testing or equivalent as necessary;
- d.4. checking the residual thickness of coamings, steel pontoon or hatch cover plating and stiffening members as deemed necessary by the Surveyor.

211. Thickness measurements are to be carried out in accordance with Table T.B3.211.1. The Surveyor may extend the thickness measurements as deemed necessary. When thickness measurements indicate substantial corrosion, the extent of thickness measurements is to be increased to determine areas of substantial corrosion. Table T.B3.211.2 may be used as guidance for these additional thickness measurements. These extended thickness measurements are to be carried out before the survey is credited as completed.

212. All bilge and ballast piping systems are to be examined and operationally tested to working pressure to attending Surveyor's satisfaction to ensure that tightness and condition remain satisfactory.

213. Sea valves and cocks are to be opened up for internal examination.

214. For all ships except for passenger ships, automatic air pipe heads are to be completely examined (both externally and internally) as indicated in Table T.B3.214.1.

215. For designs where the inner parts cannot be properly inspected from outside, this is to include removal of the head from the air pipe. Particular attention is to be paid to the condition of the zinc coating in heads constructed from galvanised steel.

216. Where decks and/or holds are fitted with wooden floor, one section near the centre and one section at the sides is to be removed and inspected to surveyor's satisfaction.

217. Lining inside the accommodation, especially under windows and scuttles, are to be removed to confirm the condition of the plating underneath at surveyor's discretion.

**TABLE T.B3.211.1 MINIMUM REQUIREMENTS FOR THICKNESS MEASUREMENTS AT RENEWAL SURVEY**

<b>Renewal Survey No.1 VRC1 Age ≤5</b>	<b>Renewal Survey No.2 VRC2 5 &lt;Age ≤10</b>	<b>Renewal Survey No.3 VRC3 10 &lt;Age ≤15</b>	<b>Renewal Survey No.4 and Subsequent VRC4 15 &lt;Age</b>
1) Suspect areas throughout the vessel.	1) Suspect areas throughout the vessel. 2) External shell plating and strength deck plating: measurements by an approved method in at least four (4) points per plate to confirm the actual thicknesses	1) Suspect areas throughout the vessel. 2) External shell plating and strength deck plating: measurements by an approved method in at least four (4) points per plate to confirm the actual thicknesses 3) Bulkhead plating and internal structural members which present corrosion wear	1) Suspect areas throughout the vessel. 2) External shell plating and strength deck plating: measurements by an approved method in at least four (4) points per plate to confirm the actual thicknesses 3) Bulkhead plating and internal structural members which present corrosion wear
	3) One transverse section of deck plating in way of a cargo space within the amidships 0.5L	2) Two transverse sections within the amidships 0.5L in way of two different cargo spaces.	2) A minimum of three transverse sections in way of cargo spaces within the amidships 0.5L.
		3) All cargo hold hatch covers and coamings (plating and stiffeners).	3) All cargo hold hatch covers and coamings (plating and stiffeners).
		4) Internals in forepeak and after peak tanks.	4) Internals in forepeak and after tanks
			5) All exposed main deck plating full length.
			6) Representative exposed superstructure deck plating (poop, bridge and forecastle deck).
			7) Lowest strake and strakes in way of 'tween decks of all transverse bulkheads in cargo spaces together with internals in way.
			8) All wind-and-water strakes, port and starboard, full length.
			9) All keel plates: full length. Also, additional bottom plates in way of cofferdams, machinery space, and aft end of tanks.
			10) Plating of sea chests. Shell plating in way of overboard discharges as considered necessary by the attending surveyor

**Notes:**

1. Thickness measurement locations are to 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. Thickness measurements of internals may be specially considered by the Surveyor if the hard protective coating is in GOOD condition.
3. For ships less than 100 meters in length, the number of transverse sections required at Renewal Survey No. 3 may be reduced to one (1), and the number of transverse sections required at Subsequent Renewal Surveys may be reduced to two (2).
4. For ships more than 100 meters in length, at Renewal Survey No. 3, thickness measurements of exposed deck plating within amidship 0.5 L may be required



**TABLE T.B3.211.2 GUIDANCE FOR ADDITIONAL THICKNESS MEASUREMENTS IN WAY OF SUBSTANTIAL CORROSION**

STRUCTURAL MEMBER	EXTENT OF MEASUREMENT	PATTERN OF MEASUREMENT
Plating	Suspect area and adjacent plates.	5 point pattern over 1 square meter.
Stiffeners	Suspect area.	3 measurements each in line across web and flange

**TABLE T.B3.205.1 MINIMUM REQUIREMENTS FOR INTERNAL EXAMINATION AT HULL RENEWAL SURVEYS OF FUEL OIL, LUBE OIL AND FRESH WATER TANKS**

Tank	Renewal Survey VF No. 1 Age ≤ 5	Renewal Survey No. 2 5 < Age ≤ 10	Renewal Survey No. 3 10 < Age ≤ 15	Renewal Survey No. 4 and Subsequent Age > 15
Fuel Oil Bunker tanks				
-Engine Room	None	None	One	One
-Cargo Length Area	None	One	Two	Half the total, minimum 2
Lube Oil	None	None	None	One
Fresh water	None	One	All	All

**Notes**

- 1) These requirements apply to tanks of integral (structural) type.
- 2) If a selection of tanks is accepted to be examined, then different tanks are to 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 in the cargo length area is to be included, if fitted
- 5) The fuel and oil tanks are to be completely emptied and degased.
- 6) If the inspection of the selected tanks is satisfactory, the remaining tanks need not be submitted to an internal examination. However, the watertightness of all tanks must be confirmed.

**TABLE T.B3.214.1 SURVEY REQUIREMENTS FOR AUTOMATIC PIPE HEADS AT RENEWAL SURVEYS**

Renewal Survey VRC1 Age < 5	Renewal Survey VRC2. 2 5 < Age ≤ 10	Renewal Survey VRC3 and VRC4 Age > 10
<ul style="list-style-type: none"> <li>- Two air pipe heads, one port and one starboard, located on the exposed decks in the forward 0.25 L, preferably air pipes serving ballast tanks.</li> <li>- Two air pipe heads, one port and one starboard, on exposed decks, serving spaced aft of 0.25 L, preferably air pipes serving ballast tanks.</li> </ul>	<ul style="list-style-type: none"> <li>- All air pipe heads located on the exposed decks in the forward 0.25L.</li> <li>- At least 20% of air pipe heads on the exposed decks serving spaces aft of 0.25 L, preferably air pipes serving ballast tanks</li> </ul>	<ul style="list-style-type: none"> <li>- All air pipe heads located on the exposed decks</li> </ul>

- (1) The selection of air pipe heads to be examined is left to the attending Surveyor.
- (2) According to the results of this examination, the Surveyor may require the examination of other heads located on the exposed decks.

### 300. Machinery Class Renewal Survey – from VRM1 on.

301. Renewal Machinery Surveys are to be carried out at 5 years intervals to renew the Class Certificate.

302. The first Renewal Survey is to be completed within 5 years from the date of the initial classification survey and thereafter 5 years from the credited date of the previous Renewal Survey. However, an extension of class of 3 months maximum beyond the 5th year can be granted in exceptional circumstances. In this case, the next period of class will start from the expiry date of the Renewal Survey before the extension was granted.

303. For surveys completed within 3 months before the expiry date of the Renewal Survey, the next period of class will start from the expiry date of the Renewal Survey. For surveys completed more than 3 months before the expiry date of the Renewal Survey, the period of class will start from the survey completion date.

304. The Renewal Survey may be commenced at the 4th Annual Survey and be progressed with a view to completion by the 5th anniversary date. When the Renewal Survey is commenced prior to the 4<sup>th</sup> Annual Survey, the entire survey is to be completed within 15 months if such work is to be credited to the Renewal Survey.

### 400. Continuous Surveys

401. Renewal Surveys of machinery may be carried out on a continuous survey basis. In this case, the interval between consecutive examinations of each item is not to exceed five (5) years. See Part I, Title 01, Section 2, Chapter F8.

### 500. Scope of Machinery Renewal surveys for vessels of GT < 500

501. The Renewal Survey is to include, in addition to the requirements of the Annual Survey, examination, tests and checks of sufficient extent to ensure that the propulsion and its associated equipment, piping systems, electrical and control systems, alarm systems, fire fighting systems and related equipment and accessories are in satisfactory condition and fit for the intended purpose for the new period of class of five years to be assigned, subject to proper maintenance and operation and the periodical surveys being carried out at the due dates. The examinations of the machinery are to be supplemented by examinations of the internal parts and testing to ensure that their integrity remains effective.

a. Main and auxiliary combustion engines; internal examination and tests on occasion of the overhauls required by the manufacturers but not later than each VRM to confirm the condition of: cylinder heads, pistons, piston pins, jackets, piston rods, injectors, crankshaft, main bearings, fuel pumps, scavenger pumps and admission and discharge

valves, carrying out operational tests to surveyor's satisfaction.

- b. Electric propulsion generators and motors to be examined internally and tested, on occasion of the overhauls required by the manufacturers and/or when deemed necessary by the surveyor to confirm the requirements of the internal combustion engines, the condition of the winding ends of rotors and stators, ventilation channels of the rotors, air ducts of the stator windings, sealing rings, high voltage busbars, isolators, coils, collectors, brushes, cable trays and earthing of the shielding.
- c. Measurement of the insulation of each propulsion unit comparing the results with previous measurements to check for significant changes. Where anomalies are detected, the acceptable limits will be re-established, the acceptable limits being defined as 0,5 to 1,0 megohm. A register is to be kept with the insulation measurement results, the ambient temperature and the condition of the equipment registered at regular intervals, with reports of the measurements taken by the crew. The measurements taken by the crew may be accepted in case the same are presented to the surveyor at least once a year.
- d. Main turbines are to be examined internally and tested on occasion of the overhauls required by the manufacturers and/or when deemed necessary by the surveyor to confirm the general condition of the vanes, rotors, rotor and thrust bearings, elastic couplings and condensers, with operational tests carried out at the starting and reversing manoeuvres. Where the main turbines are fitted with an emergency intercommunication system, vibration indicators, rotor position indicators and operational registers all considered to be in a satisfactory condition by the surveyor, the internal examination may be exempted in the first VRM by RBNA.
- e. Reduction gears are to be examined internally and tested on occasion of the overhauls required by the manufacturers and/or when deemed necessary by the surveyor to confirm the general condition of the structural elements of the gears, shafts, pinions, and their teeth. Tests are to be carried out to confirm the operation, to check the temperatures, speed and possible contamination.
- f. Intermediate shaft, thrust bearings and support bearings of the propulsion to be examined to confirm the general condition in operation, as to wear and heating up.
- g. Controlling and monitoring devices for the controllable pitch propeller system, if fitted, to be inspected and tested to confirm the general condition of the hydraulic oil pump sets, hydraulic oil piping and the auxiliary pump sets, and their electric components. The tests are

confirm the operational condition of visual and sound alarms for hydraulic oil low and high pressure, adjustment of the safety valves, manual and emergency controls, indication devices of the pitch and speed of turning.

- h. Pressure vessels, heat exchangers and heat transmission systems part of the essential services to be examined internally to confirm the general condition and the working of all safety devices. Where the equipment construction does not allow the disassembling, another test procedure will be allowed comprising non-destructive tests and / or hydrostatic tests at a pressure over 1,0 bar, but not in excess of the test pressure applied upon manufacturing.
- i. All equipment and circuits part of the essential services are to be examined to confirm the general operational conditions, to detect any changes, ventilation and heating conditions. The insulation between conductors and between conductors and Earth is to be measured with a continuous current 500 V megohmmeter and current potential for at least 30 seconds of application, comparing the results with previous measurements to check for abnormalities. Where abnormalities have been detected, the normal conditions are to be restored so that the maximum acceptable limit for isolation remain within 0,5 to 1,0 megohm.
- j. Electric generators and motors part of the essential services are to be opened, the drivers checked, and examined in operational conditions to confirm the working of the protection devices, circuit breakers and switches. Insulation measurements are to be taken in the different circuits, of different voltages, earthing, and the results are to be compared with previous measurements to detect significant changes.
- k. Electric switchboards and distribution panels are to be examined to confirm that no distribution and/or supply circuit is protected by breakers or switches of excessive capacity.
- l. Electric cables to be visually examined to confirm their general condition, adequate running and earth or return.

502. At the Renewal Surveys, the tailshaft is to be removed and the stern tube checked internally. The tailshaft survey is to be carried out in accordance with the requirements of Part I, Title 02, Section 2, subchapter C6.

## **CHAPTER C**

### **PROEDURES AND SCOPE OF SURVEY FOR VESSELS WITH GT ≥ 500**

#### **[IACS UR Z7]**

#### **CHAPTER CONTENTS**

- C1. GENERAL
  - C2. ANNUAL SURVEYS – ALL SHIPS
  - C3. INTERMEDIATE SURVEYS – ALL SHIPS
  - C4. DRY DOCK HULL AND MACHINERY SURVEYS – ALL SHIPS
  - C5. IN WATER SURVEYS – ALL SHIPS
  - C6. SURVEYS OF PROPELLER SHAFTS AND TUBE SHAFTS FOR – ALL SHIPS
  - C7. RENEWAL SURVEYS – ALL SHIPS
  - C8. BOILER SURVEYS – ALL SHIPS
- 

#### **C1. GENERAL**

##### **[IACS UR Z7.1]**

#### **100. Definitions**

See Chapter A, A.2 above.

#### **200. Application**

201. These requirements apply to all self-propelled vessels with GT > 500. The hull inspections apply also to non-propelled vessels irrespective of GT.

202. For additional requirements for hull structure, piping systems and ballast tanks applicable to tankers, bulk carriers, chemical tankers, double hulled tankers, double side skin bulk carriers, and liquefied gas carriers, refer to chapters:

- a. D Scope of surveys for dry cargo ships, Z7.1
- b. E Scope of surveys for single skin and double skin bulk carriers Z10.5 Z10.2,
- c. F Scope of surveys for single skin oil tankers and double hull oil tankers Z10.1, Z10.4,
- d. G Scope of surveys for chemical tankers Z10.3
- e. H Scope of surveys for liquefied gas carriers Z7.2

203. For additional requirements applicable to cargo installations on ships carrying liquefied gases in bulk, refer to Part I, Title 02, Section 2, Chapter H.

204. For additional requirements applicable to water level detectors fitted on single hold cargo ships, refer to Chapter D.

205. Special consideration may be given in application of relevant sections of this Chapter to commercial vessels owned or chartered by Governments, which are utilized in support of military operations or service.

### 300. Thickness measurements and close-up surveys

301. In any kind of survey, i.e. special, intermediate, annual or other surveys having the scope of the foregoing ones, thickness measurements of structures in areas where close-up surveys are required, shall be carried out simultaneously with close-up surveys.

## C2. ANNUAL SURVEYS FOR VESSELS WITH GT ≥ 500 [IACS UR Z7 / UR Z1]

### Guidance

*Additional annual and intermediate survey requirements for statutory surveys considered mandatory for class by IACS UR Z1.*

*The following texts includes the Annual and Intermediate Survey requirements of IMO Res. A.997(25)\* "Survey Guidelines Under the Harmonized System of Survey and Certification, 2007", as amended by IMO Res. A.1020(26), which are, as a minimum, to be covered by classification surveys (the paragraph numbers referred to are those of Res. A.997(25)\* as amended by Res. A.1020(26)\*). In cases where the Administration has delegated authority for the Society to act on its behalf, the remainder of A.997(25)\* as amended by A.1020(26) is carried out as a statutory requirement by the Society on behalf of the Administration.*

*\*The IMO Resolution A.997(25) has been additionally amended by Res. A.1053 (27).*

*It should be noted that load line items from the IMO International Load Line Convention have been included as hull class items by force of the IACS UR Z1.*

### End of guidance

### 100. Hull annual surveys

101. Annual Surveys are to be held within 3 months before or after each anniversary date of the date of the initial classification survey or the completion of the last Renewal Survey.

102. The survey is to consist of an examination for the purpose of ensuring, as far as practicable, that the hull, hatch covers, hatch coamings, closing appliances, equipment and related piping are maintained in a satisfactory condition.

- a. check in general that there has been no deterioration in the strength of the hull
- b. outer shell plating above the waterline, relevant shell doors and accessible parts of the rudders
- c. plating of the freeboard deck and exposed decks, superstructures (in particular attention to end bulkheads), with their openings and means of closure
- d. examination in general and as far as can be seen the hull and its closing appliances
- e. watertight penetrations as far as practicable
- f. positions of the deck line and load line which, if necessary, are to be re-marked and re-painted
- g. check that no alterations have been made to the hull or superstructures that would affect the calculations determining the position of the load lines
- h. watertight integrity of the closures to any openings in the ship's side below the freeboard deck
- i. examination the special requirements for ships permitted to sail with type "A" or type "B-minus" freeboards (see LLC 66/88/03 regulations 42 through 45)
- j. superstructure end bulkheads and the openings therein
- k. weather tightness of cargo hatchways, other hatchways and other openings on the freeboard and superstructure decks (see C2.200)
- l. ventilators and air pipes, including their coamings and closing appliances
- m. watertight integrity of the closures to any openings in the ship's side below the freeboard deck
- n. scuppers, inlets and discharges
- o. garbage chutes
- p. examination of the side scuttles and deadlights
- q. bulwarks including the provision of freeing ports, renewal attention being given to any freeing ports fitted with shutters
- r. guardrails, gangways, walkways and other means provided for the protection of the crew and means for safe passage of crew
- s. collision and the other watertight bulkheads as far as can be seen

t.	examination and testing (locally and remotely) of all the watertight doors in watertight bulkheads	201. General: Checking that no unapproved changes have been made to the hatch covers, hatch coamings and their securing and sealing devices since the last survey.
u.	drainage from enclosed cargo spaces situated on the freeboard deck is satisfactory	202. Checking the satisfactory condition of hatch coamings plating and their stiffeners.
v.	functionality of bilge well alarms to all cargo holds and conveyor tunnels	203. Confirmation is to 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.
w.	bilge pumping system for each watertight compartment	204. Where mechanically operated steel covers are fitted, checking the satisfactory conditions, as applicable, of:
x.	confirmation, when appropriate and as far as is practicable when examining internal spaces on oil tankers and bulk carriers, that the means of access to cargo and other spaces remain in good condition	a. hatch covers;
y.	ship's identification number permanently marked	b. tightness devices of longitudinal, transverse and intermediate cross junctions (gaskets, gasket lips, compression bars, drainage channels);
z.	confirmation of that new equipment containing asbestos was not fitted on board since last survey	c. clamping devices, retaining bars, cleating;
aa.	for single hull, single hold cargo ships, examination of the cargo hold water level detector and its audible and visual alarm	d. chain or rope pulleys;
bb.	anchoring and mooring equipment as far as can be seen. For ships built after 01/01/2007, confirmation of that the towing and mooring equipment is properly marked with any restriction associated with its safe operation	e. guides;
cc.	steering gear:	f. guide rails and track wheels;
cc.1.	examination of and testing the operation of main and auxiliary steering arrangements, including their associated equipment and control systems	g. stoppers, etc.;
cc.2.	confirmation of that the means of communication between the navigation bridge and steering gear compartment and the means of indicating the angular position of the rudder are operating satisfactorily	h. wires, chains, gypsies, tensioning devices;
cc.3.	confirmation of that with ships having emergency steering positions there are means of relaying heading information and, when appropriate, of supplying visual compass readings to the emergency steering position	i. hydraulic system essential to closing and securing;
cc.4.	confirmation of that the various alarms required for hydraulic power operated, electric and electro hydraulic steering gears are operating satisfactorily and that the re charging arrangements for hydraulic power operated steering gears are being maintained	j. safety locks and retaining devices.
200. Hatch covers and coamings [URZ 4]		205. Where portable covers, wooden or steel pontoons are fitted, checking the satisfactory condition where applicable, of:
		a. wooden covers and portable beams, carriers or sockets for the portable beam, and their securing devices;
		b. steel pontoons,
		c. tarpaulins;
		d. cleats, battens and wedges;
		e. hatch securing bars and their securing devices;
		f. loading pads/bars and the side plate edge;
		g. guide plates and chocks;
		h. compression bars, drainage channels and drain pipes (if any).
		206. Checking the satisfactory condition of hatch coaming plating and their stiffeners, where applicable.



207. Random checking of the satisfactory operation of mechanically operated hatch covers is to be made including:

- a. stowage and securing in open condition;
- b. proper fit and efficiency of sealing in closed condition;
- c. operational testing of hydraulic and power components, wires, chains, and link drives.

208. Examination of the weld connection between air pipes and deck plating.

209. External examination of all air pipe heads installed on the exposed decks.

210. Examination of flame screens on vents to all bunker tanks.

211. Examination of ventilators, including closing devices, if any.

### 300. Suspect Areas

301. Suspect Areas identified at previous surveys are to be examined. Thickness measurements are to be taken of the areas of substantial corrosion and the extent of thickness measurements is to be increased to determine areas of substantial corrosion. Table T.C7.211.2 may be used as guidance for these additional thickness measurements. These extended thickness measurements are to be carried out before the annual survey is credited as completed.

302. Note: these requirements are not applicable to cargo tanks of oil tankers, chemical tankers and double hull oil tankers, surveyed in accordance with the present Part II, Title 2, Section 2, Chapter G and F.

### 400. Examination of Ballast Tanks

401. Examination of ballast tanks when required as a consequence of the results of the Renewal Survey and Intermediate Survey is to be carried out. When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurement is to be carried out. If the results of these thickness measurements indicate that Substantial Corrosion is found, then the extent of thickness measurements is to be increased to determine areas of substantial corrosion. Table T.C7.211.2 may be used as guidance for these additional measurements.

402. These extended thickness measurements are to be carried out before the annual survey is credited as completed.

### 500. Machinery Annual Survey

501. A general examination of the machinery, the boilers, all steam, hydraulic, pneumatic and other systems and their associated fittings to see whether they are being properly maintained and with particular attention to the fire and explosion hazards. Where deemed necessary by the Surveyor, further and/or more detailed inspections may be required.

502. Examination of all Main Engine parts, Auxiliary Engine parts, reduction gears and couplings including bases. Operational and performance tests will be required when deemed necessary.

504. Confirmation that the normal operation of the propulsion machinery can be sustained or restored even though one of the essential auxiliaries becomes inoperative.

505. Confirmation that the means are provided so that the machinery can be brought into operation from the dead ship condition without external aid

506. Examination of the means for the operation of the main and auxiliary machinery essential for the propulsion and the safety of the ship, including, when applicable, the means of remotely controlling the propulsion machinery from the navigating bridge (including the control, monitoring, reporting, alert and safety actions) and the arrangements to operate the main and other machinery from a machinery control room.

507. Examination of the ventilation systems for the spaces below the freeboard deck and closed superstructures to confirm that all means of closure and manual and automatic stops are in working condition;

508. Confirmation of that the machinery, boilers and other pressure vessels, associated piping systems and fittings are installed and protected so as to reduce to a minimum any danger to persons on board, due regard being given to moving parts, hot surfaces and other hazards

509. Main boilers: see Part I, Title 02, Section 2, subchapter C8 below.

510. Auxiliary boilers: see Part I, Title 02, Section 2, subchapter C8 below.

511. Where multiple boilers are fitted, the internal examination is to be carried out in accordance with Part I, Title 02, Section 2, subchapter C8 below.

512. Examination of heat exchanger systems which are part of the essential services to confirm the general operational and maintenance condition. Special consideration is to be given to all the safety devices.

513. Examination, as far as practicable, visual and in operation, of the electrical installations, including the main source of power and the lighting systems.

514. Confirmation that, as far as practicable, the operation of the emergency source(s) of electrical power

including their starting arrangements, the systems supplied and, when appropriate, their automatic.

515. Examination, in general, of the precautions provided against shock, fire and other hazards of electrical origin are being maintained.

516. Examination of the arrangements for periodically unattended machinery spaces.

517. Examination of all piping, pumps and accessories of the essential services to confirm the general operational and maintenance condition. Operational tests may be required if deemed necessary.

518. Fire pumps and emergency fire pumps. Operational tests may be required if deemed necessary.

519. Examination of each bilge pump and Confirmation of that the bilge pumping system for each watertight compartment is satisfactory

521. Confirming that the engineer's alarm is clearly audible in the engineer's accommodation

522. Examination of air vents heads and piping, sounding pipes to confirm the general operational and maintenance condition:

- a. Examination of the weld connection between air pipes and deck plating.
- b. External examination of all air pipe heads installed on the exposed decks.
- c. Examination of flame screens on vents to all bunker tanks.
- d. Examination of ventilators, including closing devices, if any.

523. Examination of scuppers, sounding pipes to confirm general operational and maintenance condition. Where fitted, to confirm means of drainage and means of closure.

524. Visual examination of the condition of any expansion joints in seawater systems

525. Confirmation that the engine room telegraph, the second means of communication between the navigation bridge and the machinery space and the means of communication with any other positions from which the engines are controlled are operating satisfactorily. Confirmation of that the engineer's alarm is clearly audible in the engineers' accommodation.

526. When the Annual Machinery Survey coincides with a Propeller Shaft Survey or with an In Water Survey the following additional item are to be measured and operationally tested, as relevant:

- a. clearance of the thrust bearing of main and auxiliary turbines of the propulsion system;
- b. crankshaft deflexion and axial clearance of the thrust bearing of the Main Engine of the propulsion system;
- c. crankshaft deflexion and axial clearance of the thrust bearing of the Auxiliary Engines; and
- d. isolation of each generator, motor, driver, connection switches, switchboards, electric cables and their connections.

#### **600. Fire protection [UR Z1]**

- a. Confirming, as far as practicable, that no changes have been made in the structural fire protection, examining any manual and automatic fire doors and proving their operation, testing the means of closing the main inlets and outlets of all ventilation systems and testing the means of stopping power ventilations systems from outside the space served
- b. Confirming that the means of escape from accommodation, machinery and other spaces are satisfactory
- c. Confirming that the means of escape from accommodation, machinery and other spaces are satisfactory

#### **700. Firefighting equipment [UR Z1]**

701. Examination of the fire pumps, fire main, hydrants, hoses and nozzles and the international shore connection and checking that each fire pump, including the emergency fire pump, can be operated separately so that two jets of water are produced simultaneously from different hydrants at any part of the ship whilst the required pressure is maintained in the fire main.

702. Verification of the provision and randomly Examination of the condition of the portable and non portable fire extinguishers.

703. Confirmation that the fire fighters' outfits and emergency escape breathing devices – EEBDs – are complete and in good condition and that the cylinders, including the spare cylinders, of any required self-contained breathing apparatus are suitably charged.

704. Verification of the operational readiness and maintenance of fire-fighting systems.

705. Examination of the fixed fire-fighting system for the machinery, cargo, vehicle, special category and ro-ro spaces, as appropriate, and Confirmation of that its means of operation is clearly marked.

- a. Fixed gas fire-extinguishing system

- a.1. bottles of CO<sub>2</sub> (or other gas) fixed fire-extinguishing systems and their accessories, including the insulation for insulated low pressure CO<sub>2</sub> containers
  - a.2. system controls, piping, instructions and marking: proper maintenance and servicing, including date of last system tests which must be engraved on the bottles
  - a.3. release alarm triggered before the CO<sub>2</sub> is released
706. Sprinkler system
- a. system, including piping, valves, sprinklers and header tank
  - b. test of the automatic starting of the pump activated by a pressure drop alarm system while the above test is carried out
  - c. water-spraying system
    - c.1. system, including piping, nozzles, distribution valves and header tank
    - c.2. starting of the pump activated by a pressure drop (applicable only for machinery spaces)
  - d. fixed foam systems (low or high expansion)
    - d.1. examination of the foam system
    - d.2. the minimum number of jets of water at the required pressure in the fire main is obtained when the system is in operation
    - d.3. checking the supplies of foam concentrate and receiving confirmation that it is periodically tested (not later than three years after manufacture and annually thereafter) by the manufacturer or an agent
  - e. dry powder system
    - e.1. dry powder system, including the powder release control devices
    - e.2. check the supplies of powder contained in the receivers and that it has maintained its original smoothness
    - e.3. check that the pressure of propelling inert gas contained in the relevant bottles is satisfactory.

707. Examination of the fire-extinguishing and special arrangements in the machinery spaces and confirmation of, as far as practicable and as appropriate, the operation of the remote means of control provided for the opening and closing of the skylights, the release of smoke, the closure of the funnel and ventilation openings, the closure of

power operated and other doors, the stopping of ventilation and boiler forced and induced draft fans and the stopping of oil fuel and other pumps that discharge flammable liquids.

708. Examination of, as far as possible, and testing, as feasible, any fire detection and alarm system.

709. Examination of the fire-extinguishing systems for spaces containing paint and/or flammable liquids and deep-fat cooking equipment in accommodation and service spaces.

710. Examination of the helicopter facilities.

- a. drainage arrangements around the landing area
- b. fire fighting appliances and arrangements
- c. refuelling systems and hangar facilities for cleanliness and absence of leaks, condition of gutters and drainage arrangement.

711. Examination of the arrangements for remote closing of valves for oil fuel, lubricating oil and other flammable oils and Confirmation of, as far as practicable and as appropriate, the operation of the remote means of closing the valves on the tanks that contain oil fuel, lubricating oil and other flammable oils.

712. Examination of and testing of the general emergency alarm system.

713. Examination of the fire protection arrangements in cargo, vehicle and ro-ro spaces and confirmation of, as far as practicable and as appropriate, the operation of the means of control provided for closing the various openings.

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

715. Confirmation, as far as practicable, that no changes have been made in the structural fire protection, examination of any manual and automatic fire doors and proving their operation, testing the means of closing the main inlets and outlets of all ventilation systems and testing the means of stopping power ventilation systems from outside the space served.

716. Confirmation that the means of escape from accommodation, machinery and other spaces are satisfactory.

## **800. General emergency alarm system [UR Z1]**

801. The general emergency alarm system is to be examined and tested.

**C3. INTERMEDIATE SURVEYS FOR VESSELS  
WITH GT ≥ 500  
[IACS UR Z7]****100. Hull Intermediate Survey**

101. The Intermediate Survey is to be carried out either at or between the second and third Annual Survey. The Intermediate Survey is to include, in addition to the requirements of the Annual Survey, examination and checks on a sufficiently extensive part of the structure to show that the structures of the ship are in satisfactory condition so that the ship is expected to operate until the end of the current period of class, provided that the ship is properly maintained and other surveys for maintenance of class are duly carried out during this period.

102. Those items which are additional to the requirements of the Annual Surveys may be surveyed either at or between the 2nd and 3rd Annual Survey.

103. A survey planning meeting is to be held prior to the commencement of the survey.

104. Concurrent crediting to both Intermediate Survey and Renewal Survey for surveys and thickness measurements of spaces are not acceptable.

**200. Scope**

201. The scope of the intermediate survey coinciding with the second or third Annual Survey is to include the following (Table T.C3.201.1):

**TABLE T.C3.201.1. – HULL INTERMEDIATE SURVEY SCOPE FOR SHIPS IN GENERAL WITH GT ≥ 500 GT**

Item	5 < Age ≤ 10	10 < Age ≤ 15	Age > 15
Overall Survey of ALL cargo holds.	Overall Survey of ALL cargo holds.		
Ballast tanks and peak tanks	Overall survey of at least three representative ballast tanks and internal examination of the peak tanks is to be carried out.  See notes 1, 2 and 3	Overall survey of all spaces used for water ballast and internal examination of the peak tanks is to be carried out.  See notes 1 and 3	Overall survey of all spaces used for water ballast and internal examination of the peak tanks is to be carried out  See notes 1 and 3
Cargo holds	Overall survey of one forward and one after cargo hold and their associated tween deck spaces. See note 4	An internal examination of selected cargo holds is to be carried out.  See note 4	An internal examination of selected cargo holds is to be carried out.  See note 4
<p>Note 1 - If such examinations reveal no visible structural defects, the examination may be limited to a verification that the corrosion prevention system remains effective</p> <p>Note 2 - If there is no hard protective coating, soft or semi-hard coating, or POOR coating condition, the examination is to be extended to other ballast spaces of the same type</p> <p>Note 3 - For ballast tanks, excluding double bottom ballast tanks, if there is no hard protective coating, soft or semi-hard coating, or POOR coating condition and it is not renewed, the spaces in question are to be internally examined at annual intervals</p> <p>Note 4 – Areas found suspect at previous surveys are to be surveyed in accordance with the provisions indicated in Part II, Title 02, Section 2, subchapter D2.400 below</p> <p>Note 5 – In application of the above, the intermediate survey may be commenced at the second annual survey and be progressed during the succeeding year with a view to completion at the third annual survey</p>			

#### **C4. DRY DOCK SURVEY FOR VESSELS WITH GT ≥ 500 [IACS: UR-Z-3]**

##### **100. General**

101. There is to be a minimum of two examinations of the outside of the ship's bottom and related items during each five-year Renewal survey period. One such examination is to be carried out in conjunction with the Renewal survey, *and the other bottom survey may be carried out in conjunction with the intermediate survey*. In all cases the interval between any two such examinations is not to exceed 36 months. An extension of examination of the ship's bottom of 3 months beyond the due date can be granted in exceptional circumstances.

102. A survey in dry dock is to be a part of the Renewal Surveys. The overall and close-up surveys and thickness measurements, as applicable, of the lower portions of the cargo holds and water ballast tanks are to be carried out in accordance with the applicable requirements for Renewal surveys, if not already performed. Note: Lower portions of the cargo holds and ballast tanks are considered to be the parts below light ballast water line.

103. The Owner is to notify the RBNA whenever the outside of the ship's bottom and related items can be examined in drydock or on a slipway.

104. Examinations of the outside of the ship's bottom and related items of ships is normally to 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 Part I, Title 2, Section 2, Chapter C, Subchapter C5 special consideration is to be given to ships of 15 years or over before being permitted to have such examinations. For ESP ships of 15 years of age and over, such examinations are to be carried out with the ship in drydock.

105. The interval between examinations of the outside of the ship's bottom and related items for ships operating in fresh water and for certain harbour or non-self-propelled craft may be greater than that given in item C3.101 above.

106. Compliance with Part I, Title 2, Section 2, Chapter C, subchapter C5 does not absolve the Owner from compliance with the requirements of SOLAS as amended, especially when shorter intervals between examination of the ship's bottom for certain types of ship are required.

107. For additional requirements for hull structure, piping systems and ballast tanks applicable to tankers, bulk carriers, chemical tankers, double hulled tankers, double side skin bulk carriers, general dry cargo ships and liquefied gas carriers, refer to the following chapters of the present Part I, Title 02, Section 2:

- a. Chapter D - Scope of surveys for general cargo ships

- b. Chapter E - Scope of surveys for single and double skin bulk carriers
- c. Chapter F - Scope of surveys for single and Double skin oil tankers
- d. Chapter G - Scope of surveys for chemical tankers
- e. Chapter H - Scope of surveys for gas carriers

108. When a ship is in drydock or on a slipway, it is to 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.

##### **200. Scope of the dry dock survey**

201. The shell plating is to be examined:

- a. For excessive corrosion, or deterioration due to chafing or contact with the ground and for any undue unfairness or buckling. Special attention is to be paid to the connection between the bilge strikes and the bilge keels. Important plate unfairness or other deterioration which do not necessitate immediate repairs are to be recorded.
- b. Bottom inner surfaces: for coating condition and adherence to the plating.
- c. All watertight bulkheads: overall inspection. However, where there are areas suspected of corrosion, thickness measurements are to be taken.
- d. Structural members covered by lining: overall inspection of the areas subject to wear through removal of the coaming.

202. Sea chests and their gratings, sea connections and overboard discharge valves and cocks and their fastenings to the hull or sea chests are to be examined. Sea valves and cocks are to be opened up for internal examination. Valves and cocks need not be opened up more than once in a Renewal Survey period unless considered necessary by the Surveyor.

203. Propeller and Rudder:

- a. Visible parts of rudder, rudder pintles, rudder shafts and couplings and stern frame are to be examined. The rudder is to be lifted or the inspection plates removed for the examination of pintles. The clearance in the rudder bearings is to be ascertained and recorded. Where applicable, pressure test of the rudder may be required as deemed necessary by the surveyor.
- b. Rudder casson: in all accessible parts, measuring bearing clearances.



c. Visible parts of propeller and stern bush, are to be examined. The clearance in the stern bush and the efficiency of the oil gland, if fitted, are to be ascertained and recorded. For controllable pitch propellers, the Surveyor is to be satisfied with the fastenings and tightness of hub and blade sealing. Dismantling need not to be carried out unless considered necessary by the Surveyor.

d. Rudder stock in all accessible parts, NDT tests by an approved method for detection of cracks at the fillet welding of the flange, fixing bolts and key channel; where required by the surveyor, the bending is to be monitored; supervise the assembling of the system to ascertain the correct tightening and locking of the bolts.

e. Visible parts of side thrusters are to be examined.  
NOTE: For the survey of propeller shafts, refer to the requirements of Part I, Title 2, Section 2, Chapter C, Subchapter C6.

204. Special consideration may be given in application of relevant sections of this Unified Requirement to commercial vessels owned or chartered by Governments, which are utilized in support of military operations or service.

## **C5. IN-WATER SURVEYS FOR ALL SHIPS [URZ 3]**

### **100. General**

101. The In-water Survey is to provide the information normally obtained from a docking survey. Special consideration shall be given to ascertaining rudder bearing clearances and stern bush clearances of oil stern bearings based on a review of the operating history, on board testing and stern oil sample reports. These considerations are to be included in the proposals for in-water survey which are to be submitted in advance of the survey so that satisfactory arrangements can be agreed with the RBNA.

102. The In-water Survey is to be carried out with the ship in sheltered water and preferably with weak tidal streams and currents. The in-water visibility and the cleanliness of the hull below the waterline is to be clear enough to permit a meaningful examination which allows the surveyor and diver to determine the condition of the plating, appendages and the welding. The RBNA is to be satisfied with the methods of orientation of the divers on the plating, which should make use where necessary of permanent markings on the plating at selected points.

103. The equipment, procedure for observing and reporting the survey are to be discussed with the parties involved prior to the In-water Survey, and suitable time is to be allowed to permit the diving company to test all equipment beforehand.

104. The In-water Survey is to be carried out by a qualified diver under surveillance of a Surveyor. The diver is to be employed by a firm approved as a service supplier according to Part I, Title 2, Section 1.

105. The Surveyor is to be satisfied with the method of pictorial representation, and a good two-way communication between the Surveyor and divers is to be provided.

106. 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.

### **200. Hull In-Water Survey - VVCF**

201. Examination of the following items, which may be extended at Surveyor's discretion depending upon the conditions found:

- j. External hull plating below the waterline, bow, keel, bilge keels, Stern post, tailshaft struts and other appendices.
- k. Examination of welding seams with special attention to crossings,
- l. Corrosion protection anodes and their fixing;
- m. Free board markings;
- n. Rudder stock tube, rudder stock, rudder pin and rudder stock and rudder pin bearing clearances;
- o. Rudder plating;
- p. Operational test of the steering gear system
- q. Examination to confirm that there are no alterations in the hull which may affect the freeboard calculations and/or the Rule requirements.
- r. Other hull areas below the waterline subject to corrosion or damage, fundamental for the safety of the vessel and its crew.

### **300. Machinery In-Water Survey - VSM**

301. Examination of the following items, which may be extended at Surveyor's discretion depending upon the conditions found:

- j. Stern tube;
- k. Tailshaft bearing clearances;
- l. Watertightness of the sealings or gaskets;
- m. propellers;
- n. operational test of the propulsion system;

- o. sanitary and overboard discharges and their connections to the side shell plating
- p. sea chests and side thruster tunnels
- q. shell and bottom valves;
- r. dredging system valves for dredgers, when existing.

from seawater, the design details are approved, and a non-destructive examination is made at each survey by approved crack-detection method of the forward part of the aft shaft taper.

104. In all other cases, the interval of survey is to be 2 1/2 years (+/- 6 months).

105. The complete shaft is to be sufficiently drawn to permit entire examination.

106. However, for oil lubricated arrangement all exposed areas of the after shaft area are to be examined by an approved crack-detection method without drawing of the shaft,

107. The following items are found satisfactory. The crack detection test of the aft flange fillet area may be dispensed with for the solid flange couplings fitted at the end of the shaft,

- a. clearances and wear down of the bearings,
- b. records of lubricating oil analysis, oil consumption and bearing temperature, and
- c. visible shaft areas

108. Lubricating oil and bearing temperature controls are to be performed.

109. Where any doubt exists regarding the findings of the above, the shaft is to be sufficiently drawn to permit an entire examination

110. Examination of the stern tube comprising the measurement of the bearing clearances in all sections;

## C6. SURVEYS OF PROPELLER SHAFTS AND TUBE SHAFTS FOR ALL SHIPS [IACS UR Z21]

### 100. Normal Survey

101. Propeller shafts and tube shafts are to be sufficiently drawn to permit entire examination at the following intervals unless alternative means are provided to assure the condition of the shaft:

102. Where the propeller shafts and the tube shafts are fitted with continuous liners, or approved oil sealing glands, or made of corrosion resistant material, the interval of survey is to be:

- a. single shafting arrangement: three (3) years
- b. multi-shafting arrangements: four (4) years

103. The interval for drawing may be raised:

- a. from three (3) to a maximum of five (5) years for single shafting arrangements;
- b. from four (4) to a maximum of five (5) years for multi-shafting arrangements;
- c. in any of the following three (3) following cases:
  - c.1. where the propeller is fitted to a keyed shaft taper the design details of which are approved, and a non-destructive examination is made at each survey by an approved crack detection method of the after end of the cylindrical part of the shaft (from the after end of the liner, if any), and of about one third of the length of the taper from the large end, or
  - c.2. where the propeller is fitted to a solid flange coupling at the aft end of the shaft, the shaft and its fittings are not exposed to corrosion, the design details are approved. Non-destructive examination of the fillet radius of the aft propeller shaft flange may be required if the visual examination of the area is not satisfactory, or
  - c.3. where the propeller is fitted keyless to the shaft taper, the shaft is protected

### 200. Modified Survey

201. For single and multi-shafting arrangements the modified survey may be accepted in any of the following three (3) cases subject to:

- a. the shaft is fitted with oil lubricated bearings and oil sealing glands, and
- b. the shaft and its fittings are not exposed to corrosion, and
- c. new oil seals may be fitted without removal of the propeller (except in the case of keyed propeller), and design details are approved.
  - c.1. Where – the propeller is keyed on the shaft taper and suitable crack-prevention measures are taken, or
  - c.2. where – the propeller is fitted to a solid flange coupling at the end of the shaft,

- or  
c.3. where – the propeller is fitted keyless to the shaft taper.

202. The modified survey is accepted at alternate five (5) yearly (maximum) surveys instead of the Normal Survey, provided that the clearances of the aft bearing are found in order and the oil and the oil sealing arrangements have proved effective.

203. The modified survey consists of:

- a. drawing the shaft to expose the aft bearing contact area of the shaft,
- b. Examination of the forward bearing as far as possible and all accessible parts of the shaft including the propeller connection to the shaft, and
- c. for keyed propellers, performing a non-destructive examination by an approved crack-detection method of about one third of the length of the taper from the big end, for which dismantling of the propeller will be required.
- d. for keyless propellers performing a visual examination to confirm the good condition of the sealing arrangements.

204. Where a lubricating oil analysis is carried out regularly at intervals not exceeding six (6) months, and the oil consumption and bearing temperature are recorded and considered to be within permissible limits, drawing of the shaft to expose the aft bearing contact area of the shaft may not be required.

205. The documentation on lubricating oil analysis is to be available on board. Each analysis should include the minimum parameters:

- a. water content,
- b. chlorides content,
- c. content of bearing metal particles, and
- d. oil aging (resistance to oxidation).

206. Oil samples should be taken under service conditions.

### 300. Partial Survey

301. For shafts where the modified survey is applicable, consideration may be given, upon application by the Owner, to a prolongation of the intervals between Normal Survey, provided a partial survey is performed.

302. The partial survey consists of checking the oil sealing glands and the clearance of the bearings. For keyed propellers, the propeller is to be dismantled to expose the forward part of the taper and a non-destructive

examination by an approved crack-detection method is to be performed.

303. In no case is the interval between Normal Survey to exceed 1.5 times the due interval.

Note: Special consideration may be given in application of relevant sections of this Unified Requirement to commercial vessels owned or chartered by Governments, which are utilized in support of military operations or service.

### 400. Propellers and stern tubes

401. For propellers and Stern tubes, in all cases described in this subchapter C6, the following parts are to be examined and, according to the conditions found, further examinations and or tests requested at surveyor's discretion:

- a. propeller and connections: if deemed necessary by the surveyor, approved non destructive tests are to be carried out to detect any fractures at the propeller blade edges and the connections to the propeller boss, copuling flanges, sealing rings and fixing bolts. The devices for the pitch variation are to be examined.
- b. Stern tube and bearings: measurement of all clearances.

### 500. Recommended procedure for the determination of contents of metals and other contaminants in stern tube lubricating oil [IACS Rec 36]

501. As provided by Part I, Title 02, Section 2, Chapter C, items C6.204-C6.206, a lubricating oil analysis should be carried out at the required intervals. The documentation on lubricating oil analysis is to be available on board. Each analysis, to be performed by an appropriate method, should include the minimum parameters as listed:

- a. water contents, refer Section 4
- b. chloride contents, refer Section 4
- c. contents of bearing metal particles
- d. oil ageing (resistance to oxidation)

### 502. Sampling procedure

- a. Oil samples should be taken under service conditions, i.e. with a rotating shaft and the system at service temperature.
- b. The samples are to be drawn from the same agreed position in the system which should be positively identified.

- c. These samples, unless supervised by a Surveyor, are to be collected and identified by the Chief Engineer.

503. Contaminants determination

The contents of the following metals should be determined:

- a. in connection with contents of wear metals:

- a.1. Chromium
- a.2. Copper
- a.3. Iron
- a.4. Lead
- a.5. Nickel
- a.6. Silicon
- a.7. Tin

- b. in connection with contents of sea water:

- b.1. Magnesium
- b.2. Sodium

504. Metal and water content values

- a. The metal and water content values should be considered taking into account the type of seals used and the chemical composition of the bearing material. Suggested upper limits are given in Table T.C6.504.1 below for guidance only:

**TABLE T.C6.504.1 UPPER LIMITS: METAL AND WATER CONTENT**

Water	1%	Nickel	10 ppm
Chromium	10 ppm	Silicon	40 ppm
Copper	50 ppm	Tin	10 ppm
Iron	30 ppm	Magnesium	30 ppm
Lead	10 ppm	Sodium	80 ppm
Chloride content in water	70 ppm (ingress of salt water)		

- b. These limits should be considered versus the elapsed time.
- c. It is important to have results of a number of sequential analyses in order to observe any trends taking place.

505. Oil ageing:oxidation characteristics such as TAN (total acid number) depend upon the type of oil used. Hence no recommended value is listed. Instead observation of any trends (such as viscosity and change in colour etc.) based on sequential analysis should be made.

506. Other analysis: microscopic analysis of the particles may be recommended to identify the failure process and, where applicable, non-metallic bearing or seal material.

**600. Propeller and shaft fitting**

601. The fitting between the propeller boss and the shaft end cone shall be carried out to ensure that the contact between the surfaces is substantial and evenly distributed. The minimum contact area shall be equal to or larger than the following:

- a. Propeller and shaft cone with keyless fitting: 70%
- b. Propeller and shaft cone with key fitting

**700. Additional annual and intermediate survey requirements for statutory surveys considered mandatory for class.  
[IACS UR Z1]**

701. For ships over 5 years of age, an internal examination of representative spaces used for water ballast

702. For ships over 10 years of age, other than ships engaged in the carriage of dry cargoes only, an internal examination of selected cargo spaces

703. For ships over 15 years of age, engaged in the carriage of dry cargoes only, an internal examination of selected cargo spaces.

## **C7. RENEWAL SURVEY FOR VESSELS WITH GT ≥ 500 [IACS UR Z7]**

### **100. Schedule**

101. Renewal Surveys are to be carried out at 5 years intervals to renew the Classification Certificate.

102. The first Renewal Survey is to be completed within 5 years from the date of the initial classification survey and thereafter 5 years from the credited date of the previous Renewal Survey. However, an extension of class of 3 months maximum beyond the 5th year can be granted in exceptional circumstances. In this case, the next period of class will start from the expiry date of the Renewal Survey before the extension was granted.

103. For surveys completed within 3 months before the expiry date of the Renewal Survey, the next period of class will start from the expiry date of the Renewal Survey. For surveys completed more than 3 months before the expiry date of the Renewal Survey, the period of class will start from the survey completion date.

104. The Renewal Survey may be commenced at the 4th Annual Survey and be progressed with a view to completion by the 5th anniversary date. When the Renewal Survey is commenced prior to the 4th Annual Survey, the entire survey is to be completed within 15 months if such work is to be credited to the Renewal Survey.

105. A survey planning meeting is to be held prior to the commencement of the survey.

106. Concurrent crediting to both Intermediate Survey (VIC) and Renewal Survey (VRC, VRM) for surveys and thickness measurements of spaces are not acceptable.

### **200. Scope of hull Renewal surveys for vessels of GT ≥ 500)**

201. The Renewal Survey is to include, in addition to the requirements of the Annual Survey, examination, tests and checks of sufficient extent to ensure that the hull, equipment and related piping are in satisfactory condition and fit for the intended purpose for the new period of class of five years to be assigned, subject to proper maintenance and operation and the periodical surveys being carried out at the due dates.

202. The examinations of the hull are to be supplemented by thickness measurements and testing to ensure that the structural integrity remains effective. The aim of the examination is to discover substantial corrosion, significant deformation, fractures, damages or other structural deterioration, that may be present.

203. The Renewal Survey is to include examination of a bottom survey in dry condition as per Subchapter C5 above.

204. The anchors and chain cables are to be ranged, examined and the required complement and condition verified. The chain locker, holdfasts, hawse pipes and chain stoppers are to be examined and pumping arrangements of the chain locker tested. At Renewal Survey No. 2 and subsequent Renewal Surveys, chain cables are to be gauged and renewed in cases where their mean diameter is worn below the limits allowed by the Society.

205. All spaces including holds and their 'tween decks where fitted; double bottom, deep, ballast, peak and cargo tanks; pump rooms, pipe tunnels, duct keels, machinery spaces, dry spaces, cofferdams and voids are to be completely emptied, thoroughly cleaned and, when necessary gas freed, and then internally examined including the plating and framing, bilges and drain wells, sounding, venting, pumping and drainage arrangements. Internal examination of fuel oil, lube oil and fresh water tanks is to be carried out in accordance with Table T.C7.211.3. When plate Renewal is required, the affected tanks are to be tested by water column or any other alternative method of checking their water tightness. When inspecting ballast tanks, special attention is to be given to the area near the peak tank bulkheads;

206. Engine room structure is to be examined. Particular attention is to be given 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. Particular attention is to be given to the sea suction, sea water cooling pipes and overboard discharge valves and their connections to the shell plating. Where wastage is evident or suspect, thickness measurements are to be carried out, and Renewals or repairs made when wastage exceeds allowable limits.

207. Where provided, the condition of corrosion prevention system of ballast tanks is to be examined. For ballast tanks, excluding double bottom tanks, where a hard protective coating is found in POOR condition and it is not renewed, where soft or semi-hard coating has been applied, or where a hard protective coating was not applied from time of construction, the tanks in question are to be examined at annual intervals. Thickness measurements are to be carried out as deemed necessary by the surveyor.

208. When such breakdown of hard protective coating is found in double bottom ballast tanks and it is not renewed, where a soft or semi-hard coating has been applied, or where a hard protective coating was not applied from the time of construction, the tanks in question may be examined at annual intervals. When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurements are to be carried out.

209. Boundaries of double-bottom, deep, ballast, peak, and other tanks, including holds adapted for the carriage of salt water ballast, are to be tested with a head of liquid to the top of air pipes or to near the top of hatches for ballast/cargo holds. Boundaries of fuel oil, lube oil and fresh water tanks are to be tested with a head of liquid to the highest point that liquid will rise under service



conditions. Tank testing of fuel oil, lube oil and fresh water tanks 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. The Surveyor may extend the testing as deemed necessary.

210. Decks are to be examined, particular attention being given to the areas where stress concentration or increased corrosion are likely to develop, such as hatch corners and other discontinuities of structure.

- a. Deck erections such as hatch coamings, deckhouses and
- b. superstructures are to be examined.
- c. The sheathing of wood-sheathed steel decks may be removed, at the Surveyor's discretion, in the case of doubt as to the condition of plating underneath.
- d. Due attention is to be given to the examination in way of end and side openings and related shell and inner doors.
- e. Hatch covers: this survey shall, as a minimum, consist of:
  - e.1. a thorough inspection of the items listed in Part I, Title 02, Section 2, item C2.200 above; and in addition:
  - e.2. checking of the satisfactory operation of all mechanically operated hatch covers:
  - e.3. stowage and securing in open condition;
  - e.4. proper fit, locking and efficiency of sealing in closed condition;
  - e.5. operational testing of hydraulic and power components, wires, chains, and link drives;
  - e.6. checking the effectiveness of sealing arrangements of all hatch covers by hose testing or equivalent as necessary;
  - e.7. checking the residual thickness of coamings, steel pontoon or hatch cover plating and stiffening members as deemed necessary by the Surveyor.

211. Thickness measurements are to be carried out in accordance with Table T.C7.211.1. The Surveyor may extend the thickness measurements as deemed necessary. When thickness measurements indicate substantial corrosion, the extent of thickness measurements is to be increased to determine areas of substantial corrosion. Table T.C7.211.2 may be used as guidance for these additional thickness measurements. These extended thickness measurements are to be carried out before the survey is credited as completed.

212. All bilge and ballast piping systems are to be examined and operationally tested to working pressure to attending Surveyor's satisfaction to ensure that tightness and condition remain satisfactory.

213. Sea valves and cocks are to be opened up for internal examination.

214. For all ships except for passenger ships, automatic air pipe heads are to be completely examined (both externally and internally as indicated in Table T.C7.211.4.

215. For designs where the inner parts cannot be properly inspected from outside, this is to include removal of the head from the air pipe. Particular attention is to be paid to the condition of the zinc coating in heads constructed from galvanised steel.

216. Hold planking of single bottom ships: on both Port Side and Starboard Side, the planking is to be removed at the bilge, the central keel and where seen fit by the Surveyor to confirm the condition of the bottom plating. Where a double bottom is fitted, the planking is to be removed at random, to Surveyor's discretion;

217. For dredger ships, thickness measurements are to be taken in accordance with Table T.C7.211.1 to confirm the thicknesses of all the side plating, bulkheads, keel ducts and structural members in at least 4 points per plating;

**TABLE T.C7.211.1 MINIMUM REQUIREMENTS FOR THICKNESS MEASUREMENTS AT SPECIAL(RENEWAL) SURVEY**

<b>Renewal Survey No.1 VRC1 Age ≤5</b>	<b>Renewal Survey No.2 VRC2 5 &lt;Age ≤10</b>	<b>Renewal Survey No.3 VRC3 10 &lt;Age ≤15</b>	<b>Renewal Survey No.4 and Subsequent VRC4 15 &lt;Age</b>
1) Suspect areas throughout the vessel.	1) Suspect areas throughout the vessel. 2) External shell plating and strength deck plating: measurements by an approved method in at least four (4) points per plate to confirm the actual thicknesses	1) Suspect areas throughout the vessel. 2) External shell plating and strength deck plating: measurements by an approved method in at least four (4) points per plate to confirm the actual thicknesses 3) Bulkhead plating and internal structural members which present corrosion wear	1) Suspect areas throughout the vessel. 2) External shell plating and strength deck plating: measurements by an approved method in at least four (4) points per plate to confirm the actual thicknesses 3) Bulkhead plating and internal structural members which present corrosion wear
	3) One transverse section of deck plating in way of a cargo space within the amidships 0.5L	2) Two transverse sections within the amidships 0.5L in way of two different cargo spaces.	2) A minimum of three transverse sections in way of cargo spaces within the amidships 0.5L.
		3) All cargo hold hatch covers and coamings (plating and stiffeners).	3) All cargo hold hatch covers and coamings (plating and stiffeners).
		4) Internals in forepeak and after peak tanks.	4) Internals in forepeak and after tanks
			5) All exposed main deck plating full length.
			6) Representative exposed superstructure deck plating((poop, bridge and forecastle deck).
			7) Lowest strake and strakes in way of 'tween decks of all transverse bulkheads in cargo spaces together with internals in way.
			8) All wind – and water strakes, port and starboard, full length.
			9) All keel plates full length. Also, additional bottom plates in way of cofferdams, machinery space, and aft end of tanks.
			10) Plating of sea chests. Shell plating in way of overboard discharges as considered necessary by the attending surveyor

**Notes:**

1. Thickness measurement locations are to 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. Thickness measurements of internals may be specially considered by the Surveyor if the hard protective coating is in GOOD condition.
3. For ships less than 100 meters in length, the number of transverse sections required at Renewal Survey No. 3 may be reduced to one (1), and the number of transverse sections required at Subsequent Renewal Surveys may be reduced to two (2).
4. For ships more than 100 meters in length, at Renewal Survey No. 3, thickness measurements of exposed deck plating within

**TABLE T.C7.211.2 GUIDANCE FOR ADDITIONAL THICKNESS MEASUREMENTS IN WAY OF SUBSTANTIAL CORROSION**

STRUCTURAL MEMBER	EXTENT OF MEASUREMENT	PATTERN OF MEASUREMENT
Plating	Suspect area and adjacent plates.	5 point pattern over 1 square meter.
Stiffeners	Suspect area.	3 measurements each in line across web and flange

**TABLE T.C7.211.3 MINIMUM REQUIREMENTS FOR INTERNAL EXAMINATION AT HULL RENEWAL SURVEYS OF FUEL OIL, LUBE OIL AND FRESH WATER TANKS**

Tank	Renewal Survey VF No. 1 Age ≤ 5	Renewal Survey No. 2 5 < Age ≤ 10	Renewal Survey No. 3 10 < Age ≤ 15	Renewal Survey No. 4 and Subsequent Age > 15
Fuel Oil Bunker tanks				
-Engine Room	None	None	One	One
- Cargo Length Area	None	One	Two	Half the total, minimum 2
Lube Oil	None	None	None	One
Fresh water	None	One	All	All
<b>Notes</b> 1) These requirements apply to tanks of integral (structural) type. 2) If a selection of tanks is accepted to be examined, then different tanks are to 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 in the cargo length area is to be included, if fitted				

**TABLE T.C7.211.4 SURVEY REQUIREMENTS FOR AUTOMATIC PIPE HEADS (\*) AT RENEWAL SURVEYS**

Renewal Survey VRC1 Age < 5	Renewal Survey VRC2. 2 5 < Age ≤ 10	Renewal Survey VRC3 and VRC4 Age > 10
Two air pipe heads, one port and one starboard, located on the exposed decks in the forward 0.25 L, preferably air pipes serving ballast tanks.  - Two air pipe heads, one port and one starboard, on exposed decks, serving spaced aft of 0.25 L, preferably air pipes serving ballast tanks. (1) (2)	- All air pipe heads located on the exposed decks in the forward 0.25L.  - At least 20% of air pipe heads on the exposed decks serving spaces aft of 0.25 L, preferably air pipes serving ballast tanks (1) (2)	- All air pipe heads located on the exposed decks
(1) The selection of air pipe heads to be examined is left to the attending Surveyor. (2) According to the results of this examination, the Surveyor may require the examination of other heads located on the exposed decks.		

(\*) Automatic pipe heads: pipe heads fitted with disks or spheres which close automatically when flooded, avoiding ingress of water inside the tank.

### 300. Machinery Class Renewal Survey – from VRM1 on

301. Renewal Machinery Surveys are to be carried out at 5 years intervals to renew the Class Certificate.

302. The first Renewal Survey is to be completed within 5 years from the date of the initial classification survey and thereafter 5 years from the credited date of the pervious

Renewal Survey. However, an extension of class of 3 months maximum beyond the 5th year can be granted in exceptional circumstances. In this case, the next period of class will start from the expiry date of the Renewal Survey before the extension was granted.

303. For surveys completed within 3 months before the expiry date of the Renewal Survey, the next period of class will start from the expiry date of the Renewal Survey. For surveys completed more than 3 months before the expiry date of the Renewal Survey, the period of class will start from the survey completion date.

304. The Renewal Survey may be commenced at the 4th Annual Survey and be progressed with a view to completion by the 5th anniversary date. When the Renewal Survey is commenced prior to the 4<sup>th</sup> Annual Survey, the entire survey is to be completed within 15 months if such work is to be credited to the Renewal Survey.

#### 400. Continuous Surveys

401. Renewal Surveys of machinery may be carried out on a continuous survey basis. In this case, the interval between consecutive examinations of each item is not to exceed five (5) years. See Part I, Title 01, Section 2, Chapter F8.

#### 500. Scope of Machinery Renewal surveys for vessels of $\geq 500$

501. The Renewal Survey is to include, in addition to the requirements of the Annual Survey, examination, tests and checks of sufficient extent to ensure that the propulsion and its associated equipment, piping systems, electrical and control systems, alarm systems, fire fighting systems and related equipment and accessories are in satisfactory condition and fit for the intended purpose for the new period of class of five years to be assigned, subject to proper maintenance and operation and the periodical surveys being carried out at the due dates. The examinations of the machinery are to be supplemented by examinations of the internal parts and testing to ensure that their integrity remains effective.

- a. Main and auxiliary combustion engines; internal examination and tests on occasion of the overhauls required by the manufacturers but not later than each VRM to confirm the condition of: cylinder heads, pistons, piston pins, jackets, piston rods, injectors, crankshaft, main bearings, fuel pumps, scavenger pumps and admission and discharge valves, carrying out operational tests to surveyor's satisfaction.
- b. Electric propulsion generators and motors to be examined internally and tested, on occasion of the overhauls required by the manufacturers and/or when deemed necessary by the surveyor to confirm the requirements of the internal combustion engines, the condition of the winding ends of rotors and stators, ventilation channels of the rotors, air

ducts of the stator windings, sealing rings, high voltage bus-bars, isolators, coils, collectors, brushes, cable trays and earthing of the shieldings.

- c. Measurement of the insulation of each propulsion unit comparing the results with previous measurements to check for significant changes. Where anomalies are detected, the acceptable limits will be re-established, the acceptable limits being defined as 0,5 to 1,0 megohm. A register is to be kept with the insulation measurement results, the ambient temperature and the condition of the equipment registered at regular intervals, with reports of the measurements taken by the crew. The measurements taken by the crew may be accepted in case the same are presented to the surveyor at least once a year.
- d. Main turbines are to be examined internally and tested on occasion of the overhauls required by the manufacturers and/or when deemed necessary by the surveyor to confirm the general condition of the vanes, rotors, rotor and thrust bearings, elastic coup-lings and condensers, with operational tests carried out at the starting and reversing manoeuvres. Where the main turbines are fitted with an emergency intercommunication system, vibration indicators, rotor position indicators and operational registers all considered being in a satisfactory condition by the surveyor, the internal examination may be exempted the first VRM by RBNA.
- e. Reduction gears are to be examined internally and tested on occasion of the overhauls required by the manufacturers and/or when necessary deemed by the surveyor to confirm the general condition of the structural elements of the gears, shafts, pinions, and their teeth. Tests are to be carried out to confirm the operation, to check the temperatures, speed and possible contamination.
- f. The periodical survey of rotating and azimuth thruster consists of:
  - f.1. Removing the propeller in order to examine the following items, as applicable:
    - i. Exposed parts
    - ii. Cone and keyway to be checked by an appropriate crack detection method
    - iii. Sealing glands
    - iv. Threaded end and nut
  - f.2. Examining the results of a lubricating oil analysis (water content and presence of material particles) to detect possible deterioration of internal gears and bearings.

- g. Intermediate shaft, thrust bearings and support bearings of the propulsion to be examined to confirm the general condition in operation, as to wear and heating up.
  - h. Controlling and monitoring devices for the controllable pitch propeller system, if fitted, to be inspected and tested to confirm the general condition of the hydraulic oil pump sets, hydraulic oil piping and the auxiliary pump sets, and their electric components. The tests are confirm the operational condition of visual and sound alarms for hydraulic oil low and high pressure, adjustment of the safety valves, manual and emergency controls, indication devices of the pitch and speed of turning.
  - i. Pressure vessels, heat exchangers and heat transmission systems part of the essential services to be examined internally to confirm the general condition and the working of all safety devices. Where the equipment construction does not allow the disassembling, another test procedure will be allowed comprising non-destructive tests and / or hydrostatic tests at a pressure over 1,0 bar, but not in excess of the test pressure applied upon manufacturing.
  - j. All equipment and circuits' part of the essential services are to be examined to confirm the general operational conditions, to detect any changes, ventilation and heating conditions. The insulation between conductors and between conductors and Earth is to be measured with a continuous current 500 V megohmmeter and current potential for at least 30 seconds of application, comparing the results with previous measurements to check for abnormalities. Where abnormalities have been detected, the normal conditions are to be restored so that the maximum acceptable limit for isolation remain within 0,5 to 1,0 megohm.
  - k. Electric generators and motors part of the essential services are to be opened, the drivers checked, and examined in operational conditions to confirm the working of the protection devices, circuit breakers and switches. Insulation measurements are to be taken in the different circuits, of different voltages, earthing, and the results are to be compared with previous measurements to detect significant changes.
  - l. Electric switchboards and distribution panels are to be examined to confirm that no distribution anchor supply circuit is protected by breakers or switches of excessive capacity.
  - m. Electric cables to be visually examined to confirm their general condition, adequate running and earth or return.
502. See Part I, Title 02, Section 2, subchapter C6
503. The items listed in below are to be opened up, as deemed necessary by the Surveyor, for visual inspection. Their parts and components are to be pressure tested as appropriate and considered necessary by the Surveyor. A working test is also to be carried out, including testing of alarms and safety devices if deemed necessary by the Surveyor.
- a. Air compressors with their intercoolers, filters and/or oil separators and safety devices. Check for each main and emergency compressor:
    - a.1. safety valves
    - a.2. drains.
    - a.3. Start/stop intervals
    - a.4. Air leaks / oil leaks
    - a.5. oil level
    - a.6. vibration
    - a.7. high/low pressure alarm
  - b. Heat exchangers, ventilation fans for boilers and other equipment used for essential services
  - c. Piston pumps and centrifugal pumps for sea water, bilge and salt water ballast
  - d. Screw pumps, gear pumps and centrifugal pumps other than those listed in c) above (opening up is not required).
  - e. Valves, cocks and strainers of the bilge and ballast systems are to be opened up, as deemed necessary by the Surveyor, for visual inspection, and, together with the piping and safety devices, examined and tested under working conditions.
  - f. The fuel oil, lubricating oil, hydraulic oil, thermal oil, and feed and cooling water systems, together with pressure filters, heaters and coolers used for essential services, are to be opened up and examined or tested, as considered necessary by the Surveyor. Safety devices for the foregoing items are to be examined.
  - g. The compressed air system together with its valves, fittings and safety devices is to be examined, as considered necessary by the Surveyor.
  - h. Compressed air receivers and other pressure vessels for essential services are to be cleaned internally and examined internally and externally. Their fittings, valves and safety devices are to be opened up, as deemed necessary by the Surveyor, for visual inspection and pressure tested as appropriate.
  - i. Steel pipes for saturated steam or superheated steam having a temperature of the steam at the



- superheater outlet not exceeding 450°C are to be examined and tested at each class renewal survey for ships over 5 years of age. When the ship is 5 years of age or less, the inspection may be limited to a check of the satisfactory general condition of pipes.
- j. The examination and hydrostatic test of steel pipes for main steam machinery, and steel pipes for auxiliary steam machinery having internal diameter 75 mm and over, are to be carried out on a number of pipes selected by the Surveyor after the lagging in way is removed.
- k. Representative pipe lengths connected with bolted flanges are to be internally and externally examined, and hydrostatically tested to 1,1 times the working pressure at ambient temperature. Bolts and butt-welded joints between flanges and pipes are to be submitted to a non-destructive test for crack detection.
- l. Non-structural tanks located in machinery spaces are to be externally examined; the relevant fittings, with particular regard to the remote control shut-off valves under hydrostatic head, are to be externally examined to check the efficiency of manoeuvres and the absence of cracks or leakage.
- m. When the ship is equipped with a refrigerating plant (whether or not covered by an additional class notation), the class renewal survey is to include: • examination and test at the design pressure of the parts of the plant under pressure
- n. for refrigerating machinery spaces using ammonia as refrigerant:
- n.1. examination and test of the water-spraying fire-extinguishing system)
- n.2. examination of valves and pumps of the bilge system
- n.3. examination and test of the electrical equipment
- n.4. test of the gas detection system.
504. At the Renewal Surveys, the tail-shaft is to be removed and the stern tube checked internally. The tail-shaft survey is to be carried out in accordance with the requirements of Part I, Title 02, Section 2, subchapter C6.
- 600. Fire fighting**
601. The renewal survey of fire prevention and other general arrangements is to cover the following items:
- a. fire control plans: properly posted
- b. operation of manual and/or automatic fire doors, where fitted
- c. Examination of bulkheads and decks are in accordance with fire integrity requirements in the fire plan
- d. Openings (doors, ductwork, electrical wires, piping, etc) do not impair the fire resistance of the bulkhead
- e. General examination of means of escape: no obstructions, lighting, steps, handrails in good conditions.
- f. Remote stops for ER fans & pumps, quick closing valves,, shutting off the electrical power of the deep-fat cooking equipment.
- g. Fire dampers: automatic and manual operation of fire dampers, main inlets & outlets be closed from outside space served.
- h. Manual and automatic fire doors: indicators, alarms, local and remote control
602. Examination of the fixed fire-fighting system for the machinery, cargo, vehicle, special category and ro-ro spaces, as appropriate, and confirmation of that its means of operation is clearly marked
- a. Fixed gas fire-extinguishing system
- a.1. bottles of CO<sub>2</sub> (or other gas) to be externally inspected with all stationary fittings and devices
- a.2. the total loss of CO<sub>2</sub> is not to exceed 10% of the installed quantity (5% for halon)
- a.3. after being repaired or discharged, the CO<sub>2</sub> bottles are to be submitted to a hydrostatic test
- a.4. hydrostatic testing of high pressure CO<sub>2</sub> bottles to be carried at intervals not exceeding 5 years for ships under the Brazilian Flag
- a.5. low pressure CO<sub>2</sub> bottles are to be internally surveyed if the content has been released and the container is older than 5 years. The Surveyor may require a hydrostatic test of the bottle.
- a.6. the distribution piping is to be checked and tested to be proved clear.
- b. Sprinkler system : associated pumps to be opened up for inspection at Surveyor's discretion
- c. Water-spraying system: associated pumps to be opened up for inspection at Surveyor's discretion

- d. fixed foam systems (low or high expansion): associated pumps to be opened up for inspection at Surveyor's discretion
- e. Dry powder system: check that the pressure of propelling inert gas contained in the relevant bottles have been hydrostatically tested, as well as bottles disembarked for refilling for replacement.

603. The bottles of the portable fire extinguishers are to be hydrostatically tested every 5 years.

604. Examination of the helicopter facilities

- a. drainage arrangements around the landing area
- b. fire fighting appliances and arrangements
- c. refuelling systems and hangar facilities for cleanliness and absence of leaks, condition of gutters and drainage arrangement.

## C8. SURVEY OF STEAM BOILERS [IACS UR Z18.2, NR 13]

### 100. Classes of Steam Boilers

#### 100. Application

101. The requirements of the present Part I, Title 02, Section 2, Subchapter C8 are applicable to all boilers destined to operate in vessels flying the Brazilian flag which are subject to the regulations of NR-13 standard.

102. The present requirements also apply for boilers built in other Countries destined to operate in vessels built for the Brazilian flag.

103. The requirements for tests according to International Standards such as ASME V are applicable. However, whenever such Standards are in conflict with NR13, the requirements of NR13 are to be complied with. This is specially the case with the time-limits for the inspection of boilers, which are shorter than IACS and other Standards recommendations.

104. The standard NR-13 regards as "boilers" all equipment that simultaneously generate and accumulate water vapour or other fluid. Units installed in vehicles such ships should respect this Regulatory Standard on items that are applicable and for which there are more specific regulations or standards

105. The NR13 standards requires that all inspections are to be carried out by qualified technicians defined as "PH". The RBNA surveyor must be present at all surveys, accompanying the "PH".

### 200. Definitions

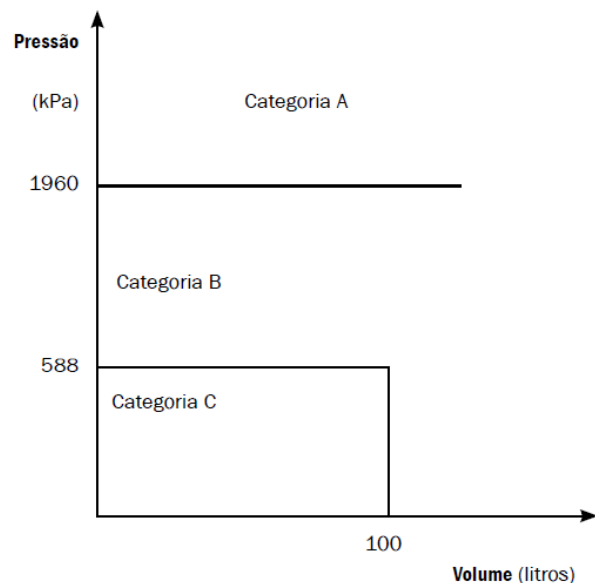
201. For the purposes of these Rules, the boilers are classified into three categories (according to NR13) as follows:

- a. **Category "A" Boilers** are those whose operating pressure is equal to or greater than the 1960 kPa (19.98 kgf/cm<sup>2</sup>).
- b. **Category "C" Boilers** are those whose operating pressure is equal to or less than 588 kPa (5.99 kgf/cm<sup>2</sup>) and the volume is equal to or less than 100 litres.
- c. **Category "B" Boilers** are all those that do not fall under previous categories. the criterion adopted for this Chapter rating for boilers, takes into account the operating pressure and the internal volume of the boiler.

#### Guidance

*This concept, also adopted by other international standards, represents the energy available in a boiler. This way, the higher the energy, the greater the risks involved. The production capacity of boiler steam (t/h, kg/h) is not indicative of the risk, as does the steam pressure produced or volume of the stored vapour.*

#### End of guidance



202. **Accumulation test:** the boiler outlets are closed to verify whether the security valve (or valves) installed in boilers is capable of discharging all the steam generated at the maximum rate of burning, without allowing the internal pressure to rise above the design values, defined by ASME, Section as 6% above the PMTA). **Note: this is a risky procedure;** see item C8.500, "Guidance", for an alternative procedure.

203. **Enabled Professional** (*pessoa habilitada*) (**PH**): one who has legal jurisdiction to exercise the profession of engineer in activities relating to building design and maintenance, monitoring, inspection and supervision inspection of boilers and pressure vessels, in accordance with the professional regulations prevailing in the country.

204. **Extraordinary Security Inspection:** carried out whenever the boiler has been damaged by accident, is subject to modification or repair important able to change their conditions of security, before the boiler is restored in operation when remain inactive for more than six months, and when there is change of place of installation of the boiler.

205. **Maximum Allowable Operating Pressure:** Maximum Allowable Working Pressure (*Pressão Máxima de Trabalho Permitida*) (**PMTP**), or Maximum Admissible Working Pressure (*Pressão Máxima de Trabalho Admissível*) (**PMTA**), is the largest pressure compatible with the Project code, the strength of the boiler materials and the dimensions of the equipment and its operational parameters.

206. **Steam boilers** are equipment for producing and accumulating steam under pressure exceeding atmospheric pressure, using any energy source, except the reboilers and similar equipment used in units of process. The steam can be used in various conditions such as: high pressure, low pressure, saturated, overheated, etc. It can be produced also by different types of equipment in which the boilers are included with various sources of energy.

### 300. Security Inspection of Boilers

301. Boilers must be subjected to initial, periodic and extraordinary security Inspections, being considered, condition of imminent and serious risk where violating the deadlines this Chapter.

302. The Initial Safety inspection must be made in new boilers before the entry into operation *on board* at the place of operation, and comprises: external and internal examination, hydrostatic and accumulation tests.

#### Guidance

*Internal and external examinations and hydrostatic test, carried out in the boiler manufacturer's dependencies are important and necessary, but **do not constitute** the Initial Safety Inspection, since the boiler components can suffer damage during their transport, storage and assembly in situ. Safety inspection can only be performed when the boiler is already installed for operation.*

#### End of guidance

303. The accumulation test must be carried out in accordance with current technical standards, recommendations of boiler manufacturers and manufacturers of safety valves or in accordance with procedures established by the PH.

304. Periodic Security inspection, consisting of internal and external examination should be carried out inside the following time limits:

- a. twelve months for boilers in categories "A", "B" and "C".
- b. 12 months for alkali recovery boiler of any category.
- c. twenty-four months for boilers of category "A", provided that every twelve months the opening pressures of safety valves are tested.
- d. Forty months special boiler

305. The scope of Periodic Safety inspection as well as the techniques to be used should be defined by the PH according to the register of operation of the boiler and existing technical standards.

306. The deadlines set in the present Part I, Title 02, Section 2, Subchapter C8 shall be considered as maximum. The real deadline should be established by the PH based on the previous experience available, and should be counted from the last full inspection.

307. The methods or inspection procedures. This action adopted by PH are based on internationally recognised standards and codes, such as ASME-V;.

308. The time limits specified in sub-items "a", "b" and "c" above are applicable to Owners that do not have their own Service Inspection Equipment.

309. Owners which have their own Service Inspection Equipment, as set out in annex II of the NR13 standard, may extend the periods between safety inspections in accordance with the following limits:

- a. eighteen months for boilers of categories "B" and "C".
- b. Thirty months for boilers of category "A".

The test for determining the opening pressure of the safety valve can be run with the boiler in operation using appropriate hydraulic devices.

310. The written procedure adopted in the test, the results obtained and the certificates of calibration of the device must be attached to the documentation of the boiler.

311. The extension of the period of inspection of boilers of category "A" for thirty months does not relieve the execution of the tests to determine the opening pressure of the safety valve every 12 months.

312. The time-limits established in item C8.304 above are also applicable to alkali recovery boilers installed in vessel whose Owners have their own Service inspection equipment.

313. Under the technical point of view, the execution of the tests to determine the opening pressure of the safety valve to each twelve months must be preserved, even with the extension of the period of inspection of boilers of

category "A" for thirty months. The table T.C8.313.1 below summarizes the maximum periods laid down for inspection of boilers..

**TABLE T.C8.313.1 BELOW SUMMARIZES THE MAXIMUM PERIODS LAID DOWN FOR INSPECTION OF BOILERS.**

Type of installation	Category "A" boilers	Category "B" and "C" boilers	Special Category
Without their own Service of Inspection of Equipment	12 months, or	12 months	
	24 months when the safety valves are tested every 12 months, with the exception of alkali recuperation boilers		
With their own Service of Inspection of Equipment	30 months	18 months	40 months

314. At the next inspection after completing twenty five years of use, the boiler shall be subjected to a rigorous evaluation to determine its remaining life and new limits for inspection.

315. Residual life assessment assumes that is parsed the integrity of each fundamental component of the boiler (ex.: drums, furnaces heat exchange tubes, mirrors, etc.).

316. Evaluation of residual life and Integrity can be enforced by a specialized company registered in the CREA Engineering Council and having a PH in their staff.

317. Boilers at the date of publication of this Rule, have already more than twenty five years, and have not been submitted to the health evaluation must be subjected to this evaluation in the next periodic security inspection.

318. If the boiler has already been submitted to tests, examinations and tests for establishment of the residual life and Assessment of Integrity before completing twenty five years, these data may be considered at the discretion of PH to attend partially or fully the requirements of this sub-item. It is important to note that inoperative boilers may suffer significant damage by corrosion.

319. For Owners that have a Service for Inspection of equipment mentioned in Annex II of the NR13 standard, the limit of twenty five years may be amended in the light of the monitoring of the conditions of the boiler, made by that body.

#### **400. Inspection of safety valves installed on boilers**

401. The safety valves installed on boilers shall be periodically inspected as follows:

- At least once a month, through debt item functioning manual of the lever, in operation, for boilers in categories "B" and "C".
- By Rapid removal, merely inspect and testing, bench, the valves flanged and, in the field, the valves welded, calibrating a frequency compatible with the operational experience of the same, but in

this case as an upper limit the period of inspection established in sub-item C8.304 or C8.309 , if applicable, for boilers of categories "A" and "B".

- The item "a" of this sub-item determines the manual operation of the lever and therefore this becomes mandatory, a lever in safety valves installed in boilers of categories "B" and "C". The requirements of this sub-item have technical grounds in ASME code, Section I (Boilers) and the Standard ANSI/NB-23, the National Board Inspection Code, internationally recognized.

402. In addition to the tests prescribed in subsection C8.401, the safety valves installed in boilers should be subjected to tests of Accumulation, in the following occasions:

- An initial inspection of the boiler.
- When they have been modified or have suffered significant reforms.
- Where there is change in standards operational items of the boiler or variation of the PMTA.
- When there are changes to its admission or discharge piping.

403. In light of the risks involved with the implementation of the Tests of Accumulation, the boiler compartment must implement all the required security measures and preserving the environment. The item "b" refers to the modifications or repairs carried out to the safety valves of the boiler.

#### **500. Accumulation Test**

501. The Accumulation Test is done to verify whether the security valve (or valves) installed in boilers is capable of discharging all the steam generated at the maximum rate of burning, without allowing the internal pressure to rise above the design values (in the case of boilers designed by ASME, Section I, this value corresponds to 6% above the PMTA).

502. This test should be performed on the basis of procedures established by the manufacturer of the boiler and/or the manufacturer of the safety valve. As this test is run with all the steam outlets blocked, the lack of circulation may cause damage to boilers fitted with super heaters or in boilers destined for heating of water, that is, therefore this test is not recommended in boilers of this configuration.

#### Guidance

*Accumulation tests and setting of safety valves of boilers and super-heaters safety valves are to be set to lift at a pressure not exceeding 103% of the design pressure. For boilers with super-heaters, the safety valves of the latter are to be set to lift before or, at the latest, at the same time as the valves of the saturated steam chest.*

*Verification that, at the maximum steaming rate the boiler pressure does not exceed 110% of the design pressure when the stop valves of the boiler, except those which must remain open for the burning operation, are closed. The boiler is to be fed so that the water level remains normal throughout the test. The test is to last:*

*n.5. 15 minutes for oil fired tube boilers*

*n.6. 7 minutes for water tube boilers*

#### Alternative requirement

*When it is recognized, for certain types of boilers, that accumulation tests might endanger the super-heaters, the omission of such tests may be considered. Such omission can be permitted, however, only if the drawings and the size of safety valves have been reviewed by the Society, and provided that the safety valves are of a type whose relieving capacity has been established by a test carried out in the presence of the surveyor, or in other conditions deemed equivalent to those of the actual boiler.*

*When the Society does not agree to proceed with an accumulation test, the valve manufacturer is to supply, for each safety valve, a certificate specifying its relieving capacity for the working conditions of the boiler. In addition, the boiler manufacturer is to supply a certificate specifying the maximum steam capacity of the boiler.*

#### End of guidance

### 600. Extraordinary Security Inspection

601. The Extraordinary Security Inspection should be performed in the following opportunities:

- a. Where the boiler has been damaged by accident or any other occurrence that could affect their safety.
- b. When the boiler is subject to modification or repair important able to change their conditions of security.
- c. Before the boiler is restored in operation when remain inactive for more than six months.

- d. When there is change of place of installation of the boiler.

602. The Extraordinary Security Inspection covers the whole boiler or part of the same, according to the need and the criterion of PH. When the Extraordinary Inspection comprises the entire boiler, the deadline for next inspection of periodic safety can be defined from the date of completion of the extraordinary inspection.

603. In the case of a boiler remain outside of operation items for a long time (more than six months) the Extraordinary Inspection mentioned in item "c" must be carried out before the boiler is returned to operation, and not every six months.

604. The safety inspection must be carried out by an accredited PH, or by the manufacturer's own inspection, as mentioned in Annex II. The sub-item refers to all types of safety inspections, initial, periodical or extraordinary. The PH may require the participation of inspectors and/or technicians at the time of the Safety Inspections. Specialized offices may be employed in case the same are registered in the CREA Engineering Council and have a PH in their staff.

605. Upon completion of the inspection of the boiler, a survey report is to be issued, report which becomes part of the boiler documentation.

606. It is understood that the completion of the inspection is the date in which the boiler has been liberated to go back to operation. The date of completion of the technical report is not to be considered as the completion of the inspection.

607. The abovementioned inspection report (must contain at least the following:

- a. The data on the identification tag of the boiler
- b. Boiler category.
- c. Boiler type.
- d. The type of inspection which has been carried out.
- e. Commencement and completion inspection dates
- f. Description of the inspections and tests which have been carried out
- g. Results of the inspections and actions to be taken
- h. List of the items of the NR standard or other legal requirements which have not been attended to.
- i. Conclusions
- j. Recommendations and required actions
- k. Scheduled date for the next boiler inspection



1. Name (legible), signature and register number of the PH in his professional council and name (legible) and signature of all the technicians who have participated in the inspection.

*Guidance*

*“Boiler Type” is the information regarding the type of boiler, i.e., aqua-tubular, flame tubular, electric etc.*

*Examples of the sub-items of item h:*

- a) lack of manometers;
- b) lack of safety valves;
- c) incorrect distance between the boiler and the starting reservoir.

*An example of item “i”:*

*“Upon satisfactory results of the inspections, the boiler is fit to enter into operation, respecting the operational parameters set by the design, and must be subjected to a periodical inspection no later than \_\_\_\_/\_\_\_\_/\_\_\_\_.”*

*Item “j” is to contain a list of all the recommendations to be attended to as per inspection results, such as:*

- a) To improve the water treatment;
- b) To test the safety valve within the next three months

*The report mentioned in the above C8.605 to C8.607 items is to be requested by the Surveyor from the Owners, and if agreed with the PH, bearing also the surveyor’s signature.*

*End of guidance*

608. Where the inspection results determine a change of the identification tag data, the identification tag must be updated.

**700. Recommendations for boiler inspection  
[IACS UR Z18.2]**

701. Water tube boilers used for main propulsion, including reheat boilers, all other boilers of essential service, and boilers of non-essential service having working pressure exceeding 0.35 N/mm<sup>2</sup> (3.5 bar) and a heating surface exceeding 4.5 m<sup>2</sup>, are to be surveyed internally. There is to be a minimum of two internal examinations during each 5-year Renewal Survey period. In all cases the interval between any two such examinations is not to exceed 36 months.

*Guidance*

*This item is in conflict with the NR13 relevant standards.*

*Boilers built or destined to vessels under the Brazilian flag are to follow the time-lines given in the NR13 standard. Refer to Part I, Title 02, Section 2, Subchapter C8, item 100, where the NR 13 Standards requires respect to its regulations when using any other standard.*

*End of guidance*

702. At each survey, the boilers, super heaters, and economizers are to be examined internally on water-steam side and fire side. Boiler mountings and safety valves are to be examined at each survey and opened out as considered necessary by the RBNA.

*Guidance*

*Refer to Part I, Title 02, Section 2, Subchapter C8, item 100, where the NR 13 Standards requires respect to its regulations when using any other standard. Therefore, the safety valves are to be subjected to inspections as described in the present Subchapter C8, items 100 to 600.*

*End of guidance*

703. The adjustment of the safety valves is to be verified during each boiler internal survey. Boiler safety valve and its relieving gear are to be examined and tested to verify satisfactory operation. However, for exhaust gas heated economizers, if steam cannot be raised at port, the safety valves may be set by the Chief Engineer at sea, and the results recorded in the log book for review by the RBNA.

*Guidance*

*The above recommendation is for the Surveyor to check the safety valves during the internal boiler survey. However, this does not exempt the inspection by a qualified PH and the relevant report.*

*End of guidance*

704. Review of the following records since the last Boiler Survey is to be carried out as part of the survey:

- a. Operation
- b. Maintenance
- c. Repair history
- d. Feedwater chemistry

705. External survey of boilers including test of safety and protective devices, and test of safety valve using its relieving gear, is to be carried out annually, within the window of the Annual Survey of a ship.

706. For exhaust gas heated economizers, the safety valves are to be tested by the Chief Engineer at sea within the annual survey window. This test is to be recorded in the log book for review by the attending Surveyor prior to crediting the Annual Survey of Machinery.

707. An extension of the internal examination of the boiler up to 3 months beyond the due date can be granted in exceptional circumstances<sup>1</sup>. The extension may be granted by the RBNA after the following is satisfactorily carried out:

- a. External examination of the boiler
- b. Boiler safety valve relieving gear (easing gear) is to be examined and operationally tested
- c. Boiler protective devices operationally tested
- d. Review of the following records since the last Boiler Survey:

- d.1. Operation
- d.2. Maintenance
- d.3. Repair history
- d.4. Feedwater chemistry

*Guidance*

*As long as the above extension is not in conflict with the relevant NR 13 Standards as per Part I, Title 02, Section 2, Subchapter C8, items 100 to 600 above.*

*End of guidance*

**800. Exhaust Gas Heated Economizers**

801. In addition to the other requirements of items C8.701-704 above (internal examination) in exhaust gas heated economizers of the shell type, all accessible welded joints are to be subjected to a visual examination for cracking. Nondestructive Testing may be required for this purpose.

802. Boilers operate continuously and that use gases can be considered when all the following conditions are met:

- a. are installed in establishments possessing their own Service Inspection Equipment cited in annex II of the NR13 standard.
- b. have, every twelve months, tested the interlock system and the opening pressure of each safety valve.
- c. do not present unexpected variations in output temperature of gases and steam, during the operation.
- d. there is periodic analysis and control of water quality and deterioration of control Exists) materials that make up the main parts of the boiler.

**CHAPTER D  
ADDITIONAL REQUIREMENTS FOR HULL  
SURVEYS OF GENERAL DRY CARGO VESSELS  
WITH AB ≥ 500  
[IACS UR Z7.1]**

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**D1. GENERAL  
[IACS UR Z7.1]**

**100. Definitions**

101. In addition to the definitions in A2.200 above, the following definitions apply to this subchapter D1:

102. **Deck cargo ship** is a ship that is designed to carry cargo exclusively above deck without any access for cargo below deck

**200. Application**

201. The requirements of this Chapter are additional to those of Chapter C, subchapter C2. (RBNA)

202. The requirements apply to all self-propelled General Cargo Ships of 500 GT and above carrying solid cargoes other than:

- a. ships subject to Bulk Carrier programs;
- b. dedicated container carriers;
- c. dedicated forest product carriers (not timber or log carriers);
- d. ro-ro cargo ships;
- e. refrigerated cargo ships;
- f. dedicated wood chip carriers;
- g. dedicated cement carriers;

- h. livestock carriers;
- i. deck cargo ships

203. The requirements also apply to those cargo ships, which, although belonging to the ship types listed in D1.201 above that are excluded from the application of this chapter D, are fitted with a single cargo hold.

203. The requirements apply to surveys of hull structure and piping systems in way of cargo holds, cofferdams, pipe tunnels, void spaces and fuel oil tanks within the cargo area and all ballast tanks. The requirements are additional to the classification requirements applicable to the remainder of the ship. Refer to Part I, Title 02, Section 2, Chapter D.

204. The requirements contain the minimum extent of examination, thickness measurements and tank testing.

205. The survey is to be extended when Substantial Corrosion and/or structural defects are found and include additional Close-up Survey when necessary.

## **D2. ADDITIONAL REQUIREMENTS FOR HULL ANNUAL HULL SURVEY OF GENERAL CARGO VESSELS WITH AB ≥ 500 [IACS UR Z7.1]**

### **100. Schedule**

101. Annual Surveys are to be held within 3 months before or after anniversary date from the date of the initial classification survey or of the date credited for the last Renewal Survey.

### **200. Scope**

201. The survey is to consist of an examination for the purpose of ensuring, as far as practicable, that the hull, hatch covers, coamings and piping are maintained in a satisfactory condition.

#### **202. Examination of the Hull**

- a. hull plating and its closing appliances as far as can be seen
- b. Plating of freeboard deck and exposed decks, superstructures, with their openings and means of closure

### **300. Examination of weather decks, hatch covers and coamings**

301. The following applies:

- a. Confirmation is to 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. (UR Z1)

- b. Where mechanically operated steel covers are fitted, checking the satisfactory condition of:

- b.1. hatch covers; including close-up survey of hatch cover plating;
- b.2. tightness devices of longitudinal, transverse and intermediate cross junctions
- b.3. (gaskets, gasket lips, compression bars, drainage channels);
- b.4. clamping devices, retaining bars, cleating;
- b.5. chain or rope pulleys;
- b.6. guides;
- b.7. guide rails and track wheels;
- b.8. stoppers, etc;
- b.9. wires, chains, gypsies, tensioning devices;
- b.10. hydraulic system essential to closing and securing;
- b.11. safety locks and retaining devices.

- c. Where portable covers, wooden or steel pontoons are fitted, checking the satisfactory condition where applicable of:

- c.1. wooden covers and portable beams, carriers or sockets for the portable beam, and their securing devices;
- c.2. steel pontoons;
- c.3. tarpaulins;
- c.4. cleats, battens and wedges;
- c.5. hatch securing bars and their securing devices;
- c.6. loading pads/bars and the side plate edge;
- c.7. guide plates and chocks;
- c.8. compression bars, drainage channels and drain pipes (if any).

- d. Checking the satisfactory condition of hatch coaming plating and their stiffeners including close-up survey.

- e. Random checking of the satisfactory operation of mechanically operated hatch covers is to be made including:

- e.1. stowage and securing in open condition;
- e.2. proper fit and efficiency of sealing in closed condition;
- e.3. operational testing of hydraulic and power components, wires, chains, and link drives.

#### 400. Suspect Areas

401. Suspect Areas identified at previous surveys are to be examined. Thickness measurements are to be taken of the areas of substantial corrosion and the extent of thickness measurements is to be increased to determine the extent of areas of substantial corrosion.

402. Table T.D2.402.1 may be used as guidance for these additional thickness measurements. These extended thickness measurements are to be carried out before the annual survey is credited as completed.

#### 500. Examination of Cargo Holds

501. For Ships 10-15 years of age, the following is to apply:

- a. Overall Survey of one forward and one after cargo hold and their associated tween deck spaces.
- b. When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurement is to be carried out. If the results of these thickness measurements indicate that Substantial Corrosion is found, then the extent of thickness measurements is to be increased to determine the extent of areas of substantial corrosion. Table T.D2.402.1 may be used as guidance for these additional measurements. These extended thickness measurements are to be carried out before the annual survey is credited as completed.

502. For Ships over 15 years of age, the following is to apply:

- a. Overall Survey of all cargo holds and tween deck spaces.
- b. Close-up examination of sufficient extent, minimum 25% of frames, to establish the condition of the lower region of the shell frames including approx. lower one third length of side frame at side shell and side frame end attachment and the adjacent shell plating in a forward lower cargo hold and one other selected lower cargo hold.
- c. Where this level of survey reveals the need for remedial measures, the survey is to be extended to include a Close-up Survey of all of the shell frames and adjacent shell plating of those cargo holds and associated tween deck spaces (as applicable) as well as a Close-up Survey of sufficient extent of all

remaining cargo holds and tween deck spaces (as applicable).

- d. When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurement is to be carried out. If the results of these thickness measurements indicate that Substantial Corrosion is found, then the extent of thickness measurements is to be increased to determine the extent of areas of substantial corrosion. Table T.D2.402.1 may be used as guidance for these additional measurements. These extended thickness measurements are to be carried out before the annual survey is credited as completed.
- e. Where the protective coating in cargo holds, as applicable, is found to be in GOOD condition the extent of close-up surveys may be specially considered.
- f. All piping and penetrations in cargo holds, including overboard piping, are to be examined.

#### 600 Examination of Ballast Tanks

601. Examination of ballast tanks when required as a consequence of the results of the Renewal Survey and Intermediate Survey is to be carried out. When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurement is to be carried out. If the results of these thickness measurements indicate that Substantial Corrosion is found, then the extent of thickness measurements are to be increased to determine the extent of areas of substantial corrosion. Table T.D2.402.1 may be used as guidance for these additional measurements. These extended thickness measurements are to be carried out before the annual survey is credited as completed.

#### 700. Additional requirements for single hold cargo ships after determining compliance with SOLAS II-I/23-3 and II-I/25

701. For ships complying with the requirements of SOLAS II-I/23-3 and II-I/25 for hold water level detectors, the annual survey is to include an examination and a test, at random, of the water ingress detection system and of their alarms.

#### D3. ADDITIONAL REQUIREMENTS FOR HULL INTERMEDIATE SURVEY OF GENERAL CARGO VESSELS WITH AB ≥ 500 [IACS UR Z7.1]

#### 100. Schedule

101. The Intermediate Survey is to be held at or between either the 2<sup>nd</sup> or 3<sup>rd</sup> Annual Survey.

102. Those items which are additional to the requirements of the Annual Surveys may be surveyed either at or between the 2<sup>nd</sup> and 3<sup>rd</sup> Annual Survey.

103. A survey planning meeting is to be held prior to the commencement of the survey (see Chapter A, A2.800).

104. Concurrent crediting to both Intermediate Survey and Renewal Survey for surveys and thickness measurements of spaces are not acceptable.

## **200. Scope**

201. The survey extent is dependent on the age of the vessel.

202. Ships 5 - 10 Years of Age, the following is to apply.

## **300. Ballast tanks**

301. For tanks used for water ballast, an Overall Survey of Representative Tanks selected by the Surveyor is to be carried out. If such overall survey reveals no visible structural defects, the examination may be limited to verification that the corrosion prevention system remains efficient.

302. Where POOR coating condition, soft or semi-hard coating, corrosion or other defects are found in water ballast tanks or where a hard protective coating was not applied from the time of construction, the examination is to be extended to other ballast tanks of the same type.

303. In water ballast tanks other than double bottom tanks, where a hard protective coating is found in POOR condition, and it is not renewed, where soft or semi-hard coating has been applied, or where a hard protective coating was not applied from time of construction, the tanks in question are to be examined and thickness measurements carried out as considered necessary at annual intervals. When such breakdown of hard protective coating is found in water ballast double bottom tanks, where a soft or semi-hard coating has been applied, or where a hard protective coating has not been applied, the tanks in question may be examined at annual intervals. When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurements are to be carried out.

304. In addition to the requirements above, areas found suspect at previous surveys are to be surveyed in accordance with the provisions indicated in D2.400.

## **400. Cargo Holds**

401. An Overall Survey of one forward and one after cargo hold and their associated tween deck spaces.

402. Areas found suspect at previous surveys are to be surveyed in accordance with the provisions indicated in D2.400.

## **500. Ships 10-15 Years of Age, the following is to apply:**

### **501. Ballast Tanks**

a. For tanks used for water ballast, an overall survey of all tanks is to be carried out. If such overall survey reveals no visible structural defects, the examination may be limited to verification that the corrosion prevention system remains efficient.

b. The requirements of D3.303 and D3.304 also apply.

### **502. Cargo Holds**

a. An Overall Survey of all cargo holds and tween deck spaces.

b. Areas found suspect at previous surveys are to be surveyed in accordance with the provisions indicated in D2.400.

c. When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurement is to be carried out. If the results of these thickness measurements indicate that Substantial Corrosion is found, then the extent of thickness measurements is to be increased to determine the extent of areas of substantial corrosion. Table T.D2.402.1 may be used as guidance for these additional measurements. These extended thickness measurements are to be carried out before the survey is credited as completed.

## **600. Ships over 15 Years of Age, the following is to apply:**

601. The requirements of the Intermediate Survey are to be to the same extent as the previous Renewal Survey. However, tank testing, survey of automatic air pipe heads and internal examination of fuel oil, lube oil and fresh water tanks are not required unless deemed necessary by the attending surveyor.

602. In application of D3.601, the intermediate survey may be commenced at the second annual survey and be progressed during the succeeding year with a view to completion at the third annual survey in lieu of the application of D4.104.

603. In lieu of the requirements of D4.300 below, an underwater survey may be considered as equivalent.

## **D4. ADDITIONAL REQUIREMENTS FOR HULL RENEWAL SURVEY OF GENERAL CARGO VESSELS WITH AB ≥ 500 [IACS UR Z7]**

### **100. Schedule**

101. Renewal Surveys are to be carried out at 5 years intervals to renew the Classification Certificate.



102. The first Renewal Survey is to be completed within 5 years from the date of the initial classification survey and thereafter within 5 years from the credited date of the previous Renewal Survey. However, an extension of class of 3 months maximum beyond the 5th year can be granted in exceptional circumstances. In this case, the next period of class will start from the expiry date of the Renewal Survey before the extension was granted.

103. For surveys completed within 3 months before the expiry date of the Renewal Survey, the next period of class will start from the expiry date of the Renewal Survey. For surveys completed more than 3 months before the expiry date of the Renewal Survey, the period of class will start from the survey completion date.

104. The Renewal Survey may be commenced at the 4th Annual Survey and be progressed with a view to completion by the 5<sup>th</sup> anniversary date. When the Renewal Survey is commenced prior to the 4th Annual Survey, the entire survey is to be completed within 15 months if such work is to be credited to the Renewal Survey.

105. A survey planning meeting is to be held prior to the commencement of the survey.

106. Concurrent crediting to both Intermediate Survey and Renewal Survey for surveys and thickness measurements of spaces are not acceptable.

## **200. Scope**

201. The Renewal Survey is to include, in addition to the requirements of the Annual Surveys, examination, tests and checks of sufficient extent to ensure that the hull and related piping are in a satisfactory condition and fit for the intended purpose for the new period of class of 5 years to be assigned, subject to proper maintenance and operation and to periodical surveys being carried out at the due dates.

202. All cargo holds, water ballast tanks, including double bottom tanks, pipe tunnels, cofferdams and void spaces bounding cargo holds, decks and outer hull are to be examined, and this examination is to be supplemented by thickness measurement and testing to ensure that the structural integrity remains effective. The aim of the examination is to discover Substantial Corrosion, significant deformation, fractures, damages or other structural deterioration, that may be present.

203. All piping systems within the above spaces are to be examined and operationally tested to working pressure to attending Surveyor's satisfaction to ensure that tightness and condition remain satisfactory.

204. The survey extent of ballast tanks converted to void spaces is to be specially considered in relation to the requirements for ballast tanks.

205. Note: For survey of automatic air pipes refer to D4.203.

## **300. Dry Dock Survey**

301. A survey in dry dock is to be a part of the Renewal Survey. The overall and close-up surveys and thickness measurements, as applicable, of the lower portions of the cargo holds and water ballast tanks are to be carried out in accordance with the applicable requirements for Renewal surveys, if not already performed.

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

## **400. Tank Protection**

401. Where provided, the condition of corrosion prevention system of ballast tanks is to be examined. For tanks used for water ballast, excluding double bottom tanks, where a hard protective coating is found in POOR condition and it is not renewed, where soft or semi-hard coating has been applied, or where a hard protective coating was not applied from time of construction, the tanks in question are to be examined at annual intervals. Thickness measurements are to be carried out as deemed necessary by the surveyor.

402. When such breakdown of hard protective coating is found in water ballast double bottom tanks and it is not renewed, where a soft or semi-hard coating has been applied, or where a hard protective coating was not applied from the time of construction, the tanks in question may be examined at annual intervals. When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurements are to be carried out.

403. Where the hard protective coating in spaces is found to be in a GOOD condition, the extent of close-up surveys and thickness measurements may be specially considered.

## **500. Hatch Covers and Coamings**

501. The hatch covers and coamings are to be surveyed as follows:

- a. A thorough inspection of the items listed in D2.300 is to be carried out.
- b. Checking of the satisfactory operation of all mechanically operated hatch covers is to be made, including:
  - b.1. stowage and securing in open condition;
  - b.2. proper fit and efficiency of sealing in closed conditions;
  - b.3. operational testing of hydraulic and power components, wires, chains and link drives.
- c. Checking the effectiveness of sealing arrangements of all hatch covers by hose testing or equivalent is to be carried out.

- d. Thickness measurement of the hatch cover and coaming plating and stiffeners is to be carried out as given in Table T.D4.701.1.

#### **600. Extent of Overall and Close-up Survey**

601. An Overall Survey of all tanks and spaces, excluding fuel oil, lube oil and fresh water tanks, is to be carried out at each Renewal Survey.

602. Note: For fuel oil, lube oil and fresh water tanks, reference is to be made to Table T.D2.402.1.

603. The minimum requirements for close-up surveys at Renewal survey are given in Table T.D4.603.1.

604. The Surveyor may extend the close-up survey 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.

605. For areas in spaces where hard protective coatings are found to be in a GOOD condition, the extent of close-up surveys according to Table T.D4.603.1 may be specially considered.

#### **700. Extent of Thickness Measurement**

701. The minimum requirements for thickness measurements at Renewal Survey are given in Table T.D4.701.1.

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

703. The Surveyor may extend the thickness measurements as deemed necessary. When thickness measurements indicate substantial corrosion, the extent of thickness measurements is to be increased to determine the extent of areas of substantial corrosion.

704. Table T.D2.402.1 may be used as guidance for these additional thickness measurements.

705. For areas in tanks where hard protective coatings are found to be in a GOOD condition, the extent of thickness measurement according to Table T.D4.701.1 may be specially considered.

706. Transverse sections are to be chosen where the largest reductions are suspected to occur or are revealed from deck plating measurements.

#### **800. Extent of Tank Testing**

801. All boundaries of water ballast tanks and deep tanks used for water ballast within the cargo length area are to be pressure tested. For fuel oil tanks, the representative tanks are to be pressure tested.

802. The Surveyor may extend the tank testing as deemed necessary.

803. Tank testing of fuel oil tanks is to be carried out with a head of liquid to the highest point that liquid will rise under service conditions. Tank testing of fuel oil tanks 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.

#### **900. Additional requirements for single hold cargo ships after determining compliance with SOLAS II-I/23-3 and II-I/25**

901. For ships complying with the requirements of SOLAS II-I/23-3 and II-I/25 for hold water level detectors, the Renewal survey is to include an examination and a test of the water ingress detection system and their alarms.

TABLE T.D2.402.1 GUIDANCE FOR ADDITIONAL THICKNESS MEASUREMENTS IN WAY OF SUBSTANTIAL CORROSION

STRUCTURAL MEMBER	EXTENT OF MEASUREMENT	PATTERN OF MEASUREMENT
Plating	Suspect area and adjacent plates.	5 point pattern over 1 square meter.
Stiffeners	Suspect area.	3 measurements each in line across web and flange

FIGURE F.D4.501.1 - AREAS FOR AREAS FOR CLOSE UP SURVEY AND THICKNESS MEASUREMENTS FOR GENERAL DRY CARGO SHIPS: SINGLE DECK SHIPS

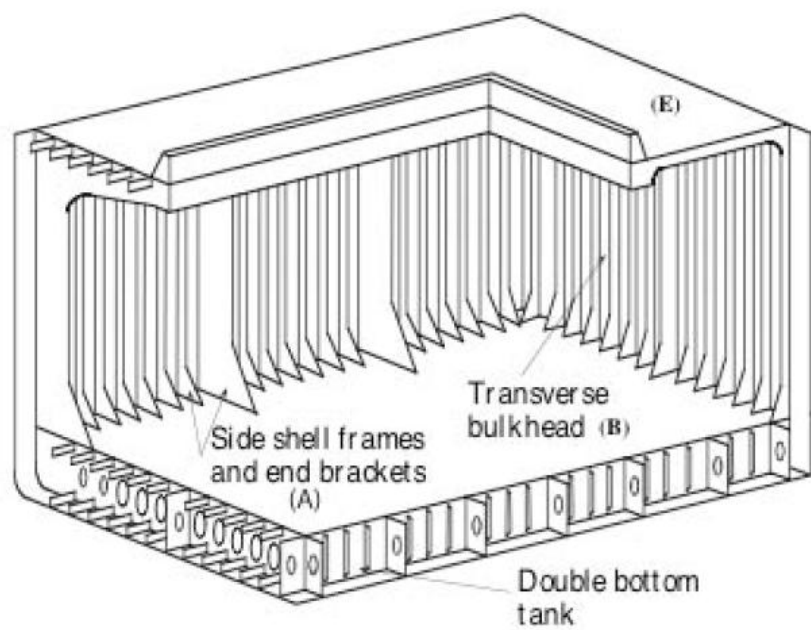
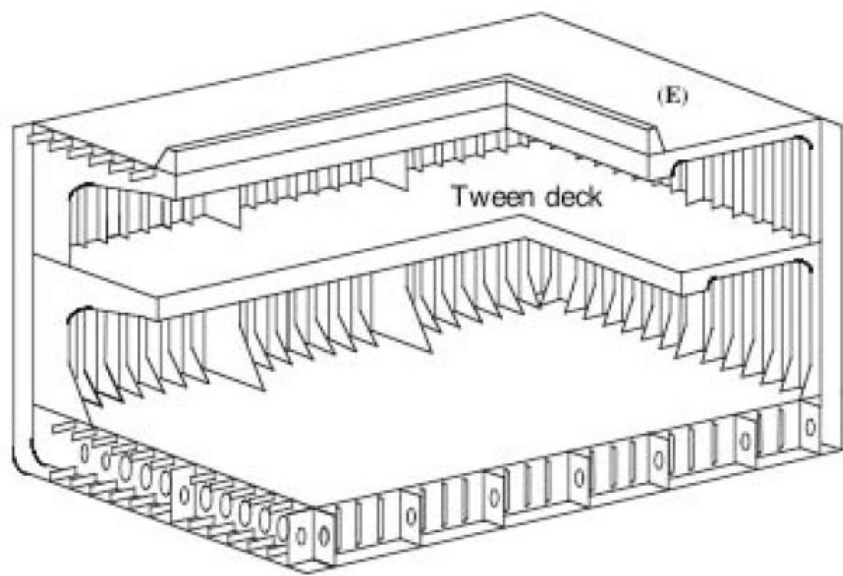
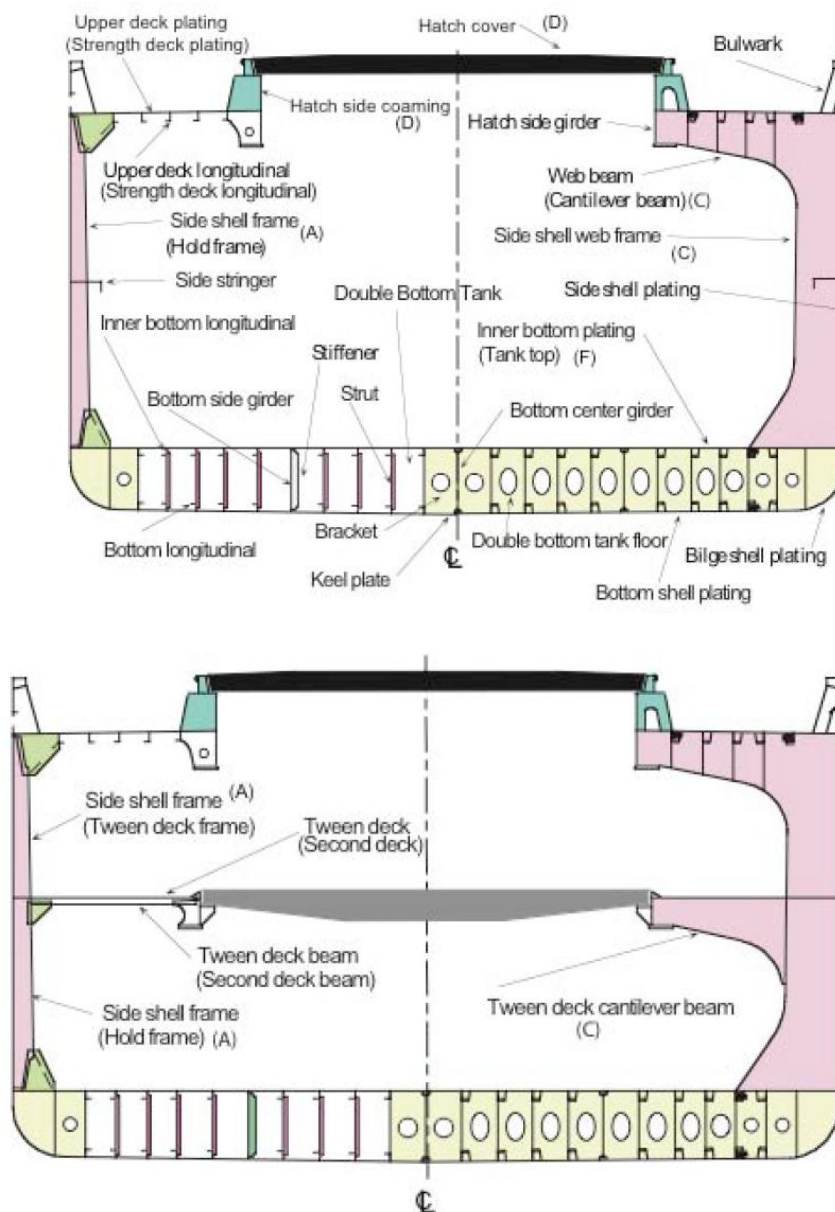


FIGURE F.D4.501.2 - AREAS FOR CLOSE UP SURVEY AND THICKNESS MEASUREMENTS FOR GENERAL DRY CARGO SHIPS: TWEENDECK SHIPS



**FIGURE F.D4.501.3 - AREAS AREAS FOR CLOSE UP SURVEY AND THICKNESS MEASUREMENTS FOR GENERAL SINGLE DECK SHIPS**



**TABLE T.D4.603.1 OF THE MINIMUM REQUIREMENTS FOR CLOSE-UP SURVEY AT HULL  
RENEWAL SURVEYS OF GENERAL GENERAL CARGO SHIPS**

<b>Renewal Survey No.1 Age≤5</b>	<b>Renewal Survey No.2 5&lt;Age≤10</b>	<b>Renewal Survey No.3 10&lt;Age≤15</b>	<b>Renewal Survey No.4 and Subsequent Age&gt;15</b>
<p>(A) Selected shell frames in one forward and one aft cargo hold and associated tween deck spaces.</p> <p>(B) One selected cargo hold transverse bulkhead</p> <p>(D) All cargo hold hatch covers and coamings (plating and stiffeners)</p>	<p>(A) Selected shell frames in all cargo holds and tween deck spaces.</p> <p>(B) One transverse bulkhead in each cargo hold</p> <p>(B) Forward and aft transverse bulkhead in one side ballast tank, including stiffening system</p> <p>(C) One transverse web with associated plating and framing in two representative water ballast tanks of each type (i.e. topside, hopper side, side tank or double bottom tank)</p> <p>(D) All cargo hold hatch covers and coamings (plating and stiffeners).</p> <p>(E) Selected areas of all deck plating and underdeck structure inside line of hatch openings between cargo hold hatches.</p> <p>(F) Selected areas of inner bottom plating.</p>	<p>(A) All shell frames in the forward lower cargo hold and 25% frames in each of the remaining cargo holds and tween deck spaces including upper and lower end attachments and adjacent shell plating.</p> <p>(B) All cargo hold transverse bulkheads.</p> <p>(B) All transverse bulkheads in ballast tanks, including stiffening system.</p> <p>(C) All transverse webs with associated plating and framing in each water ballast tank.</p> <p>(D) All cargo hold hatch covers and coaming (plating and stiffeners)</p> <p>(E) All deck plating and underdeck structure inside line of hatch openings between cargo hold hatches.</p> <p>(F) All areas of inner bottom plating.</p>	<p>(A) All shell frames in all cargo holds and tween deck spaces including upper and lower end attachments and adjacent shell plating.</p> <p>Area (B-F) as for Renewal Survey No.3</p>

(A) Cargo hold transverse frames.

(B) Cargo hold transverse bulkhead plating, stiffeners and girders.

(C) Transverse web frame or watertight transverse bulkhead in water ballast tanks.

(D) Cargo hold hatch covers and coamings.

(E) Deck plating and underdeck structure inside line of hatch openings between cargo hold hatches.

(F) Inner bottom plating.

See Figs F.D4.501.1, F.D4.501.2 and F.D4.501.3 for the areas corresponding to (A), (B), (C), (D), (E) and (F) .

Note: Close-up survey of cargo hold transverse bulkheads to carried out at the following levels:

- Immediately above the inner bottom and immediately above the tween decks, as applicable.
- Mid-height of the bulkheads for holds without tween decks.
- Immediately below the main deck plating and tween deck plating.



**TABLE T.D4.701.1 TABLE OF MINIMUM REQUIREMENTS FOR THE THICKNESS MEASUREMENT AT HULL RENEWAL SURVEYS OF GENERAL CARGO SHIPS**

<b>Renewal Survey No.1</b> <b>Age≤5</b>	<b>Renewal Survey No.2</b> <b>5&lt;Age≤10</b>	<b>Renewal Survey No.3</b> <b>10&lt;Age≤15</b>	<b>Renewal Survey No.4</b> <b>and Subsequent</b> <b>Age&gt;15</b>
1. Suspect areas	<p>1. Suspect areas</p> <p>2. One transverse section of deck plating in way of a cargo space within the amidship 0,5L.</p> <p>3. Measurement for general assessment and recording of corrosion pattern of those structural members subject to close-up survey according to Table T.D4.603.1</p>	<p>1. Suspect areas</p> <p>2. Two transverse sections within the amidship 0,5L in way of two different cargo spaces.</p> <p>3. Measurements for general assessment and recording of corrosion pattern of those structural members subject to close-up survey according to Table T.D4.603.1</p> <p>4. Within the cargo length area, each deck plate outside line of cargo hatch openings.</p> <p>5. All wind and water strakes within the cargo length area.</p> <p>6. Selected wind and water strakes outside the cargo length area.</p>	<p>1. Suspect areas</p> <p>2. Within the cargo length area:</p> <p>a) A minimum of three transverse sections within the amidship 0,5L</p> <p>b) each deck plate outside line of cargo hatch openings.</p> <p>c) Each bottom plate, including lower turn of bridge.</p> <p>d) Duct keel or pipe tunnel plating and internals.</p> <p>3. Measurement for general assessment and recording for corrosion pattern of those structural members subject to close-up survey according to Table T.D4.603.1</p> <p>4. All wind and water strakes full length</p>

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 metres in length, the number of transverse sections required at Renewal survey No. 3 may be reduced to one and the number of transverse sections at Renewal Survey No. 4 and subsequent surveys may be reduced to two.

**CHAPTER E**  
**ADDITIONAL REQUIREMENTS FOR HULL**  
**SURVEYS OF SINGLE AND DOUBLE SKIN BULK**  
**CARRIERS OF AB ≥ 500**  
**[IACS UR Z10.2 IACS URZ 10.5]**

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**O)**

**E1. GENERAL**  
**[IACS UR Z10.2.1]**

**100. Application**

101. The requirements apply to all self-propelled Bulk Carriers of Single and Double Skin Bulk Carriers.

102. The Requirements apply to surveys of hull structure and piping systems in way of the cargo holds, cofferdams, pipe tunnels, void spaces, fuel oil tanks within the cargo length area and all ballast tanks. The requirements are

additional to the classification requirements applicable to the remainder of the ship.

103. The requirements contain the minimum extent of examination, thickness measurement and tank testing. The survey is to be extended when Substantial Corrosion and/or structural defects are found and include additional Close-Up Survey when necessary.

104. Single skin existing ships which are required to comply with Part II, Title 14, Section 2, Chapter L are subject to the additional thickness measurement guidance contained in E9 with respect to the vertically corrugated transverse watertight bulkhead between cargo holds Nos. 1 and 2 for purposes of determining compliance with Part II, Title 14, Section 2, Chapter L prior to the relevant compliance deadline stipulated in Part II, Title 14, Section 2, Subchapter A2 and at subsequent intermediate surveys (for ships over 10 years of age) and Renewal surveys for purposes of verifying continuing compliance with Part II, Title 14, Section 2, Chapter L.

105. Single skin existing ships which are required to comply with Part II, Title 14, Section 2, Chapter O are subject to the additional thickness measurement guidance with respect to the side shell frames and brackets for the purposes of determining compliance with Part II, Title 14, Section 2, Chapter O prior to the relevant compliance deadline stipulated in Part II, Title 14, Section 2, Chapter O and at subsequent intermediate and Renewal surveys for purposes of verifying continuing compliance with Part II, Title 14, Section 2, Chapter O.

**200. Definitions**

**201. Bulk Carrier**

A Bulk Carrier is a ship which is constructed generally with single deck, topside tanks and hopper side tanks in cargo spaces, and is intended primarily to carry dry cargo in bulk. Combination carriers are included.

**202. Double Skin Bulk Carrier**

A Double Skin Bulk Carrier is a ship which is constructed generally with single deck, topside tanks and hopper side tanks in cargo spaces, and is intended primarily to carry dry cargo in bulk, including such types as ore carriers and combination carriers, in which all cargo holds are bounded by a double-side skin (regardless of the width of the wing space).

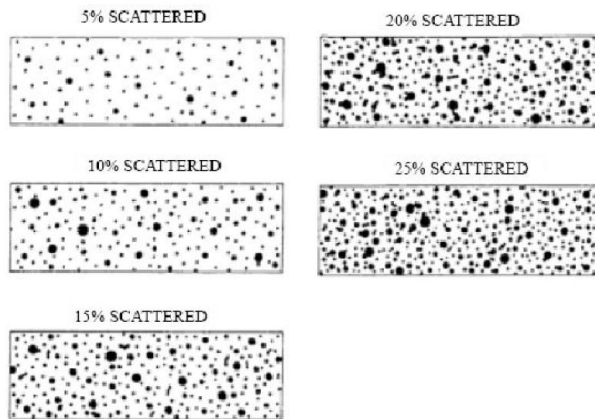
- a. For single skin combination carriers additional requirements are specified in the present Chapter E.
- b. For combination carriers with longitudinal bulkheads additional requirements are specified in this Chapter E, as applicable.

203. **Pitting Corrosion:** Pitting corrosion is defined as scattered corrosion spots/areas with local material reductions which are greater than the general corrosion in the surrounding area. Pitting intensity is defined in Figure F.E1.203.1.

204. **Critical Structural Area:** locations which have been identified from calculations to require monitoring or from the service history of the subject ship or from similar or sister ships (if available) to be sensitive to cracking, buckling or corrosion which would impair the structural integrity of the ship.

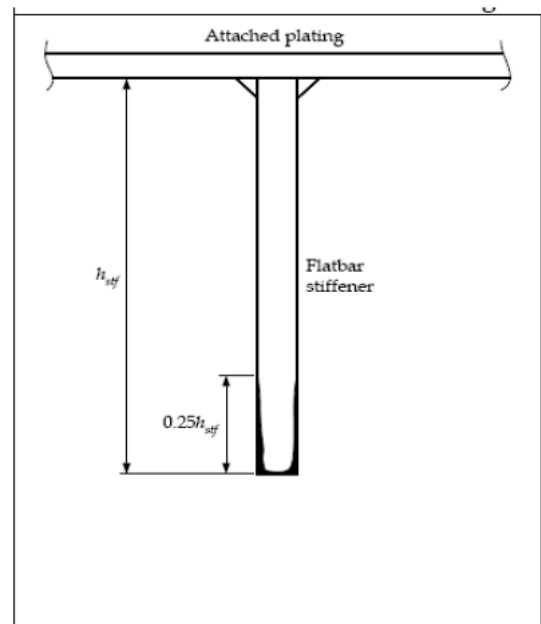
205. **Renewal Thickness (tren):** is the minimum allowable thickness, in mm, below which renewal of structural members is to be carried out.

**FIGURE F.E1.203.1- PITTING INTENSITY DIAGRAMS**

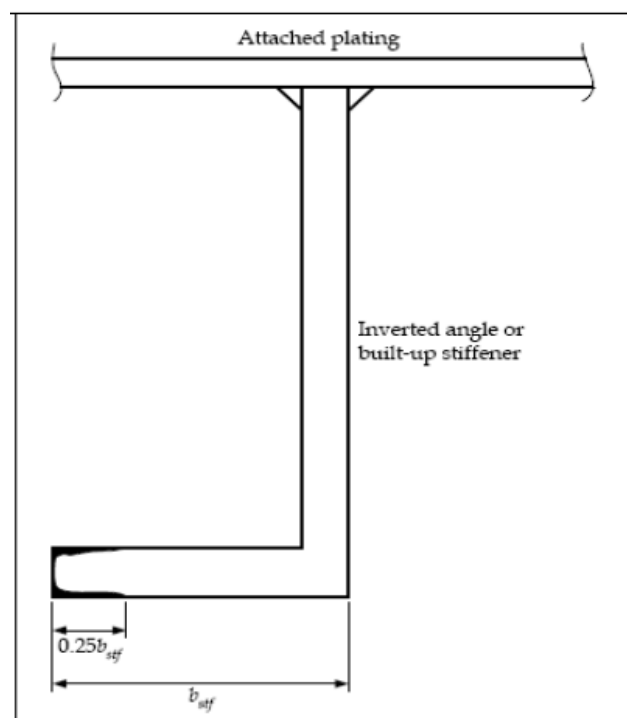


206. **Edge Corrosion:** Edge corrosion is defined as local corrosion at the free edges of plates, stiffeners, primary support members and around openings. An example of edge corrosion is shown in Figures F.E1.204.1 and F.E1.204.2.

**FIGURE F.E1.204.1 – EDGE CORROSION**

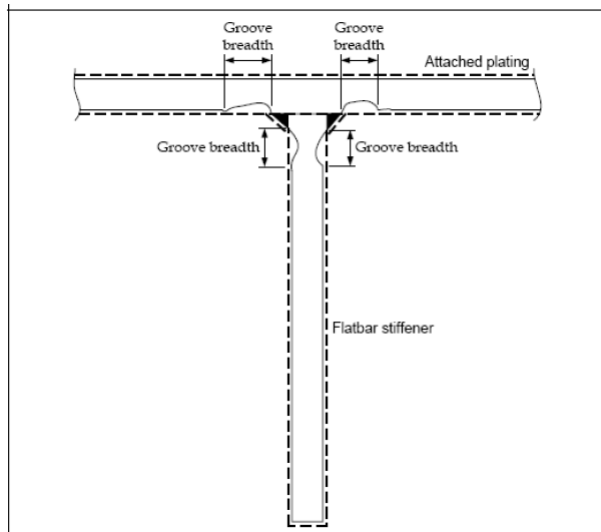


**FIGURE F.E1.204.2 – EDGE CORROSION**



207. **Grooving Corrosion:** Grooving corrosion is typically local material loss adjacent to weld joints along abutting stiffeners and at stiffener or plate butts or seams. An example of groove corrosion is shown in Figure F.E1.205.1.

**FIGURE F.E1.205.1 – GROOVING CORROSION**



208. Cargo Length Area: that part of the ship which includes cargo holds and adjacent areas including fuel tanks, cofferdams, ballast tanks and void spaces.

**300. Procedural Requirement for certain ESP Surveys**  
[IACS PR 20]

301. Taking into consideration, the size of vessels and scope of surveys for vessels noted below, it is more effective to have more than one surveyor examine the required spaces, holds or tanks and to provide mutual support and consultation during the surveys in recommending repairs and actions required for conditions of Class.

302. On ships 20,000 tonnes DWT and above, subject to ESP, starting with renewal survey No.3, all special and intermediate hull classification surveys are to be carried out by at least two exclusive surveyors.

303. On bulk carriers 100,000 dwt and above of single side skin construction the intermediate hull classification survey between 10 and 15 years of age is to be performed by two exclusive surveyors.

304. This requires that at least two exclusive surveyors attend on board at the same time to perform the required survey. Where compatible with relevant laws and regulations, on dual class vessels, the requirement for two surveyors may be fulfilled by having one surveyor attend from each Society.

305. Though each attending surveyor is not required to perform all aspects of the required survey, they are required to consult with each other and to do joint overall and closeup surveys to the extent necessary to determine the condition of the vessel. The extent of these surveys should be sufficient for the surveyors to agree on actions required to complete the survey with respect to renewals, repairs, and other recommendations or conditions of class.

306. Each surveyor is required to co-sign the survey report or indicate their concurrence in an equivalent manner.

307. The following surveys may be witnessed by a single Surveyor:

- a. Thickness measurements in accordance with Part I, Title 02, Section 02, Chapter A, item A2.900;
- b. Tank testing in accordance with the applicable in the present Chapter E;
- c. Repairs carried out in association with Intermediate and Renewal Hull Classification Survey, the extent of which have been agreed upon by the required two surveyors during the course of the surveys.

308. Surveyors used to fulfill this requirement are to be qualified in the survey processes involved.

309. The onboard attendance of the surveyors is to be documented according to the Societies' procedures.

**E2. ADDITIONAL REQUIREMENTS FOR HULL ANNUAL SURVEYS – SINGLE AND DOUBLE SKIN BULK CARRIERS**  
[IACS UR Z10.2.3 AND IACS UR Z1, UR Z10.5]

**100. Schedule**

101. Annual Surveys are to be held within 3 months before or after anniversary date from the date of the initial classification survey or of the date credited for the last Renewal Survey.

**200. Scope**

201. The survey is to consist of an examination for the purpose of ensuring, as far as practicable, that the hull, weather decks, hatch covers, coamings and piping are maintained in a satisfactory condition.

**202. Examination of the Hull**

- a. Examination of the hull plating and its closing appliances as far as can be seen.
- b. Examination of watertight penetrations as far as practicable.

**203. Examination of weather decks, Hatch covers and coamings**

- a. Confirmation is to 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.
- b. A thorough survey of cargo hatch covers and coamings is only possible by examination in the open as well as closed positions and should include verification of proper opening and closing

- operation. As a result, the hatch cover sets within the forward 25% of the ship's length and at least one additional set, such that all sets on the ship are assessed at least once in every 5-year period, are to be surveyed open, closed and in operation to the full extent on each direction at each annual survey, including:
- b.1. stowage and securing in open condition;
  - b.2. proper fit and efficiency of sealing in closed condition; and
  - b.3. operational testing of hydraulic and power components, wires, chains, and link drives.
- c. The closing of the covers is to include the fastening of all peripheral, and cross joint cleats or other securing devices. Particular attention is to be paid to the condition of the hatch covers in the forward 25% of the ship's length, where sea loads are normally greatest.
- d. If there are indications of difficulty in operating and securing hatch covers, additional sets above those required by E2.203.(b-c) above, at the discretion of the surveyor, are to be tested in operation.
- e. Where the cargo hatch securing system does not function properly, repairs are to be carried out under the supervision of the RBNA.
- f. For each cargo hatch cover set, at each annual survey, the following items are to be surveyed:
- f.1. Cover panels, including side plates, and stiffener attachments that may be accessible in the open position by close-up survey (for corrosion, cracks, deformation);
  - f.2. sealing arrangements of perimeter and cross joints (gaskets for condition and permanent deformation, flexible seals on combination carriers, gasket lips, compression bars, drainage channels and non return valves);
  - f.3. clamping devices, retaining bars, cleating (for wastage, adjustment, and condition of rubber components);
  - f.4. closed cover locating devices (for distortion and attachment);
  - f.5. chain or rope pulleys;
  - f.6. guides;
  - f.7. guide rails and track wheels;
- f.8. stoppers;
  - f.9. wires, chains, tensioners, and gypsies;
  - f.10. hydraulic system, electrical safety devices and interlocks; and
  - f.11. end and interpanel hinges, pins and stools where fitted.
- g. At each hatchway, at each annual survey, the coamings, with panel stiffeners and brackets are to be checked for corrosion, cracks and deformation, especially of the coaming tops, including close-up survey.
- h. Where considered necessary, the effectiveness of sealing arrangements may be proved by hose or chalk testing supplemented by dimensional measurements of seal compressing components.
- i. Where portable covers, wooden or steel pontoons are fitted, checking the satisfactory condition, where applicable, of:
- i.1. wooden covers and portable beams, carriers or sockets for the portable beam, and their securing devices;
  - i.2. steel pontoons, including close-up survey of hatchcover plating.
  - i.3. tarpaulins;
  - i.4. cleats, battens and wedges;
  - i.5. hatch securing bars and their securing devices;
  - i.6. loading pads/bars and the side plate edge;
  - i.7. guide plates and chocks;
  - i.8. compression bars, drainage channels and drain pipes (if any).
- j. Examination of flame screens on vents to all bunker tanks.
- k. Examination of bunker and vent piping systems, including ventilators.
- 300. Examination of cargo holds and ballast tanks**
301. Examination of cargo holds for single skin bulk carriers: see Table T.E2.301.1



**TABLE T.E2.301.1. – ANNUAL SURVEY OF CARGO HOLDS FOR SINGLE SKIN BULK CARRIERS  
[IACS UR Z10.2]**

10 < Age ≤ 15	Age > 15
Overall Survey of ALL cargo holds.	Overall Survey of ALL cargo holds.
Close-up survey of sufficient extent, minimum 25% of frames, to establish the condition of the lower region of the shell frames including approx. lower one third length of side frame at side shell and side frame end attachment and the adjacent shell plating in the forward cargo hold. (see note 1)	Close-up survey of sufficient extent, minimum 25% of frames, to establish the condition of the lower region of the shell frames including approx. lower one third length of side frame at side shell and side frame end attachment and the adjacent shell plating in the forward cargo hold and one other selected cargo hold. (see note 1)
See notes 2 and 3	See notes 2 and 3
All piping and penetrations in cargo holds, including overboard piping, are to be examined	All piping and penetrations in cargo holds, including overboard piping, are to be examined
<p>Note 1 - Where this level of survey reveals the need for remedial measures, the survey is to be extended to include a Close-up Survey of all of the shell frames and adjacent shell plating of that cargo hold as well as a Close-up survey of sufficient extent of all remaining cargo holds</p> <p>Note 2 - When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurement is to be carried out. If the results of these thickness measurements indicate that Substantial Corrosion is found, the extent of thickness measurements is to be increased in accordance with Tables T.E6.402.1 to T.E6.402.5. These thickness measurements are to be carried out before the annual survey is credited as completed. Suspect Areas identified at previous surveys are to be examined. Areas of substantial corrosion identified at previous surveys are to have thickness measurements taken</p> <p>Note 3 - Where the protective coating in cargo holds, as defined by Part II, Title 14, Section 2, Chapter R is found to be in GOOD condition, the extent of close-up surveys and thickness measurements may be specially considered.(See Guidance)</p>	

302. Examination of cargo holds for double skin bulk carriers: see Table T.E2.302.1 below.

**TABLE T.E2.302.1. – ANNUAL SURVEY OF CARGO HOLDS FOR DOUBLE SKIN BULK CARRIERS  
[IACS UR Z10.5]**

10 < Age ≤ 15	Age > 15
Overall Survey of TWO cargo holds.	Overall Survey of ALL cargo holds.
See note 1	See notes 2 and 3
All piping and penetrations in cargo holds, including overboard piping, are to be examined	All piping and penetrations in cargo holds, including overboard piping, are to be examined
<p>Note 1 - When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurement is to be carried out. If the results of these thickness measurements indicate that Substantial Corrosion is found, the extent of thickness measurements is to be increased in accordance with Tables T.E6.402.6 to T.E6.402.9.. These thickness measurements are to be carried out before the annual survey is credited as completed. Suspect Areas identified at previous surveys are to be examined. Areas of substantial corrosion identified at previous surveys are to have thickness measurements taken</p>	

*Guidance*

*Corrosion Protection Coatings for Cargo Hold Spaces on Bulk Carriers (IACS UR Z9)*

*At the time of new construction, all internal and external surfaces of hatch coamings and hatch covers, and all internal surfaces of the cargo holds, excluding the flat tank top areas and the hopper tanks sloping plating approximately 300 mm below the side shell frame and brackets, are to have an efficient protective coating (epoxy coating or equivalent) applied in accordance with the manufacturer's recommendation. In the selection of coating due consideration is to be given by the owner to intended cargo conditions expected in service. For existing bulk carriers, where Owners may elect to coat or recoat cargo holds as noted above, consideration may be given to the extent of the close-up and thickness measurement surveys. Prior to the coating of cargo holds of existing vessels, scantlings are to be ascertained in the presence of a Surveyor.*

*End of guidance*

303. Examination of Ballast Tanks

a) Examination of Ballast Tanks when required as a consequence of the results of the Renewal Survey and Intermediate Survey is to be carried out. When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurements are to be carried out. If the results of these thickness measurements indicate that Substantial Corrosion is found, the extent of thickness measurements is to be increased in accordance with Tables T.E6.402.1 to T.E6.402.9. These extended thickness measurements are to be carried out before the survey is credited as completed. Suspect Areas identified at previous surveys are to be examined. Areas of substantial corrosion identified at previous survey are to have thickness measurements taken.

**400. Additional annual survey requirements for the foremost cargo hold of ships subject to SOLAS XII/9.1 [IACS UR Z10.2, Annex IV]**

401. Ships subject to SOLAS XII/9.1 are those meeting all the following conditions:

- a. Bulk Carriers of 150m in length and upwards of single side skin construction,
- b. carrying solid bulk cargoes having a density of 1780 kg/m<sup>3</sup> and above,
- c. contracted for construction (see Note 1) before 1 July 1999, and
- d. constructed with an insufficient number of transverse watertight bulkheads to enable them to withstand flooding of the foremost cargo hold in all loading conditions and remain afloat in a satisfactory condition of equilibrium as specified in SOLAS XII/4.3.

Note: "The "contracted for construction" date means the date on which the contract to build the vessel is signed

between the prospective owner and the shipbuilder. For further details regarding the date of "contract for construction", refer to IACS Procedural Requirement (PR) No.29."

402. In accordance with SOLAS XII/9.1, for the foremost cargo hold of such ships, the following additional survey requirements shall apply:

403. In the case of Bulk Carrier over 5 years of age, the Annual Survey is to include, in addition to the requirements of the Annual Surveys prescribed in the present chapter an examination of the following items:

- a. An Overall Survey of the foremost cargo hold, including Close-up Survey of sufficient extent, minimum 25% of frames, is to be carried out to establish the condition of:
  - a.1. Shell frames including their upper and lower end attachments, adjacent shell plating, and transverse bulkheads.
  - a.2. Suspect areas identified at previous surveys. (see definition in C1.107 above).
- b. Where considered necessary by the surveyor as a result of the Overall and Close-up Survey as described in a) above, the survey is to be extended to include a Close-up Survey of all of the shell frames and adjacent shell plating of the cargo hold.

404. For bulk carriers of 5 - 15 years of age:

- a. An Overall Survey of the foremost cargo hold, including Close-up Survey of sufficient extent, minimum 25% of frames, is to be carried out to establish the condition of:
  - a.1. Shell frames including their upper and lower end attachments, adjacent shell plating, and transverse bulkheads.
  - a.2. Suspect areas identified at previous surveys (see definition in C1.107 above).
- b. Where considered necessary by the surveyor as a result of the Overall and Close-up Survey as described in a) above, the survey is to be extended to include a Close-up Survey of all of the shell frames and adjacent shell plating of the cargo hold.

405. For bulk carriers exceeding 15 years of age:

- c. An Overall Survey of the foremost cargo hold, including Close-up Survey is to be carried out to establish the condition of:
  - c.1. All shell frames including their upper and lower end attachments, adjacent shell plating, and transverse bulkheads.
  - c.2. Suspect areas identified at previous surveys

406. Extent of Thickness Measurement :

- a. Thickness measurement is to be carried out to an extent sufficient to determine both general and local corrosion levels at areas subject to Close-up Survey.
- b. The minimum requirement for thickness measurements are suspect areas identified at previous surveys(see definition in C1.107 above)..
- c. Where Substantial Corrosion is found, the extent of thickness measurements should be increased with the requirements of Tables T.E6.402.1 to T.E6.402.9.
- d. The thickness measurement may be dispensed with provided the surveyor is satisfied by the Close-up Survey, that there is no structural diminution and the Protective Coating where fitted remains effective.

407. **Special Consideration.** Where the protective coating in the foremost cargo hold, as defined by Part II, Title 14, Section 2, Chapter R is found to be in GOOD condition, the extent of close-up surveys and thickness measurements may be specially considered.

*Explanatory note:*

For existing bulk carriers, where owners may elect to coat or recoat cargo holds as noted above, consideration may be given to the extent of the close-up and thickness measurement surveys. Prior to the coating of cargo holds of existing ships, scantlings should be ascertained in the presence of a surveyor.

**500. Additional annual survey requirements after determining compliance with SOLAS XII/12 and XII/13 IACS UR Z10.2 Annex IV**

501. For ships complying with the requirements of SOLAS XII/12 for hold, ballast and dry space water level detectors, the annual survey is to include an examination and a test, at random, of the water ingress detection systems and of their alarms.

502. For ships complying with the requirements of SOLAS XII/13 for the availability of pumping systems, the annual survey is to include an examination and a test,

of the means for draining and pumping ballast tanks forward of the collision bulkhead and bilges of dry spaces any part of which extends forward of the foremost cargo hold, and of their controls.

**600. Additional annual and intermediate survey requirements for statutory surveys considered mandatory for class by IACS UR Z1.**

601. See Chapter C, Subchapter C2, item c2.103 through C3.105.

**E3. ADDITIONAL REQUIREMENTS FOR HULL INTERMEDIATE SURVEYS – SINGLE AND DOUBLE SKIN BULK CARRIERS**

**100. Schedule**

101. The intermediate Survey is to be held at or between either the 2nd or 3rd Annual Survey.

102. Those items which are additional to the requirements of the Annual Survey may be surveyed either at or between the 2nd and 3rd Annual Survey.

103. Concurrent crediting to both Intermediate Survey (IS) and Renewal Survey (SS) for surveys and thickness measurements of spaces are not acceptable.

**200. Scope**

201. General

202. The survey extent is dependent on the age of the vessel as specified below.

**300. Bulk Carriers 5 -10 years of age.**

301. The following is to apply:

**TABLE T.E3.301.1. – INTERMEDIATE SURVEY OF CARGO HOLDS FOR SINGLE SKIN BULK CARRIERS  
[IACS UR Z10.2]**

5 < Age < 10	Age ≥ 10
Overall Survey of ALL cargo holds.	Overall Survey of ALL cargo holds.
<p>An overall survey of all cargo holds, including close-up survey of sufficient extent, minimum 25 % of frames, is to be carried out to establish the condition of:</p> <ul style="list-style-type: none"> <li>- 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;</li> <li>- Areas found suspect at previous surveys.</li> </ul> <p>(see note 1)</p> <p>See notes 1 to 4</p>	<p>The requirements of the Intermediate Survey are to be to the same extent to the previous Renewal Survey. However, internal examination of fuel tanks and pressure testing of all tanks are not required unless deemed necessary by the attending surveyor. The intermediate survey may be commenced at the second annual survey and be progressed during the succeeding year with a view to completion at the third annual survey.</p> <p>A survey in dry dock is to be part of the intermediate survey.</p> <p>The overall and close-up surveys and thickness measurements, as applicable, of the lower portions of the cargo holds and water ballast tanks are to be carried out in accordance with the applicable requirements for intermediate surveys, if not already performed. Lower portions of the cargo holds and ballast tanks are considered to be the parts below light ballast water line.</p>
<p>Note 1- When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurement is to be carried out. If the results of these thickness measurements indicate that Substantial Corrosion is found, the extent of thickness measurements is to be increased in accordance with Tables T.E6.402.1 to T.E6.402.5. These thickness measurements are to be carried out before the annual survey is credited as completed. Suspect Areas identified at previous surveys are to be examined. Areas of substantial corrosion identified at previous surveys are to have thickness measurements taken</p> <p>Note 2 - Where the protective coating in cargo holds, as defined below is found to be in GOOD condition, the extent of close-up surveys and thickness measurements may be specially considered.(See Guidance in subchapter E2 above)</p> <p>Note 3 – Extent of Thickness Measurements</p> <ul style="list-style-type: none"> <li>a) Thickness measurements are to be carried out to an extent sufficient to determine both general and local corrosion levels at areas subject to close-up survey. The minimum requirement for thickness measurements at the Intermediate Survey are areas found to be Suspect Areas at previous surveys.</li> <li>b) The extent of thickness measurement may be specially considered provided the Surveyor is satisfied by the close-up survey, that there is no structural diminution and the hard protective coatings are found to be in a GOOD condition.</li> <li>c) Where Substantial Corrosion is found, the extent of thickness measurements is to be increased in accordance with the requirements of Tables T.E6.402.1 to T.E6.402.5. These extended thickness measurements are to be carried out before the survey is credited as completed. Suspect Areas identified at</li> </ul>	<p>Note 1 - Ballast Tanks</p> <ul style="list-style-type: none"> <li>a) For tanks used for water ballast, an overall survey of representative spaces selected by the Surveyor is to be carried out. The selection is to include fore and aft peak tanks and a number of other tanks, taking into account the total number and type of ballast tanks. If such overall survey reveals no visible structural defects, the examination may be limited to verification that the corrosion prevention system remains efficient.</li> <li>b) Where POOR coating condition, corrosion or other defects are found in water Ballast tanks or where a hard Protective Coating was not applied from the time of construction, the examination is to be extended to other Ballast tanks of the same type.</li> <li>c) In ballast tanks other than double bottom tanks, where a hard Protective Coating is found in POOR condition, and it is not renewed, or where soft or semi-hard coating has been applied, or where a hard protective coating was not applied from the time of construction, the tanks in question are to be examined and thickness measurements carried out as considered necessary at annual intervals. When such breakdown of hard protective coating is found in ballast double bottom tanks, or where a soft or semi-hard coating has been applied, or where a hard protective coating has not been applied, the tanks in question may be examined at annual intervals. When considered necessary by the Surveyor, or where extensive corrosion exists, thickness measurements are to be carried out.</li> <li>d) In addition to the requirements above, suspect areas identified at previous surveys are to be overall and close-up surveyed.</li> </ul> <p>Note 2 - Extent of Thickness Measurements</p>

5 < Age < 10	Age ≥ 10
Overall Survey of ALL cargo holds.	Overall Survey of ALL cargo holds.
<p>previous surveys are to be examined. Areas of substantial corrosion identified at previous surveys are to have thickness measurements taken.</p> <p>Note 4 - For existing bulk carriers, where owners may elect to coat or recoat cargo holds as noted above, consideration may be given to the extent of the close-up and thickness measurement surveys. Prior to the coating of cargo holds of existing ships, scantlings should be ascertained in the presence of a surveyor.</p>	<p>d) Where the hard protective coating in cargo holds, as defined by Part II, Title 14, Section 2, Chapter R is found to be in GOOD condition, the extent of close-up surveys and thickness measurements may be specially considered.</p>

**TABLE T.E3.302.1. – INTERMEDIATE SURVEY OF CARGO HOLDS FOR DOUBLE SKIN BULL CARRIERS [IACS UR Z10.2]**

5 < Age < 10	Age ≥ 10
Overall Survey of ALL cargo holds.	Overall Survey of ALL cargo holds.
<p>An overall survey of all cargo holds</p> <p>- Close up survey of areas found suspect at previous surveys.</p>	<p>The requirements of the Intermediate Survey are to be to the same extent to the previous Renewal Survey. However, internal examination of fuel tanks and pressure testing of all tanks are not required unless deemed necessary by the attending surveyor. The intermediate survey may be commenced at the second annual survey and be progressed during the succeeding year with a view to completion at the third annual survey.</p> <p>A survey in dry dock is to be part of the intermediate survey.</p> <p>The overall and close-up surveys and thickness measurements, as applicable, of the lower portions of the cargo holds and water ballast tanks are to be carried out in accordance with the applicable requirements for intermediate surveys, if not already performed. Lower portions of the cargo holds and ballast tanks are considered to be the parts below light ballast water line.</p>
<p>Note 1- Ballast Tanks</p> <p>a) For tanks used for water ballast, an overall survey of representative spaces selected by the Surveyor is to be carried out. The selection is to include fore and aft peak tanks and a number of other tanks, taking into account the total number and type of ballast tanks. If such overall survey reveals no visible structural defects, the examination may be limited to verification that the corrosion prevention system remains efficient.</p> <p>b) Where POOR coating condition, corrosion or other defects are found in water Ballast tanks or where a hard Protective Coating was not applied from the time of construction, the examination is to be extended to other Ballast tanks of the same type.</p> <p>c) In ballast tanks other than double bottom tanks, where a hard Protective Coating is found in POOR condition, and it is not renewed, or where soft or semi-hard coating has been applied, or where a hard protective coating was not applied from the time of construction, the tanks in question are to be examined and thickness measurements carried out</p>	<p>Note 1 - Ballast Tanks</p> <p>a) For tanks used for water ballast, an overall survey of representative spaces selected by the Surveyor is to be carried out. The selection is to include fore and aft peak tanks and a number of other tanks, taking into account the total number and type of ballast tanks. If such overall survey reveals no visible structural defects, the examination may be limited to verification that the corrosion prevention system remains efficient.</p> <p>b) Where POOR coating condition, corrosion or other defects are found in water Ballast tanks or where a hard Protective Coating was not applied from the time of construction, the examination is to be extended to other Ballast tanks of the same type.</p> <p>c) In ballast tanks other than double bottom tanks, where a hard Protective Coating is found in POOR condition, and it is not renewed, or where soft or semi-hard coating has been applied, or where a hard protective coating was not applied from the time of construction, the tanks in question are to be examined and thickness measurements carried out</p>



5 < Age < 10	Age ≥ 10
Overall Survey of ALL cargo holds.	Overall Survey of ALL cargo holds.
<p>as considered necessary at annual intervals. When such breakdown of hard protective coating is found in ballast double bottom tanks, or where a soft or semi-hard coating has been applied, or where a hard protective coating has not been applied, the tanks in question may be examined at annual intervals. When considered necessary by the Surveyor, or where extensive corrosion exists, thickness measurements are to be carried out.</p> <p>d) In addition to the requirements above, suspect areas identified at previous surveys are to be overall and close-up surveyed.</p> <p>Note 2 - When considered necessary by the surveyor, as a result of the overall and close up survey, the survey is to be extended to include a close up survey of those areas of structure in the cargo holds selected by the surveyor</p> <p>Note 3 - Where the protective coating in cargo holds, as defined below is found to be in GOOD condition, the extent of close-up surveys and thickness measurements may be specially considered. <i>(See Guidance in subchapter E2 above)</i></p> <p>Note 3 – Extent of Thickness Measurements</p> <p>a) Thickness measurements are to be carried out to an extent sufficient to determine both general and local corrosion levels at areas subject to close-up survey. The minimum requirement for thickness measurements at the Intermediate Survey are areas found to be Suspect Areas at previous surveys.</p> <p>b) The extent of thickness measurement may be specially considered provided the Surveyor is satisfied by the close-up survey, that there is no structural diminution and the hard protective coatings are found to be in a GOOD condition.</p> <p>c) Where Substantial Corrosion is found, the extent of thickness measurements is to increased in accordance with the requirements of Tables T.E6.402.1 to T.E6.402.5. These extended thickness measurements are to be carried out before the survey is credited as completed. Suspect Areas identified at previous surveys are to be examined. Areas of substantial corrosion identified at previous surveys are to have thickness measurements taken.</p> <p>Note 4 - For existing bulk carriers, where owners may elect to coat or recoat cargo holds as noted above, consideration may be given to the extent of the close-up and thickness measurement surveys. Prior to the coating of cargo holds of existing ships, scantlings should be ascertained in the presence of a surveyor.</p>	<p>as considered necessary at annual intervals. When such breakdown of hard protective coating is found in ballast double bottom tanks, or where a soft or semi-hard coating has been applied, or where a hard protective coating has not been applied, the tanks in question may be examined at annual intervals. When considered necessary by the Surveyor, or where extensive corrosion exists, thickness measurements are to be carried out.</p> <p>a) In addition to the requirements above, suspect areas identified at previous surveys are to be overall and close-up surveyed.</p> <p>Note 2 - Extent of Thickness Measurements</p> <p>d) Where the hard protective coating in cargo holds is found to be in GOOD condition, the extent of close-up surveys and thickness measurements may be specially considered.</p>

**600. Additional annual and intermediate survey requirements for statutory surveys considered mandatory for class by [IACS UR Z1.]**

601. See Chapter C, Subchapter C6, item C6.600.

**E4. ADDITIONAL REQUIREMENTS FOR HULL RENEWAL SURVEYS – BULK CARRIERS**

**100. Schedule**

101. Renewal Surveys are to be carried out at a 5 year intervals to renew the Classification certificate.

102. The first Renewal Survey is to be completed within 5 years from the date of the initial classification survey and thereafter within 5 years from the credited date of the previous Renewal Survey. However, an extension of class of 3 months maximum beyond the 5th year can be granted in exceptional circumstances. In this case, the next period of class will start from the expiry date of the Renewal Survey before the extension was granted.

103. For surveys completed within 3 months before the expiry date of the Renewal Survey, the next period of class will start from the expiry date of the Renewal Survey. For surveys completed more than 3 months before the expiry date of the Renewal Survey, the period of class will start from the survey completion date.

104. The Renewal Survey may be commenced at the 4th Annual Survey and be progressed with a view to completion by the 5th anniversary date. When the Renewal Survey is commenced prior to the 4th Annual Survey, the entire survey is to be completed within 15 months if such work is to be credited to the Renewal Survey.

105. Concurrent crediting to both Intermediate Survey (IS) and Renewal Survey (SS) for surveys and thickness measurements of spaces are not acceptable.

**200. Scope**

201. General

- a. The Renewal Survey is to include, in addition to the requirements of the Annual Survey, examination, tests, and checks of sufficient extent to ensure that the hull and related piping, is in a satisfactory condition and is fit for its intended purpose for the new period of class of 5 years to be assigned subject to proper maintenance and operation and to periodical surveys being carried out at the due dates.
- b. All cargo holds, Ballast Tanks, including double bottom tanks, pipe tunnels, cofferdams and void spaces bounding cargo holds, decks and outer hull are to be examined, and this examination is to be supplemented by thickness measurement and testing, to ensure that the structural integrity remains

effective. The aim of the examination is to discover Substantial Corrosion, significant deformation, fractures, damages or other structural deterioration, that may be present.

- c. All piping systems within the above Spaces are to be examined and operationally tested to working pressure to attending Surveyor's satisfaction to ensure that tightness and condition remain satisfactory.
- d. The survey extent of ballast tanks converted to void spaces is to be specially considered in relation to the requirements for ballast tanks.

**300. Dry dock Survey**

301. A survey in dry dock is to be a part of the Renewal Survey. The overall and close-up surveys and thickness measurements, as applicable, of the lower portions of the cargo holds and ballast tanks are to be carried out in accordance with the applicable requirements for Renewal Surveys, if not already performed.

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

**303. Tank Protection**

- a. Where provided, the condition of the corrosion prevention system of Ballast Tanks is to be examined. For ballast tanks, excluding double bottom tanks, where a hard protective coating is found in POOR condition and it is not renewed where soft or semi-hard coating has been applied, or where a hard protective coating has not been applied from the time of construction, the tanks in question are to be examined at annual intervals. Thickness measurements are to be carried out as deemed necessary by the surveyor. When such breakdown of hard protective coating is found in water ballast double bottom tanks and it is not renewed, where a soft or semi-hard coating has been applied, or where a hard protective coating has not been applied from the time of construction, the tanks in question may be examined at annual intervals. When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurements are to be carried out.
- b. Where a hard protective coating is provided in cargo holds, as defined in Part II, Title 14, Section 2, Chapter R and is found in GOOD condition, the extent of close-up surveys and thickness measurements may be specially considered.

**304. Hatch Covers and Coamings**

The hatch covers and coamings are to be surveyed as follows:

- a. A thorough inspection of the items listed in C2.200 is to be carried out, in addition to all hatch covers and coamings.

- b. Checking of the satisfactory operation of all mechanically operated hatch covers is to be made, including:
- b.1. stowage and securing in open condition;
  - b.2. proper fit and efficiency of sealing in closed condition;
  - b.3. operational testing of hydraulic and power components, wires, chains, and link drives.

- c. Checking the effectiveness of sealing arrangements of all hatch covers by hose testing or equivalent.
- d. Thickness measurement of the hatch cover and coaming plating and stiffeners is to be carried out as given in T.E6.401.1 and T.E6.401.2.

#### **400. Extent of Overall and Close-up Survey**

401. An Overall Survey of all tanks and spaces is to be carried out at each Renewal Survey. Fuel oil tanks in the cargo length area are to be surveyed as follows:

**TABLE T.E4.401.1 SURVEY OF FUEL OIL TANKS IN THE CARGO LENGTH AREA**

Renewal Survey No.1 Age ≤ 5	Renewal Survey No.2 5 < Age ≤ 10	Renewal Survey No.3 10 < Age ≤ 15	Renewal Survey No.4 and Subsequent 15 < Age
None	One	Two	Half, minimum two
<p>Notes</p> <p>1. These requirements apply to tanks of integral (structural) type.</p> <p>2. If a selection of tanks is accepted to be examined, then different tanks are to be examined at each Renewal Survey, on a rotational basis.</p> <p>3. Peak tanks (all uses) are subject to internal examination at each Renewal Survey.</p> <p>4. At Renewal Survey No.3 and subsequent Renewal Surveys, one deep tank for fuel oil in the cargo area is to be included, if fitted.</p>			

402. The minimum requirements for close-up surveys at Renewal survey are given in Tables T.E6.302.1 and T.E6.302.2.

403. The Surveyor may extend the close-up survey 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.

404. For areas in spaces where hard protective coatings are found to be in a GOOD condition, the extent of close-up surveys according to T.E6.302.1 below may be specially considered, refer also to item E4.303.b above.

## **E5. DOCUMENTATION ON BOARD**

### **100. General**

101. The owner is to obtain, supply and maintain on board documentation as specified in E5.200 and E5.300 below, which is to be readily available for the Surveyor.

102. The documentation is to be kept on board for the life time of the ship.

### **200. Survey Report File**

201. A Survey Report File is to be a part of the documentation on board consisting of

- a. Reports of structural surveys
- b. Executive Hull Summary
- c. Thickness measurement reports

202. The Survey Report File is to be available also in the Owner's and the RBNA's management offices.

### **300. Supporting Documents**

301. The following additional documentation is to be available onboard:

- a. Survey Programme as required by E1.300 above until such time as the Renewal Survey or Intermediate Survey, as applicable, has been completed.

- b. Main structural plans of cargo and ballast tanks
- c. Previous repair history
- d. Cargo and ballast history
- e. Extent of use of inert gas plant and tank cleaning procedures
- f. Inspections by ship's personnel with reference to
- g. structural deterioration in general
- h. leakages in bulkheads and piping
- i. condition of corrosion prevention system, if any
- j. A guidance for reporting is shown in IACS UR Z10.3 Annex IIIC.
- k. Any other information that will help identify Critical Structural Areas and/or Suspect Areas requiring inspection.

#### **400. Review of Documentation On Board**

401. Prior to survey, the Surveyor is to examine the completeness of the documentation onboard and its contents as a basis for the survey.

## **E6. PROCEDURES FOR THICKNESS MEASUREMENTS**

### **100. General**

101. The required thickness measurements, if not carried out by the Society itself, are to be witnessed by a Surveyor of the Society. The Surveyor is to be on board to the extent necessary to control the process.

102. The thickness measurement company is to be part of the survey planning meeting to be held prior to commencing the survey.

103. Thickness measurements of structures in areas where close-up surveys are required shall be carried out simultaneously with close-up surveys.

104. In all cases the extent of the thickness measurements is to be sufficient as to represent the actual average condition.

### **200. Certification of Thickness Measurement Company**

201. The thickness measurements are to be carried out by a qualified company certified by the RBNA.

### **300. Reporting**

301. A thickness measurement report is to be prepared. The report is to give the location of measurements, the thickness measured as well as corresponding original thickness. Furthermore, the report is to give the date when the measurements were carried out, type of measurement equipment, names of personnel and their qualifications and has to be signed by the operator. The thickness measurement report is to follow the principles as specified in the Recommended Procedures for Thickness Measurements for Oil Tankers, Ore/Oil Ships and etc..

302. The Surveyor is to review the final thickness measurement report and countersign the cover page.

**TABLE E6.302.1 MINIMUM REQUIREMENT FOR CLOSE-UP SURVEY AT RENEWAL HULL SURVEYS OF SINGLE SKIN BULK CARRIERS**

Renewal Survey no. 1	Renewal Survey no. 2	Renewal Survey no. 3	Renewal Survey no. 4
Age ≤ 5	5 < Age ≤ 10	10 < Age ≤ 15	Age > 15
25% of shell frames in the forward cargo hold at representative positions (A) Selected shell frames in all remaining cargo holds (A)	All shell frames in the forward cargo hold and 25% of shell frames in each of the remaining cargo holds, including upper and lower end attachments and adjacent shell plating (A) 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 (A)	All shell frames in the forward and one other selected cargo hold and 50% of shell frames in each of the remaining cargo holds including upper and lower end attachments and adjacent shell plating (A)	All shell frames in all cargo holds including upper and lower end attachments and adjacent shell plating (A)
One transverse web with associated plating and longitudinals in two representative water ballast tanks of each type (i.e. topside or hopper side tank) (B)	One transverse web with associated plating and longitudinals in each water ballast tank (B)	All transverse webs with associated plating and longitudinals in each water ballast tank (B)	Areas (B) to (E) as for class renewal survey for ships between 10 and 15 years of age
	Forward and aft transverse bulkheads in one ballast tank, including stiffening system (B)	All transverse bulkheads in ballast tanks, including stiffening system (B)	
Two selected cargo hold transverse bulkheads (C)	All cargo hold transverse bulkheads (C)	All cargo hold transverse bulkheads (C)	
All cargo hold hatch covers and coamings (D)	All cargo hold hatch covers and coamings (D)	All cargo hold hatch covers and coamings (D)	
	All deck plating and underdeck structure inside line of hatch openings between all cargo hold hatches (E)	All deck plating and underdeck structure inside line of hatch openings between all cargo hold hatches (E)	

(A) Cargo hold transverse frames.

(B) Transverse web frame or transverse watertight bulkhead in water ballast tanks.

(C) Cargo hold transverse bulkhead plating, stiffeners and girders, including internal structure of upper and lower stools, where fitted.

(D) Cargo hold hatch covers and coamings (plating and stiffeners).

(E) Deck plating and under deck structure inside line of hatch openings between cargo hold hatches.

See sketches of Figure F.E6.300.1 for the areas corresponding to (A), (B), (C), (D) and (E)

See also sketch in Figure F.E6.300.2 for zones of side shell frames for ships subject to compliance with Part II, Title 14, Section 2, Chapter O

Note:

Close-up survey of transverse bulkheads to be carried out at four levels:

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

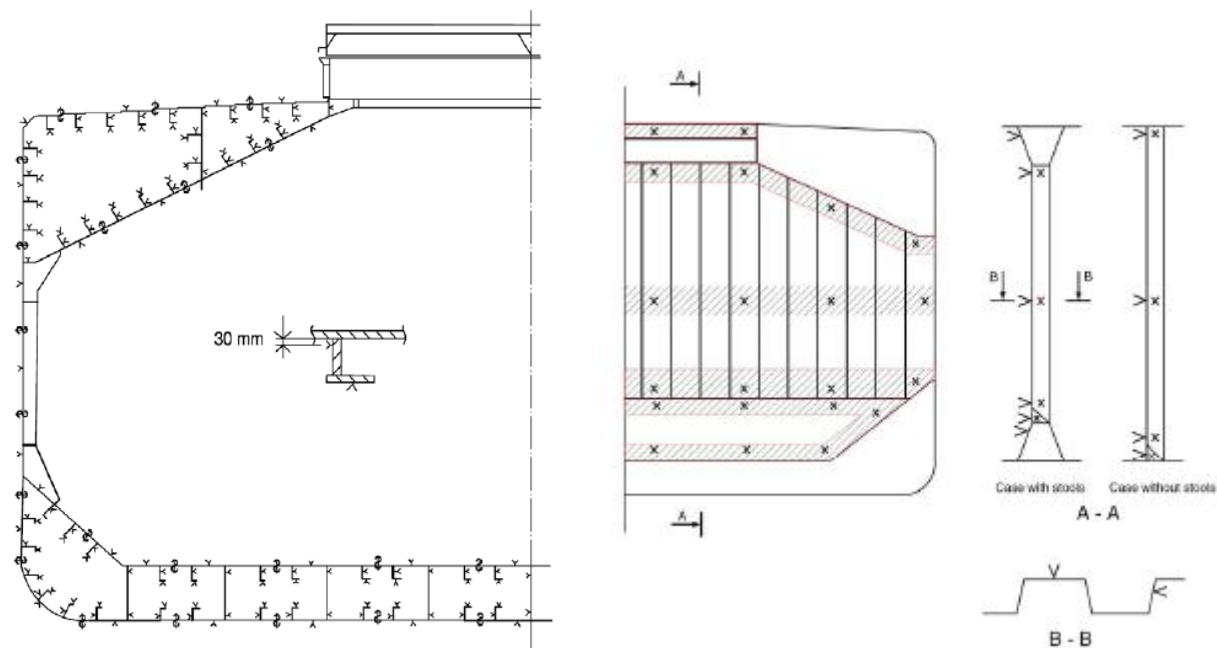
Level (b) immediately above and below the lower stool shelf plate (for bulkheads fitted with lower stools), and immediately above the line of the shedder plates

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 bulkheads fitted with upper stools, or immediately below the top side tanks.

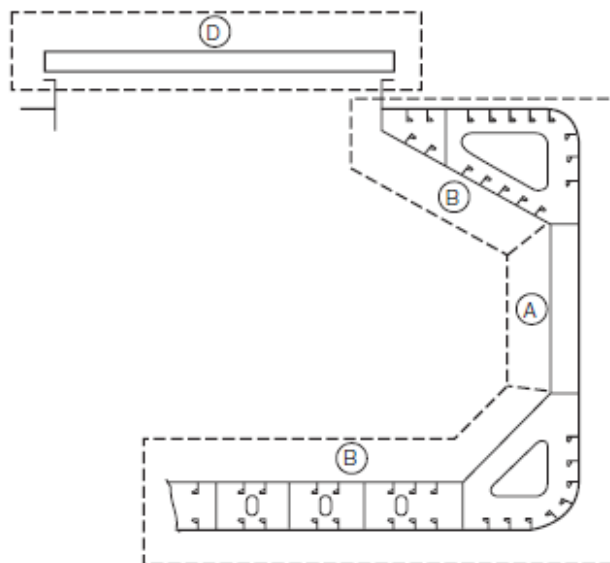


**FIGURE F.E6.302.1 – SINGLE SKIN BULK CARRIER: TRANSVERSE SECTION OF A SINGLE SKIN BULK CARRIER AND LOCATIONS OF MEASUREMENTS ON STRUCTURAL MEMBERS IN CARGO HOLDS AND BALLAST TANKS OF SINGLE SIDE SKIN BULK CARRIERS**

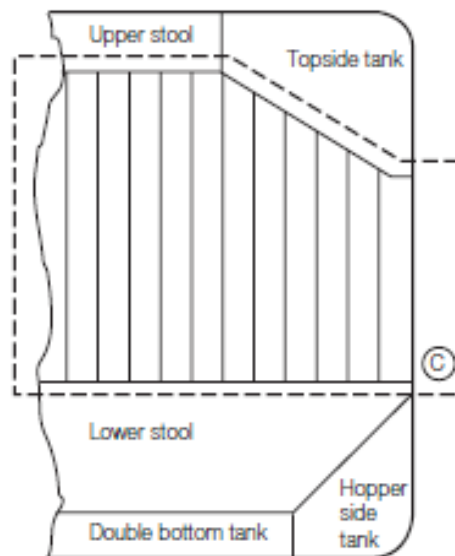


## F.E6.300.1 SKETCHES OF AREAS A, B, C, D AND E

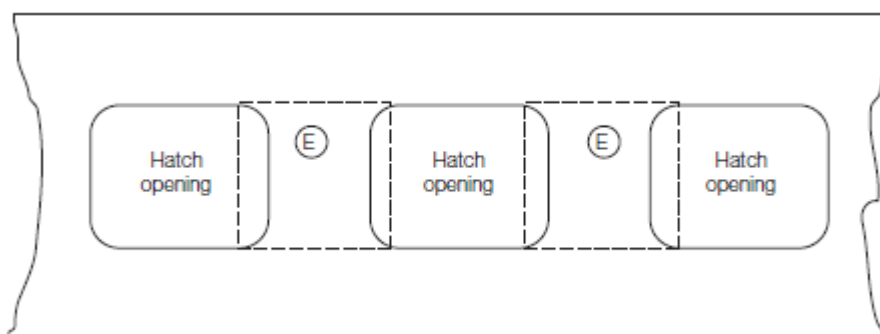
### TYPICAL TRANSVERSE SECTION



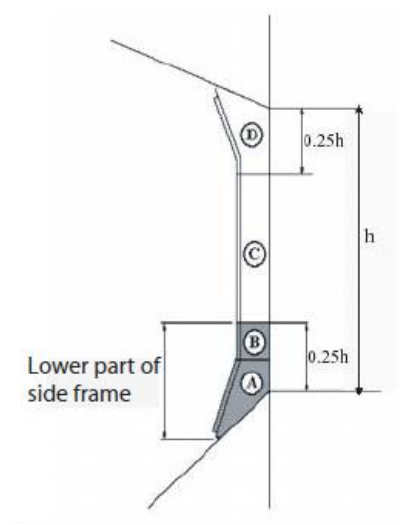
### CARGO HOLD TRANSVERSE BULKHEAD



### TYPICAL AREAS OF DECK PLATING INSIDE LINE OF HATCH OPENINGS BETWEEN CARGO HOLD HATCHES



## F.E6.300.2 ZONES OF SIDE SHELL FRAMES AND BRACKETS



**TABLE T.E6.302.2 - MINIMUM REQUIREMENT FOR CLOSE-UP SURVEY AT SPECIAL HULL SURVEYS OF DOUBLE SKIN BULK CARRIERS, EXCLUDING ORE CARRIERS**

<b>Renewal Survey no. 1</b>	<b>Renewal Survey no. 2</b>	<b>Renewal Survey no. 3</b>	<b>Renewal Survey no. 4</b>
<b>Age ≤ 5</b>	<b>5 &lt; Age ≤ 10</b>	<b>10 &lt; Age ≤ 15</b>	<b>Age &gt; 15</b>
One transverse web with associated plating and longitudinals in two representative water ballast tanks of each type (this is to include the foremost topside and double side water ballast tanks on either side) (A)	One transverse web with associated plating and longitudinals in each water ballast tank (A)	All transverse webs with associated plating and longitudinals in each water ballast tank (A)	All transverse webs with associated plating and longitudinals in each water ballast tank (A)
	Forward and aft transverse bulkheads including stiffening system in a transverse section including topside, hopper side and double side ballast tanks (A)	All transverse bulkheads in ballast tanks, including stiffening system in each water ballast tank (A)	All transverse bulkheads in ballast tanks, including stiffening system in each water ballast tank (A)
	25% of ordinary transverse web frames in the foremost double side tanks (B)	25% of ordinary transverse web frames in all double side tanks (B)	All ordinary transverse web frames in all double side tanks (B)
			Areas (C) to (E) as for class renewal survey for ships between 10 and 15 years of age
Two selected cargo hold transverse bulkheads, including internal structure of upper and lower stools, where fitted (C)	One transverse bulkhead in each cargo hold, including internal structure of upper and lower stools, where fitted (C)	All cargo hold transverse bulkheads, including internal structure of upper and lower stools, where fitted (C)	
All cargo hold hatch covers and coamings (platings and stiffeners) (D)	All cargo hold hatch covers and coamings (platings and stiffeners) (D)	All cargo hold hatch covers and coamings (platings and stiffeners) (D)	All cargo hold hatch covers and coamings (platings and stiffeners) (D)
	All deck plating and underdeck structure inside line of hatch openings between all cargo hold hatches (E)	All deck plating and underdeck structure inside line of hatch openings between all cargo hold hatches (E)	

(A), (B), (C), (D) and (E) are areas to be subjected to close-up surveys and thickness measurements (see Figure F.E6.300.3 and F.E6.300.4).

( A ) Transverse web frame or watertight transverse bulkhead in topside, hopper side and double side ballast tanks. In fore and aft peak tanks, transverse web frame means a complete transverse web frame ring including adjacent structural members.

( B ) Ordinary transverse frame in double side tanks.

( C ) Cargo hold transverse bulkheads plating, stiffeners and girders.

( D ) Cargo hold hatch covers and coamings.

( E ) Deck plating and underdeck structure inside line of hatch openings between cargo hold hatches.

**Note**

Close-up survey of transverse bulkheads to be carried out at four levels

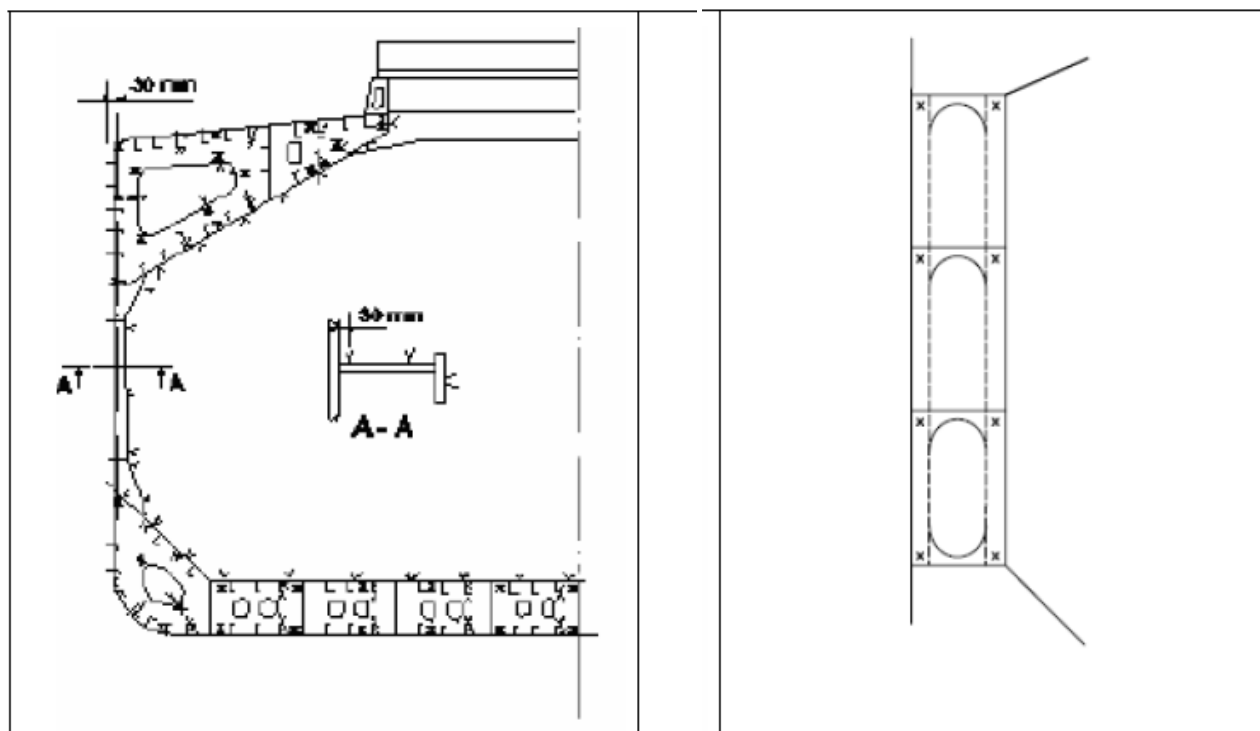
Level (a) immediately above the inner bottom and immediately above the line of gussets (if fitted) and shedders for bulkheads without lower stool

Level (b) immediately above and below the lower stool shelf plate (for bulkheads 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 bulkheads fitted with upper stools, or immediately below the top side tanks.

**FIGURE F.E6.302.2 TRANSVERSE SECTION OF A DOUBLE SKIN BULK CARRIER**

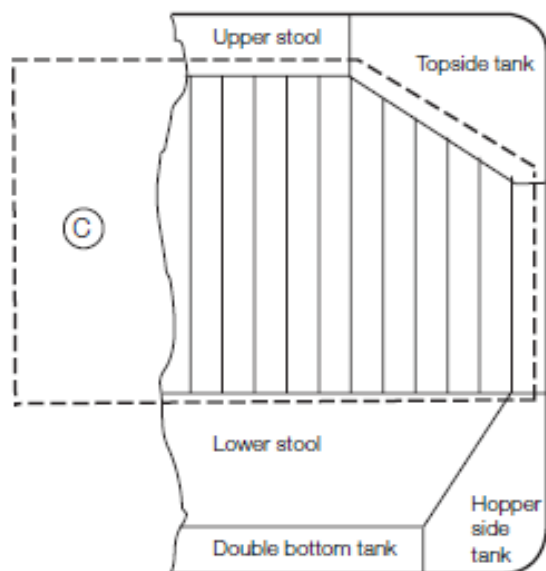
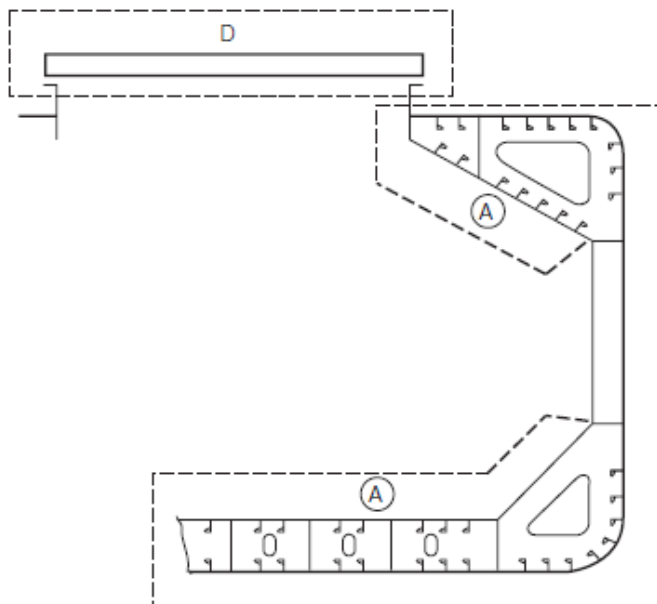


*Note: Measurements are to be taken on both port and starboard sides of the selected transverse section.*

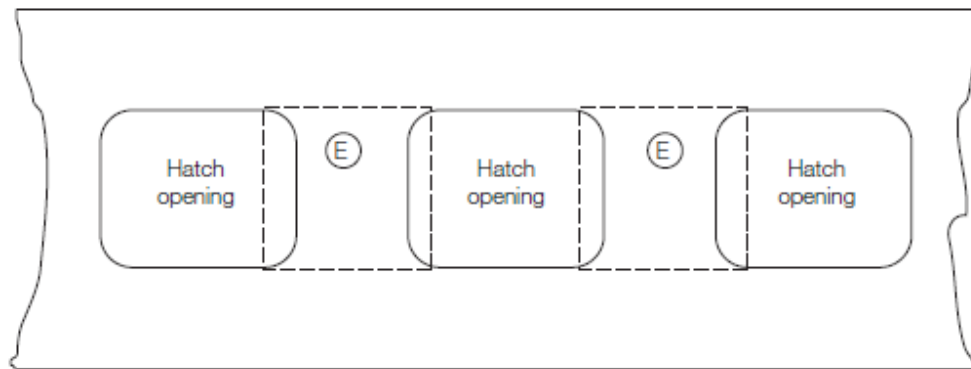
**F.E6.300.3 CLOSE-UP SURVEY AND THICKNESS MEASUREMENT AREAS  
(SKETCHES OF AREAS A, B, C, D AND E)**

**TYPICAL TRANSVERSE SECTION**

**CARGO HOLD TRANSVERSE BULKHEAD**

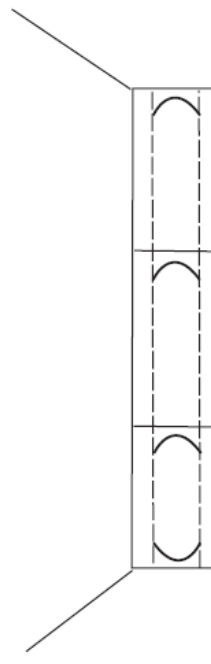


# **TYPICAL AREAS OF DECK PLATING AND UNDERDECK STRUCTURE INSIDE LINE OF HATCH OPENINGS BETWEEN CARGO HOLD HATCHES**



## **F.E6.300.4 - CLOSE-UP SURVEY AND THICKNESS MEASUREMENT AREAS ORDINARY TRANSVERSE FRAME IN DOUBLE SKIN TANK**

Area (B)



### **400. Extent of Thickness Measurement**

401. The minimum requirements for thickness measurement at Renewal Survey are given in Table T.E6.401.1 for single skin bulk carriers and T.E6.401.2 for double skin bulk carriers. For additional thickness measurement guidelines applicable to the vertically corrugated transverse watertight bulkhead between cargo hold Nos. 1 and 2 on ships subject to compliance with Part II Title 14, Section 2, Chapters L and A2. For additional thickness measurement guidelines applicable to the side shell frames and brackets on ships subject to compliance with Part II, Title 14, Section 2, Chapter O.

402. Provisions for extended measurements for areas with Substantial Corrosion are given in Tables T.E6.402.1 to T.E6.402.5 for single skin bulk carriers, and T.E6.402.6 to T.E6.402.9 for double skin bulk carriers, and as may be additionally specified in the Survey Programme. These extended thickness measurements are to be carried out before the survey is credited as completed. Suspect Areas identified at previous surveys are to be examined. Areas of substantial corrosion identified at previous surveys are to have thickness measurements taken.

403. The Surveyor may further extend the thickness measurements as deemed necessary.



404. For areas in tanks where hard protective coatings are found to be in a GOOD condition, the extent of thickness measurement according to Table T.E6.401.1, T.E6.401.2 may be specially considered.

405. Transverse sections are to be chosen where largest reductions are suspected to occur or are revealed from deck plating measurements.

406. 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 is to be carried out. Thickness measurement is also to 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 T.E6.401.1 –MINIMUM REQUIREMENTS FOR THICKNESS MEASUREMENTS AT SPECIAL HULL SURVEY OF SINGLE SKIN BULK CARRIERS**

Renewal Survey no. 1	Renewal Survey no. 2	Renewal Survey no. 3	Renewal Survey no. 4
Age ≤ 5	5 < Age ≤ 10	10 < Age ≤ 15	Age > 15
Suspect areas	Suspect areas	Suspect areas	Suspect areas
	Within the cargo length area: -two transverse sections of deck plating outside line of cargo hatch openings	Within the cargo length area: -each deck plate outside line of cargo hatch openings -two transverse sections, one in the amidship area, outside line of cargo hatch openings,	Within the cargo length area: -each deck plate outside line of cargo hatch openings -three transverse sections, one in the amidship area, outside line of cargo hatch openings, -each bottom plate
	Measurement, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to TABLE E6.302.1	Measurement, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to TABLE E6.302.1	Measurement, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to TABLE E6.302.1
	Wind and water strakes in way of the transverse sections considered above	All wind and water strakes within the cargo area	All wind and water strakes, full length
	Selected wind and water strakes outside the cargo area	Selected wind and water strakes outside the cargo area	
		Additional thickness measurements given in E1.104 and E10 are to be taken on the transverse watertight bulkhead between the two foremost cargo holds on ships to which the requirements given in Part II, Title 14 , Section 2, Chapter L and Part II, Title 14, Section 2, Subchapter A2 apply	Additional thickness measurements given in E1.104 and E10 are to be taken on the transverse watertight bulkhead between the two foremost cargo holds on ships to which the requirements given in Part II, Title 14 , Section 2, Chapter L and Part II, Title 14, Section 2, Subchapter A2 apply
	Additional thickness measurements given in E1.105 and E12 are to be taken on the side shell frames and brackets on ships subject to compliance with Part II, Title 14 , Section 2, Chapter O	Additional thickness measurements given in E1.105 and E12 are to be taken on the side shell frames and brackets on ships subject to compliance with Part II, Title 14 , Section 2, Chapter O	Additional thickness measurements given in E1.105 and E12 are to be taken on the side shell frames and brackets on ships subject to compliance with Part II, Title 14 , Section 2, Chapter O

**TABLE T.E6.401.2 – THICKNESS MEASUREMENT FOR DOUBLE BULK CARRIERS MINIMUM REQUIREMENTS FOR THICKNESS MEASUREMENTS AT SPECIAL HULL SURVEY OF DOUBLE SKIN BULK CARRIERS**

Renewal Survey no. 1	Renewal Survey no. 2	Renewal Survey no. 3	Renewal Survey no. 4
Age ≤ 5	5 < Age ≤ 10	10 < Age ≤ 15	Age > 15
Suspect areas	Suspect areas	Suspect areas	Suspect areas
	Within the cargo length area: -two transverse sections of deck plating outside line of cargo hatch openings	Within the cargo length area: -each deck plate outside line of cargo hatch openings -two transverse sections, one in the amidship area, outside line of cargo hatch openings, - all wind and water strakes	Within the cargo length area: -each deck plate outside line of cargo hatch openings -three transverse sections, one in the amidship area, outside line of cargo hatch openings -each bottom plate
	Measurement, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to TABLE T.E6.302.2	Measurement, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to TABLE T.E6.302.2	Measurement, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to TABLE T.E6.302.2
	Wind and water strakes in way of the transverse sections considered above Selected wind and water strakes outside the cargo area	Selected wind and water strakes outside the cargo length area	All wind and water strakes, full length

**TABLE T.E6.402.1 - REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENT AT THOSE AREAS OF SUBSTANTIAL CORROSION RENEWAL SURVEY OF SINGLE SKIN BULK CARRIERS WITHIN THE CARGO AREA**

SHELL STRUCTURES		
STRUCTURAL MEMBER	EXTENT OF MEASUREMENT	PATTERN OF MEASUREMENT
1. Bottom and Side Shell plating	a. Suspect plate, plus four adjacent plates  b. See other tables for particulars on gauging in way of tanks and cargo holds	a. 5 point pattern for each panel between longitudinals
2. Bottom/Side Shell longitudinals	Minimum of three longitudinals in way of suspect areas	3 measurements in line across web 3 measurements on flange

**TABLE T.E6.402.2 - REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENT AT THOSE AREAS OF SUBSTANTIAL CORROSION RENEWAL SURVEY OF SINGLE SKIN BULK CARRIERS WITHIN THE CARGO AREA - TRANSVERSE BULKHEADS IN CARGO HOLDS**

STRUCTURAL MEMBER	EXTENT OF MEASUREMENT	PATTERN OF MEASUREMENT
1. Lower Stool	<b>a.</b> Transverse band within 25 mm of welded connection to inner bottom  <b>b.</b> Transverse band within 25 mm of welded connection to shell plate	<b>a.</b> 5 point between stiffeners over 1 metre length  <b>b</b> Ditto
2. Transverse Bulkhead	<b>a.</b> Transverse band at approximately mid height  <b>b.</b> Transverse band at part of bulkhead adjacent to upper deck or below upper stool shelf plate (for those ships fitted with upper stools)	<b>a.</b> 5 point pattern over 1 sq metre of plating  <b>b.</b> 5 point pattern over 1 sq. metre of plating

**TABLE T.E6.402.3 - REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENT AT THOSE AREAS OF SUBSTANTIAL CORROSION RENEWAL SURVEY OF SINGLE SKIN BULK CARRIERS WITHIN THE CARGO AREA - DECK STRUCTURE INCLUDING CROSS STRIPS, MAIN CARGO HATCHWAYS, HATCH COVERS, COAMINGS AND TOPSIDE TANKS**

STRUCTURAL MEMBER	EXTENT OF MEASUREMENT	PATTERN OF MEASUREMENT
1. Cross Deck Strip plating	Suspect cross deck ship plating	<b>a.</b> 5 point pattern between underdeck stiffeners over 1 metre length
2. Underdeck Stiffeners	<b>a.</b> Transverse members  <b>b.</b> Longitudinal member	<b>a.</b> 5 point pattern at each end and mid span <b>b.</b> 5 point pattern on both web and flange.
3. Hatch Covers	<b>a.</b> Side and end skirts, each 3 locations.  <b>b.</b> 3 longitudinal bands outboard strakes (2) and centerline strake (1)	<b>a.</b> 5 point pattern at each location  <b>b.</b> 5 point measurement each band
4. Hatch Coamings	Each side and end coaming, one band lower 1/3, one band upper 2/3 of coaming	5 point measurement each band i.e. end of side coaming
5. Topside Water Ballast Tanks	<b>a.</b> Watertight transverse bulkheads. <ul style="list-style-type: none"> <li><b>i.</b> lower 1/3 of bulkhead</li> <li><b>ii.</b> upper 2/3 of bulkhead</li> <li><b>iii.</b> stiffeners</li> </ul> <b>b.</b> 2 representative swash transverse bulkheads <ul style="list-style-type: none"> <li><b>i.</b> lower 1/3 of bulkhead</li> <li><b>ii.</b> upper 2/3 of bulkhead</li> <li><b>iii.</b> stiffeners</li> </ul> <b>c.</b> 3 representative bays of slope plating <ul style="list-style-type: none"> <li><b>i.</b> lower 1/3 of tank</li> </ul>	<ul style="list-style-type: none"> <li><b>i.</b> 5 point pattern over 1 sq. metre of plating</li> <li><b>ii.</b> 5 point pattern over 1 sq. metre of plating</li> <li><b>iii.</b> 5 point pattern over 1 metre length</li> </ul> <ul style="list-style-type: none"> <li><b>i.</b> 5 point pattern over 1 sq. metre of plating</li> <li><b>ii.</b> 5 point pattern over 1 sq. metre of plating</li> <li><b>iii.</b> 5 point pattern over 1 metre length</li> </ul> <ul style="list-style-type: none"> <li><b>i.</b> 5 point pattern over 1 sq. metre of plating</li> </ul>

	<b>ii.</b> upper 2/3 of bulkhead <b>d.</b> Longitudinals, suspect and adjacent	<b>ii.</b> 5 point pattern over 1 sq. metre of plating <b>d.</b> 5 point pattern both web and flange over 1 metre length
<b>6.</b> Main deck plating	Suspect plates and adjacent (4)	5 point pattern over 1 sq. metre of plating
<b>7.</b> Main Deck Longitudinals	Minimum of 3 longitudinals where plating measured	5 point pattern on both web and flange over 1 metre length
<b>8.</b> Web frames/Transverse	Suspect plates	5 point pattern over 1 sq. metre

**TABLE T.E6.402.4 - REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENT AT THOSE AREAS OF SUBSTANTIAL CORROSION RENEWAL SURVEY OF SINGLE SKIN BULK CARRIERS WITHIN THE CARGO AREA - DOUBLE BOTTOM AND HOPPER STRUCTURE**

STRUCTURAL MEMBER	EXTENT OF MEASUREMENT	PATTERN OF MEASUREMENT
<b>1.</b> Inner/Double Bottom Plating	<b>a.</b> Suspect plate, plus all adjacent plates	<b>a.</b> 5 point pattern for each panel between longitudinals over 1 metre length
<b>2.</b> Inner/Double Bottom Longitudinals	Three longitudinals where plates measured	+3 Measurements in line across web and 3 Measurements on flange
<b>3.</b> Longitudinal Girders or Transverse floors	<b>b.</b> Suspect plates	<b>b.</b> 5 point pattern over about 1 sq. metre
<b>4.</b> Watertight Bulkheads (WT Floors)	<b>a.</b> lower 1/3 of tank	<b>a.</b> 5 point pattern over 1 sq. metre of plating
<b>5.</b> Web Frames	<b>b.</b> upper 2/3 of tank	<b>b.</b> 5 point pattern alternate plates over 1 sq. metre of plating
<b>6.</b> Bottom/Side Shell longitudinals	Suspect plate	5 point pattern over 1 sq. metre of plating
	Minimum of three longitudinals in way of suspect areas	3 measurements in line across web 3 measurements on flange

**TABLE T.E6.402.5 - REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENT AT THOSE AREAS OF SUBSTANTIAL CORROSION RENEWAL SURVEY OF SINGLE SKIN BULK CARRIERS WITHIN THE CARGO AREA CARGO HOLDS**

STRUCTURAL MEMBER	EXTENT OF MEASUREMENT	PATTERN OF MEASUREMENT
1. Side Shell frames	Suspect frame and adjacent	<p><b>a.</b> At each end and mid span: 5 point pattern of both web and flange</p> <p><b>b.</b> 5 point pattern within 25 mm of welded attachment to both shell and lower slope plate.</p>

**TABLE T.E6.402.6 - REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENT AT THOSE AREAS OF SUBSTANTIAL CORROSION RENEWAL SURVEY OF DOUBLE BULK CARRIERS WITHIN THE CARGO AREA**

BOTTOM, INNER BOTTOM AND HOPPER STRUCTURE		
STRUCTURAL MEMBER	EXTENT OF MEASUREMENT	PATTERN OF MEASUREMENT
Bottom, Inner bottom and hopper structure plating	Minimum of three bays across double bottom tank, including aft bay Measurements around and under all suction bell mouths	Five-point pattern for each panel between longitudinals and floors
Bottom, inner bottom and hopper structure longitudinals	Minimum of three longitudinals in each bay where bottom plating measured	Three measurements in line across the flange and three measurements on the vertical web
Bottom girders, including, the watertight ones	At fore and aft watertight floors and in centre of tanks	Vertical line of single measurements on girder plating with one measurement between each panel stiffener, or a minimum of three measurements
Bottom floors, including the watertight ones	Three floors in the bays where bottom plating measured, with measurements at both ends and middle	Five-point pattern over two square metre area
Hopper structure web frame ring	Three floors in bays where bottom plating measured	Five-point pattern over one square metre of plating Single measurements on flange
Hopper structure transverse watertight bulkhead or swash bulkhead	- lower 1/3 of bulkhead	-five-point pattern over one square metre of plating
	- upper 2/3 of bulkhead	-five-point pattern over two square metre of plating
	- stiffeners (minimum of three)	-For web, five-point pattern over span (two measurements across web at each end and one at centre of span). For flange, single measurements at each end and centre of span
Panel stiffening	Where applicable	Single measurements



**TABLE T.E6.402.7 - REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENTS AT THOSE AREAS OF SUBSTANTIAL CORROSION OF DOUBLE SKIN BULK CARRIERS WITHIN THE CARGO LENGTH AREA**

<b>DECK STRUCTURE, INCLUDING CROSS STRIPS, MAIN CARGO HATCHWAYS, HATCH COVERS, CAMINGS AND TOPSIDE TANKS</b>		
<b>STRUCTURAL MEMBER</b>	<b>EXTENT OF MEASUREMENT</b>	<b>PATTERN OF MEASUREMENT</b>
Cross Deck Strip plating	Suspect Cross Deck Strip plating	Five-point pattern between underdeck stiffeners over 1 metre length
Underdeck stiffeners	Transverse members Longitudinal member	Five-point pattern at each end and mid span Five-point pattern on both web and flange
Hatch Covers	Side and end skirts, each three locations  Three longitudinal bands, outboard strakes (2) and centerline strake (1)	Five-point pattern at each location  Five-point measurement each band
Hatch Coamings	Each side and end of coaming, one band lower 1/3, one band upper 2/3 of coaming	Five-point measurement each band i.e. end or side coaming
Topside Ballast Tanks	a) watertight transverse bulkheads:	
	- lower 1/3 of bulkhead	-five-point pattern over one square metre of plating
	- upper 2/3 of bulkhead	-five-point pattern over two square metre of plating
	- stiffeners	-five-point pattern over two square metre of length
Topside Ballast Tanks	b) two representative swash transverse bulkheads:	
	- lower 1/3 of bulkhead	-five-point pattern over one square metre of plating
	- upper 2/3 of bulkhead	-five-point pattern over two square metre of plating
	- stiffeners	-five-point pattern over two square metre of length
Topside Ballast Tanks	c) three representative bays of slope plating:	
	- lower 1/3 of bulkhead	-five-point pattern over one square metre of plating
	- upper 2/3 of bulkhead	-five-point pattern over two square metre of plating
Topside Ballast Tanks	d) Longitudinals, suspect and adjacent	Five-point pattern on both web and flange over 1 metre length
Main Deck Plating	Suspect plates and adjacent (4)	Five-point pattern over 1 sq. metre of plating
Main Deck Longitudinals	Suspect plate	Five-point pattern on both web and flange over 1 sq. metre length
Web Frames/Transverse	Suspect plate	Five-point pattern over 1 sq. metre

**TABLE T.E6.402.8 - REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENTS AT THOSE AREAS OF SUBSTANTIAL CORROSION OF DOUBLE SKIN BULK CARRIERS WITHIN THE CARGO LENGTH AREA**

<b>STRUCTURE IN DOUBLE SIDE SPACES OF DOUBLE SKIN BULK CARRIER INCLUDING WING VOID SPACES OF ORE CARRIERS</b>		
<b>Structural member</b>	<b>Extent of measurement</b>	<b>Pattern of Measurement</b>
Side shell and inner plating:  -Upper strake and strake in way of horizontal girders  -All other strakes	- Plating between each pair of transverse frames/longitudinals in a minimum of three bays (along the tank)  - plating between every third pair of longitudinals in same three bays	- Single measurement  - Single measurement
Side shell and inner side transverse frames/longitudinals on:  -upper strake  -all other strakes	- Each transverse frame/longitudinal in same three bays  - Every third transverse frame/longitudinal in same tree bays	- Three measurements across web and 1 measurement on flange  - Three measurements across web and 1 measurement on flange
Transverse frames/Longitudinals -brackets	Minimum of three at top, middle and bottom of tank in same three bays	Five-point pattern over area of bracket
Vertical web and transverse bulkheads:  -strakes in way of horizontal girders  -other strakes	- Minimum of two webs and both transverse bulkheads  - Minimum of two webs and both transverse bulkheads	- Five-point pattern over approx.. two square metre area  - Two measurements between each pair of vertical stiffeners
Horizontal girders	Plating on each girder in a minimum of three bays	Two measurements between each pair of longitudinal girder stiffeners
Panel stiffening	Where applicable	Single measurements

**TABLE T.E6.402.9 - REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENTS AT THOSE AREAS OF SUBSTANTIAL CORROSION OF DOUBLE SKIN BULK CARRIERS WITHIN THE CARGO LENGTH AREA**

TRANSVERSE BULKHEADS IN CARGO HOLDS		
Structural member	Extent of measurement	Pattern of Measurement
Lower stool, where fitted	<ul style="list-style-type: none"> <li>- Transverse band within 25 mm of welded connection to inner bottom</li> <li>- Transverse bands within 25 mm of welded connection to shelf plate</li> </ul>	<ul style="list-style-type: none"> <li>- Five-point pattern between stiffeners over one metre length</li> <li>- Five-point pattern between stiffeners over one metre length</li> </ul>
Transverse bulkheads	<ul style="list-style-type: none"> <li>- Transverse band at approximately mid height</li> <li>- Transverse bands at part of bulkhead adjacent to upper deck or below upper stool shelf plate (for those ships fitted with upper stools)</li> </ul>	<ul style="list-style-type: none"> <li>- Five-point pattern over one square metre of plating</li> <li>- Five-point pattern over one square metre of plating</li> </ul>

## 500 Extent of Tank Testing

501. All boundaries of water ballast tanks, deep tanks and cargo holds used for water ballast within the cargo length area are to be pressure tested. For Fuel Oil Tanks, only representative tanks are to be pressure tested.

502. The Surveyor may extend the tank testing as deemed necessary

503. Boundaries of ballast tanks are to be tested with a head of liquid to the top of air pipes.

504. Boundaries of ballast holds are to be tested with a head of liquid to near to the top of hatches.

505. Boundaries of fuel oil tanks are to be tested with a head of liquid to the highest point that liquid will rise under service conditions. Tank testing of fuel oil tanks 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.

506. The testing of 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.

## 600 Additional Renewal survey requirements after determining compliance with SOLAS XII/12 and XII/13

601. For ships complying with the requirements of SOLAS XII/12 for hold, ballast and dry space water level detectors, the Renewal survey is to include an examination and a test of the water ingress detection systems and of their alarms.

602. For ships complying with the requirements of SOLAS XII/13 for the availability of pumping systems, the Renewal survey is to include an examination and a test of the means for draining and pumping ballast tanks forward of the collision bulkhead and bilges of dry spaces any part of which extends forward of the foremost cargo hold, and of their controls.

## E7. EVALUATION OF SURVEYS

### 100. Evaluation of Survey Report

101. The data and information on the structural condition of the vessel collected during the survey is to be evaluated for acceptability and continued structural integrity of the vessel.

## E8. SURVEY REPORTING PRINCIPLES

### 100 General

101. As a principle, for bulk carriers subject to ESP, the surveyor is to include the following content in his report for survey of hull structure and piping systems, as relevant for the survey.

102. A survey report is to be generated in the following cases:

- In connection with commencement, continuation and / or completion of periodical hull surveys, i.e. annual, intermediate and Renewal surveys, as relevant
- When structural damages / defects have been found

- c. When repairs, Renewals or modifications have been carried out
  - d. When condition of class (recommendation) has been imposed or deleted
103. The purpose of reporting is to provide:
- a. Evidence that prescribed surveys have been carried out in accordance with applicable classification rules
  - b. Documentation of surveys carried out with findings, repairs carried out and condition of class (recommendation) imposed or deleted
  - c. Survey records, including actions taken, which shall form an auditable documentary trail. Survey reports are to be kept in the survey report file required to be on board
  - d. Information for planning of future surveys
  - e. Information which may be used as input for maintenance of classification rules and instructions

104. When a survey is split between different survey stations, a report is to be made for each portion of the survey. A list of items surveyed, relevant findings and an indication of whether the item has been credited is to be made available to the next attending surveyor, prior to continuing or completing the survey. Thickness measurement and tank testing carried out is also to be listed for the next surveyor.

## 200. Extent of the survey

201. Identification of compartments where an overall survey has been carried out.

202. Identification of locations, in each ballast tank and cargo hold including hatch covers and coamings, where a close-up survey has been carried out, together with information of the means of access used.

203. Identification of locations, in each ballast tank and cargo hold including hatch covers and coamings, where thickness measurement has been carried out.

**Note:** *As a minimum, the identification of location of close-up survey and thickness measurement is to include a confirmation with description of individual structural members corresponding to the extent of requirements stipulated in Z10.2 based on type of periodical survey and the ship's age. Where only partial survey is required, i.e. 25% of shell frames, one transverse web, two selected cargo hold transverse bulkheads, the identification is to include location within each ballast tank and cargo hold by reference to frame numbers.*

205. For areas in ballast tanks and cargo holds where protective coating is found to be in GOOD condition and the extent of close-up survey and / or thickness

measurement has been specially considered, structures subject to special consideration are to be identified.

206. Identification of tanks subject to tank testing.

207. Identification of piping systems on deck and within cargo holds, ballast tanks, pipe tunnels, cofferdams and void spaces where:

- a. Examination including internal examination of piping with valves and fittings and thickness measurement, as relevant, has been carried out
- b. Operational test to working pressure has been carried out

## 300. Result of the survey

301. Type, extent and condition of protective coating in each tank, as relevant (rated GOOD, FAIR or POOR).

302. Structural condition of each compartment with information on the following, as relevant:

- a. Identification of findings, such as:
  - a.1. Corrosion with description of location, type and extent
  - a.1. Areas with substantial corrosion
  - a.2. Cracks / fractures with description of location and extent
  - a.3. Buckling with description of location and extent
  - a.4. Indents with description of location and extent
- b. Identification of compartments where no structural damages / defects are found

303. The report may be supplemented by sketches / photos.

304. Thickness measurement report is to be verified and signed by the surveyor controlling the measurements on board.

## 400. Actions taken with respect to findings

401. Whenever the attending surveyor is of the opinion that repairs are required, each item to be repaired is to be identified in a numbered list. Whenever repairs are carried out, details of the repairs affected are to be reported by making specific reference to relevant items in the numbered list.

402. Repairs carried out are to be reported with identification of:

- a. Compartment

- b. Structural member
- c. Repair method (i.e. Renewal or modification) including:
  - c.1. Steel grades and scantlings (if different from the original)
  - c.2. Sketches/photos, as appropriate
- d. Repair extent
  - d.1. NDT / Tests

403. For repairs not completed at the time of survey, condition of class (recommendation) is to be imposed with a specific time limit for the repairs. In order to provide correct and proper information to the surveyor attending for survey of the repairs, condition of class (recommendation) is to be sufficiently detailed with identification of each item to be repaired. For identification of extensive repairs, reference may be given to the survey report.

404. When a survey is split between different survey stations, a report is to be made for each portion of the survey. A list of items examined and / or tested (pressure testing, thickness measurements etc.) and an indication of whether the item has been credited, are to be made available to the next attending Surveyor(s), prior to continuing or completing the survey.

405. An Executive Hull Summary of the survey and results is to be issued to the Owner and placed on board the vessel for reference at future surveys. The Executive Hull Summary is to be endorsed by the RBNA's head office or regional managerial office.

## **E9. GUIDELINES FOR TECHNICAL ASSESSMENT IN CONJUNCTION WITH PLANNING FOR ENHANCED SURVEYS OF SINGLE AND DOUBLE BULK CARRIERS RENEWAL SURVEY – HULL [IACS 10.2 and 10.5 – Annex 1]**

### **REFERENCES**

1. IACS Unified Requirement Z10.2, "Hull Surveys of Bulk Carriers", and 10.5, "Hull Surveys of Double Skin Bulk Carriers".
2. TSCF, "Guidance Manual for the Inspection and Condition Assessment of Tanker Structures, 1986."
3. TSCF, "Condition Evaluation and Maintenance of Tanker Structures, 1992."
4. IACS, "Bulk Carriers: Guidelines for Surveys, Assessment and Repair of Hull Structures, 1994."

## **100. Introduction**

101. This Subchapter E9 contains information and suggestions concerning technical assessments which may be of use in conjunction with the planning of enhanced renewal surveys of bulk carriers.. As indicated in, A3.109 they are a recommended tool which may be invoked at the discretion of RBNA, when considered necessary and appropriate, in conjunction with the preparation of the required Survey Programme.

## **200. Purpose and principles**

201. The purpose of the technical assessments described in these guidelines is to assist in identifying critical structural areas, nominating suspect areas and in focusing attention on structural elements or areas of structural elements which may be particularly susceptible to, or evidence a history of, wastage or damage. This information may be useful in nominating locations, areas, holds and tanks for thickness measurement, close-up survey and tank testing. Critical Structural Areas are locations which have been identified from calculations to require monitoring or from the service of the subject ship or from similar or sister ships (if available) to be sensitive to cracking, buckling or corrosion which would impair the structural integrity of the ship.

202. Minimum Requirements: However, these guidelines may not be used to reduce the requirements pertaining to thickness measurement, close-up survey and tank testing contained in Tables I, II and paragraph 2.5, respectively, of Z10.2; which are, in all cases, to be complied with as a minimum.

203. Timing: As with other aspects of survey planning, the technical assessments described in these guidelines are to be worked out by the Owner or operator in cooperation with the RBNA well in advance of the commencement of the Renewal Survey, i.e., prior to commencing the survey and normally at least 12 to 15 months before the survey's completion due date.

204. Aspects to be Considered: Technical assessments, which may include quantitative or qualitative evaluation of relative risks of possible deterioration, of the following aspects of a particular ship may be used as a basis for the nomination of tanks and areas for survey:

- a. Design features such as stress levels on various structural elements, design details and extent of use of high tensile steel.
- b. Former history with respect to corrosion, cracking, buckling, indents and repairs for the particular ship as well as similar vessels, where available.
- c. Information with respect to types of cargo carried, protection of tanks, and condition of coating, if any, of holds and tanks.
- d. Technical assessments of the relative risks of susceptibility to damage or deterioration of various structural elements and areas are to be judged and decided on the basis of recognized principles and



practices, such as may be found in the IACS publication "Bulk Carriers: Guidelines for Surveys, Assessment and Repair of Hull Structure," (Ref. 4).

### 300. Technical assessment

301 General: There are three basic types of possible failure which may be the subject of technical assessment in connection with planning of surveys; corrosion, cracks and buckling. Contact damages are not normally covered by the survey plan since indents are usually noted in memoranda and assumed to be dealt with as a normal routine by Surveyors. Technical assessments performed in conjunction with the survey planning process are, in principle to be as shown schematically in Figure F.E9.603.1 depicts, schematically, how technical assessments can be carried out in conjunction with the survey planning process.

- a. The approach is basically an evaluation of the risk based on the knowledge and experience related to design and corrosion.
- b. The design is to be considered with respect to structural details which may be susceptible to buckling or cracking as a result of vibration, high stress levels or fatigue.
- c. Corrosion is related to the ageing process, and is closely connected with the quality of corrosion protection at newbuilding, and subsequent maintenance during the service life.
- d. Corrosion may also lead to cracking and/or buckling.

### 400. Methods

401. Design Details Damage experience related to the ship in question and similar ships, where available, is the main source of information to be used in the process of planning. In addition, a selection of structural details from the design drawings is to be included.

402 Typical damage experience to be considered will consist of:

- a. Number, extent, location and frequency of cracks;
- b. Location of buckles.

403. This information may be found in the survey reports and/or the Owner's files, including the results of the Owner's own inspections. The defects should be analyzed, noted and marked on sketches.

404. In bulk carriers which experience has shown may be susceptible to structural damage. Also, reference is to be made to IACS's "Bulk Carriers: Guidelines for Survey, Assessment and Repair," (Ref. 4) which contains a catalogue of typical damages and proposed repair methods for various bulk carrier structural details.

405. Such figures are to be used together with a review of the main drawings, in order to compare with the actual structure and search for similar details which may be susceptible to damage.

406. An example is shown in Figure F.E10.102.3.

407. The review of the main structural drawings, in addition to using the above mentioned figures, should include checking for typical design details where cracking has been experienced. The factors contributing to damage are to be carefully considered.

408. The use of high tensile steel (HTS) is an important factor. Details showing good service experience where ordinary, mild steel has been used may be more susceptible to damage when HTS, and its higher associated stresses, are utilized. There is extensive and, in general, good experience, with the use of HTS for longitudinal material in deck and bottom structures. Experience in other locations, where the dynamic stresses may be higher, is less favourable, e.g. side structures.

409. In this respect, stress calculations of typical and important components and details, in accordance with the latest Rules or other relevant methods, may prove useful and are to be considered. The selected areas of the structure identified during this process are to be recorded and marked on the structural drawings to be included in the Survey Programme.

### 500. Corrosion

501. In order to evaluate relative corrosion risks, the following information is generally to be considered:

- a. Usage of Tanks and Spaces
- b. Condition of Coatings
- c. Cleaning Procedures
- d. Previous Corrosion Damage
- e. Ballast use and time for Cargo Holds
- f. Risk of Corrosion in Cargo Holds and Ballast Tanks
- g. Location of Ballast Tanks Adjacent to Heated Fuel Oil Tanks

502. Ref. 3 gives definitive examples which can be used for judging and describing coating condition, using typical pictures of conditions.

503. For bulk carriers, Ref. 4 is to be used as the basis for the evaluation, together with relevant information on the anticipated condition of the ship as derived from the information collected in order to prepare the Survey Programme and the age of the ship.

504. The various tanks, holds and spaces are to be listed with the corrosion risks nominated accordingly.

#### 600. Locations for Close-up Survey and Thickness Measurement

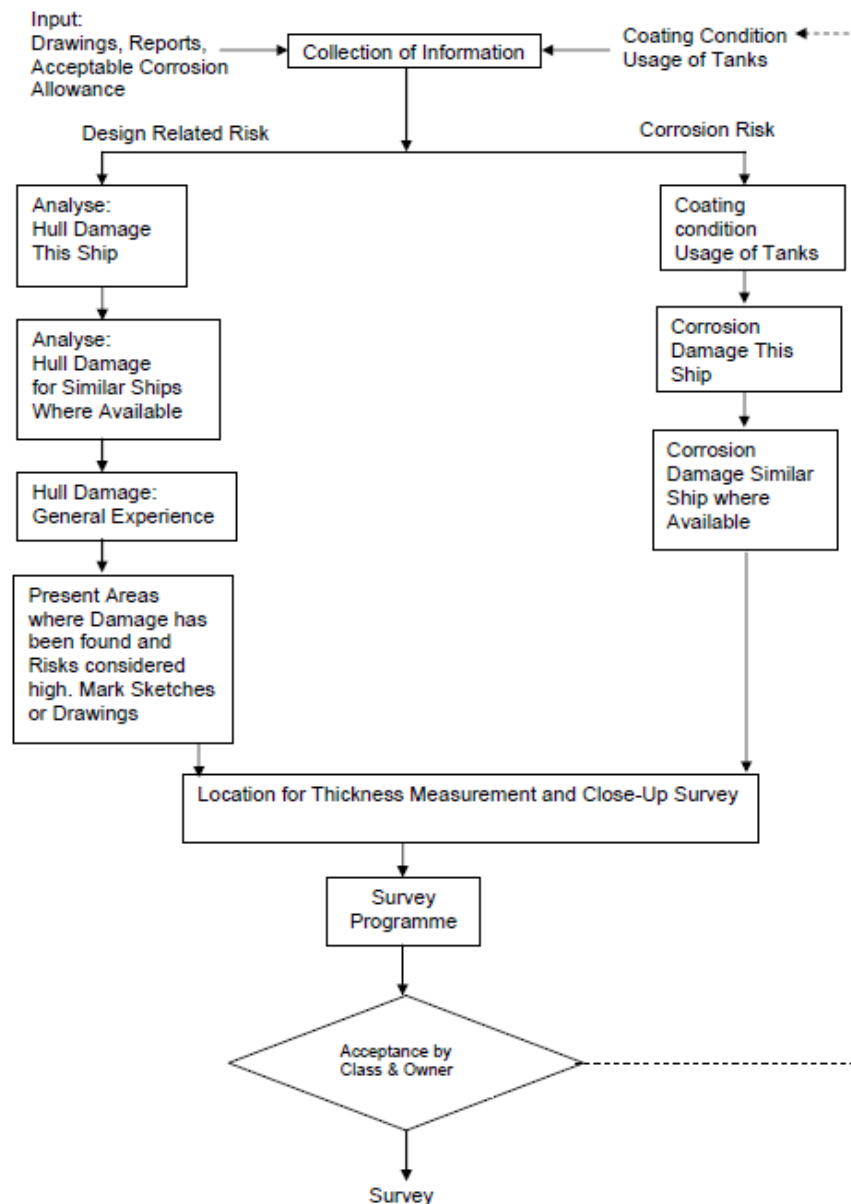
601. On the basis of the table of corrosion risks and the evaluation of design experience, the locations for initial close-up survey and thickness measurement (sections) may be nominated.

602. The sections subject to thickness measurement are to normally be nominated in tanks and spaces where corrosion risk is judged to be the highest.

603. The nomination of tanks, holds and spaces for close-up survey is to, initially, be based on highest corrosion risk, and is to always include ballast tanks. The principle for the selection should be that the extent is increased by age or where information is insufficient or unreliable.

End of Guidance

FIGURE F.E9.603.1 – TECHNICAL ASSESSMENT & THE SURVEY PLANNING PROCESS



**FIGURE F.E10.102.2: TYPICAL LOCATIONS SUSCEPTIBLE TO STRUCTURAL DAMAGE OR CORROSION**

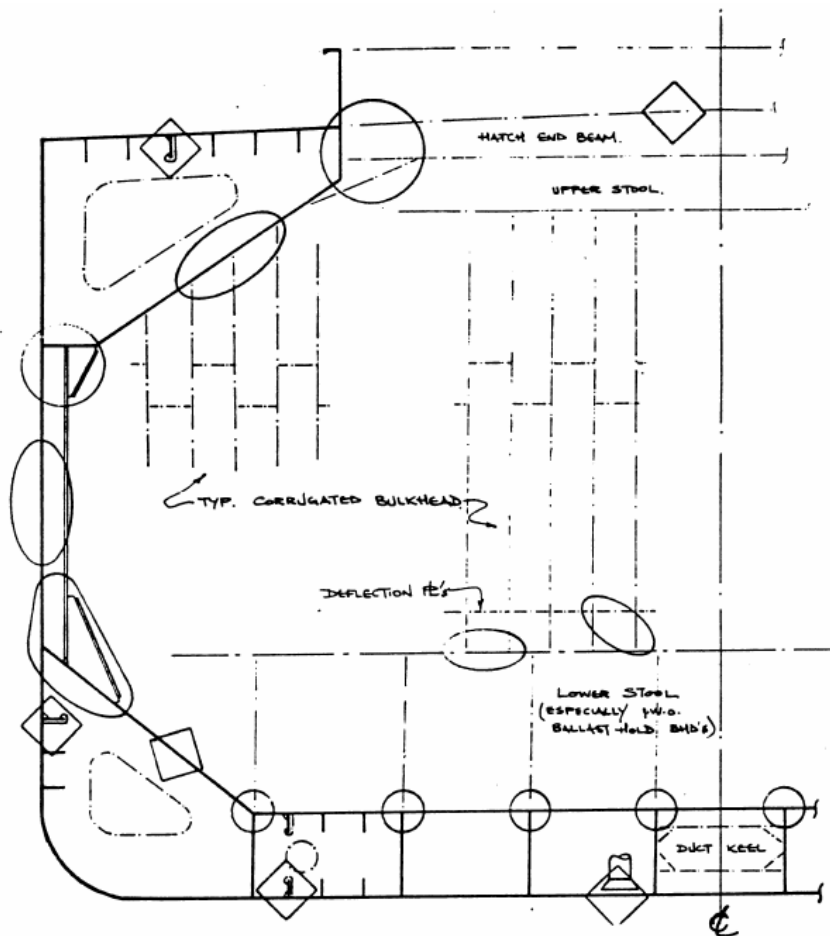
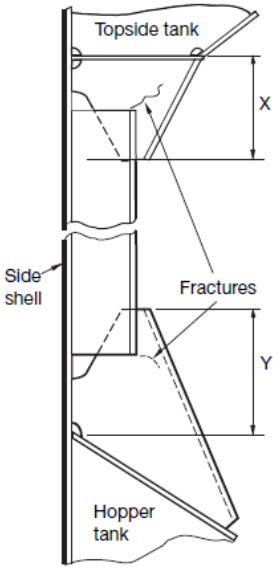
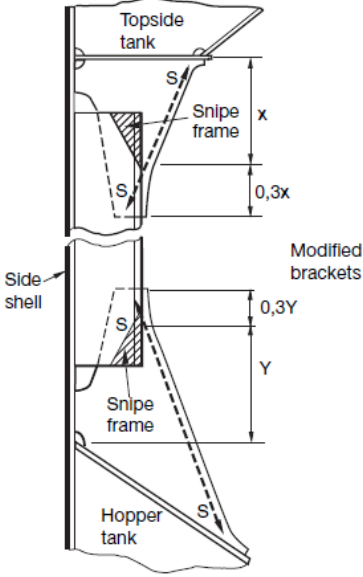


FIGURE F.E10.102.3: TYPICAL DAMAGE AND REPAIR EXAMPLE (REPRODUCED FROM REF: 4)

AREA 1	Structural item	Side shell frames and end brackets (separate bracket configuration)	EXAMPLE 1
Detail of damage		Fractures in brackets at termination of frame	
Sketch of damage		Sketch of repair	
 <p>Separate Bracket Configuration</p> <p>3276/04</p>		 <p>S = Sniped end</p>	
Notes on possible cause of damage		Notes on repairs	
1. This type of damage is due to stress concentration.		1. For small fractures e.g. hairline fractures, the fracture can be 'veed' out, welded up, ground and examined by NDT for fractures. 2. For larger/significant fractures consideration is to be given to cropping and partly renewing/renewing the frame brackets. If renewing the brackets, ends of frames can be sniped to soften them. 3. If felt prudent, soft toes are to be incorporated at the boundaries of the bracket to the wing tanks. 4. Attention to be given to the structure in wing tanks in way of the extended bracket arm i.e. reinforcement provided in line with the bracket arm.	

E10. GUIDELINES FOR THE GAUGING OF THE VERTICALLY CORRUGATED TRANSVERSE BULKHEAD BETWEEN HOLDS NOS. 1 AND 2 [IACS 10.2 and 10.5 Annex III]

100. Guidelines for the gauging of the vertically corrugated transverse watertight bulkhead between holds nos. 1 and 2

101. Gauging is necessary to determine the general condition of the structure and to define the extent of possible repairs and/or reinforcements of the vertically corrugated transverse watertight bulkhead for verification

of the compliance with Part II, Title 14, Section 2, Chapter L.

102. Taking into account the buckling model applied in Part II, Title 14, Section 2, Chapter L in the evaluation of strength of the bulkhead, it is essential to determine the thickness diminution at the critical levels shown in Figures F.E10.102.1 and F.E10.102.2.

103. The gauging is to be carried out at the levels as 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 are to be gauged.

a. Level (a) Ships without lower stool (see Figures F.E10.102.1.) Locations:

- a.1. The mid-breadth of the corrugation flanges at approximately 200 mm above the line of shedder plates;
- a.1. The middle of gusset plates between corrugation flanges, where fitted;
- a.2. The middle of the shedder plates;
- a.3. The mid-breadth of the corrugation webs at approximately 200 mm above the line of shedder plates.

b. Level (b) Ships with lower stool (see Figures F.E10.102.2) Locations:

- b.1. • The mid-breadth of the corrugation flanges at approximately 200 mm above the line of shedder plates;
- b.2. • The middle of gusset plates between corrugation flanges, where fitted;
- b.3. • The middle of the shedder plates;
- b.4. • The mid-breadth of the corrugation webs at approximately 200 mm above the line of shedder plates.

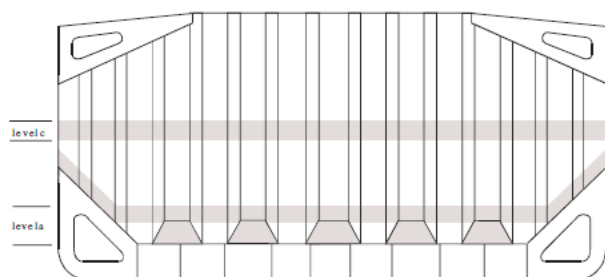
c. Level (c) Ships with or without lower stool (see Figures F.E10.102.1 and F.E10.102.2): Locations:

- c.1. • The mid-breadth of the corrugation flanges and webs at about the mid-height of the corrugation.

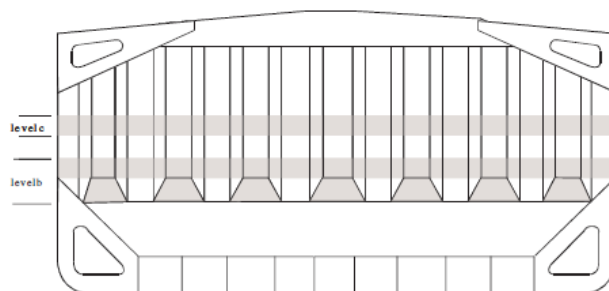
104. Where the thickness changes within the horizontal levels, the thinner plate is to be gauged.

105. Steel renewal and/or reinforcement is to comply with Part II, Title 14, Section 2, Chapter L.

**FIGURE F.E10.102.1**



**FIGURE F.E10.102.2**



#### [ANNEX IV]

### **E11. ADDITIONAL ANNUAL SURVEY REQUIREMENTS FOR THE FOREMOST CARGO HOLD OF SHIPS SUBJECT TO SOLAS XII/9.1**

#### **100. General**

101. In the case of Bulk Carrier over 5 years of age, the Annual Survey is to include, in addition to the requirements of the Annual Surveys prescribed in chapter 3, an examination of the following items:

#### **200. Extent of Survey**

201. For bulk carriers of 5 - 15 years of age:

- a. An Overall Survey of the foremost cargo hold, including Close-up Survey of sufficient extent, minimum 25% of frames, is to be carried out to establish the condition of:
  - a.1. Shell frames including their upper and lower end attachments, adjacent shell plating, and transverse bulkheads.
  - a.2. Suspect areas identified at previous surveys.
- b. Where considered necessary by the surveyor as a result of the Overall and Close-up Survey as described in a) above, the survey is to be extended to include a Close-up Survey of all of the shell frames and adjacent shell plating of the cargo hold.

202. For bulk carriers exceeding 15 years of age:

- a. An Overall Survey of the foremost cargo hold, including Close-up Survey is to be carried out to establish the condition of:
  - a.1. All shell frames including their upper and lower end attachments, adjacent shell plating, and transverse bulkheads.
  - a.2. Suspect areas identified at previous surveys.



### 300. Extent of Thickness Measurement

301. Thickness measurement is to be carried out to an extent sufficient to determine both general and local corrosion levels at areas subject to Close-up Survey. The minimum requirement for thickness measurements are suspect areas identified at previous surveys.

302. Where Substantial Corrosion is found, the extent of thickness measurements should be increased with the requirements of Tables T.E6.402.1 to T.E6.402.9.

303. The thickness measurement may be dispensed with provided the surveyor is satisfied by the Close-up Survey, that there is no structural diminution and the Protective Coating where fitted remains effective.

### 400. Special Consideration

401. Where the protective coating in the foremost cargo hold is found to be in GOOD condition, the extent of close-up surveys and thickness measurements may be specially considered.

#### 402. Guidance:

*For existing bulk carriers, where owners may elect to coat or recoat cargo holds as noted above, consideration may be given to the extent of the close-up and thickness measurement surveys. Prior to the coating of cargo holds of existing ships, scantlings should be ascertained in the presence of a surveyor.*

*End of guidance*

## [ANNEX V]

### E12. GUIDELINES FOR THE GAUGING OF SIDE SHELL FRAMES AND BRACKETS IN SINGLE SIDE SKIN BULK CARRIERS REQUIRED TO COMPLY WITH PART II, TITLE 14, SECTION 2, CHAPTER O [UR S31]

#### 100. General

101. Gauging is necessary to determine the general condition of the structure and to define the extent of possible steel renewals or other measures for the webs and flanges of side shell frames and brackets for verification of the compliance with Part II Title 14 Section 2 Chapter L.

#### 200. Zones of Side Shell Frames and Brackets

201. For the purpose of steel renewal, sand blasting and coating, four zones A, B, C and D are defined, as shown in Figure F.E6.300.2.

- Zones A & B are considered to be the most critical zones.
- Lower part of side frame Figure F.E6.300.2 Zones of Side Shell Frames and Brackets

#### 300. Pitting and grooving

301. Pits can grow in a variety of shapes, some of which would need to be ground before assessment.

302. Pitting corrosion may be found under coating blisters, which must be removed before inspection.

303. To measure the remaining thickness of pits or grooving the normal ultrasonic transducer (generally 10mm diameter) will not suffice. A miniature transducer (3 to 5 mm diameter) must be used. Alternatively the gauging firm must use a pit gauge to measure the depth of the pits and grooving and calculate the remaining thickness.

#### 400. Assessment based upon Area

401. This is the method specified in Part II Title 14 Section 2 Subchapter O2 and is based upon the intensity determined from Figure F.E1.203.1.Pitting Intensity Diagram.

402. If pitting intensity is higher than 15% in an area, then thickness measurements are to be taken to check the extent of the pitting corrosion. The 15% is based upon pitting or grooving on only one side of the plate.

403. In cases where pitting is evident as defined above (exceeding 15 %) then an area of 300mm diameter or more (or, where this is impracticable on the frame flange or the side shell, hopper tank plating or topside tank plating attached to the side frame, an equivalent rectangular area), at the most pitted part, is to be cleaned to bare metal, and the thickness measured in way of the five deepest pits

within the cleaned area. The least thickness measured in way of any of these pits is to be taken as the thickness to be recorded.

404. The minimum acceptable remaining thickness in any pit or groove is equal to:

- a. 75% of the as built thickness, for pitting or grooving in the cargo hold side frame webs and flanges.
- b. 70% of the as built thickness, for pitting or grooving in the side shell, hopper tank and topside tank plating attached to the cargo hold side frame, over a width up to 30mm from each side of it.

### 500. Gauging methodology

501. Numbers of side frames to be measured are equivalent to those of Renewal Survey or Intermediate Survey corresponding to the ship's age. Representative thickness measurements are to be taken for each zone as specified below.

502. Special consideration to the extent of the thickness measurements may be given by the RBNA, if the structural members show no thickness diminution with respect to the as built thicknesses and the coating is found in "as-new" condition (i.e., without breakdown or rusting).

504. Where gauging readings close to the criteria are found, the number of hold frames to be measured is to be increased.

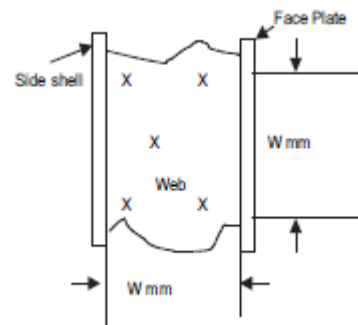
505. If renewal or other measures according to Part II, Title 14, Section 2, Chapter O are to be applied on individual frames in a hold, then all frames in that hold are to be gauged.

506. There is a variety of construction methods used for side shell frames in bulk carriers. Some have faceplates (T sections) on the side shell frames, some have flanged plates and some have bulb plates. The use of faceplates and flanged sections is considered similar for gauging purposes in that both the web and faceplate or web and flange plate are to be gauged. If bulb plate has been used, then web of the bulb plate is to be gauged in the normal manner and the sectional modulus has to be specially considered if required.

### 600. Gaugings for Zones A, B & D

601. Web plating: The gauging pattern for Zones A, B & D are to be a five point pattern. See Figure F.F12.601.1. The 5 point pattern is to be over the depth of the web and the same area vertically. The gauging report is to reflect the average reading.

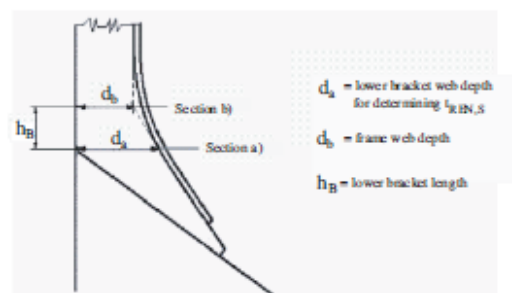
**FIGURE F.F12.601.1 TYPICAL 5 POINT PATTERN ON THE WEB PLATE**



602. Gaugings for Zone C: Web plating: Depending upon the condition of the web in way of Zone C, the web may be measured by taking 3 readings over the length of Zone C and averaging them. The average reading is to be compared with the allowable thickness. If the web plating has general corrosion then this pattern should be expanded to a five point pattern as noted above.

603. Gaugings for section a) and b) (flanges and side shell plating) Where the lower bracket length or depth does not meet the requirements in Part II, Title 11, Section 2, Chapter F gaugings are to be taken at sections a) and b) to calculate the actual section modulus required in Part II, Title 14, Section 2, Chapter R. See Figure F.E12.603.1. At least 2 readings on the flange/faceplate are to be taken in way of each section. At least one reading of the attached shell plating is to be taken on each side of the frame (i.e. fore and aft) in way of section a) and section b).

**FIGURE F.E12.603.1 SECTIONS A) AND B)**



700. Report on Thickness Measurement of Cargo Hold Frames

See form TM7-BC IACS S31 (sheet 11 bis).

## CHAPTER F

### ADDITIONAL REQUIREMENTS FOR HULL AND CARGO MACHINERY SURVEYS OF SINGLE SKIN AND DOUBLE SKIN OIL TANKERS OF AB ≥ 500 [IACS UR Z10.1 e UR Z10.4 FOR HULL SURVEYS]

#### CHAPTER CONTENTS

##### F1. GENERAL

##### F2. ADDITIONAL REQUIREMENTS FOR ANNUAL SURVEYS – SINGLE SKIN AND DOUBLE SKIN OIL TANKERS

##### F3. ADDITIONAL REQUIREMENTS FOR HULL INTERMEDIATE SURVEYS – OIL TANKERS

##### F4. ADDITIONAL REQUIREMENTS FOR HULL RENEWAL SURVEYS – SINGLE SKIN AND DOUBLE SKIN OIL TANKERS

##### F5. DOCUMENTATION ON BOARD

##### F6. PROCEDURES FOR THICKNESS MEASUREMENTS

##### F7. EVALUATION OF SURVEYS

##### F8. SURVEY REPORTING PRINCIPLES

##### F9. GUIDELINES FOR TECHNICAL ASSESSMENT IN CONJUNCTION WITH PLANNING FOR ENHANCED SURVEYS OF OIL TANKERS RENEWAL SURVEY – HULL

#### F1. GENERAL [UR Z10.1.1]

##### 100. Application

101. The requirements of the present Chapter F apply to all self-propelled Oil Tankers, whether single hull or double hull Oil Tankers.

102. The present requirements apply to surveys of hull structure and piping systems in way of cargo tanks, pump rooms, cofferdams, pipe tunnels, void spaces within the cargo area and all ballast tanks. The requirements are additional to the classification requirements (Part I, Title 2, Section 2, Chapter D) applicable to the remainder of the ship.

103. The present requirements contain the minimum extent of examination, thickness measurements and tank testing. The survey is to be extended when Substantial Corrosion and/or structural defects are found and include additional Close-up Survey when necessary.

##### 200. Definitions

201. In addition to the definitions given in

202. **Oil Tanker:** An Oil Tanker is a ship which is constructed primarily to carry oil in bulk and includes ship types such as combination carriers (Ore/Oil ships etc.).

203. **Double Hull Oil Tanker:** A Double Hull Oil Tanker is a ship which is constructed primarily for the carriage of oil <sup>(1)</sup> in bulk, which has the cargo tanks protected by a double hull which extends for the entire length of the cargo area, consisting of double sides and double bottom spaces for the carriage of water ballast or void spaces.

(1) MARPOL Annex I cargoes. The requirements in this Chapter F are also applicable to existing double hull tankers not complying with MARPOL Regulation 13F, but having a U-shaped midship section.

204. **Combined Cargo/Ballast Tank** is a tank which is used for the carriage of cargo or ballast water as a routine part of the vessel's operation and will be treated as a Ballast Tank. Cargo tanks in which water ballast might be carried only in exceptional cases per MARPOL I/18(3) are to be treated as cargo tanks.

#### *Guidance*

*Reference is made to IACS Recommendation No.87 "Guidelines for Coating Maintenance & Repairs for Ballast Tanks and Combined Cargo / Ballast Tanks on Oil Tankers".*

#### *End of guidance*

205. **Representative Tank:** are those 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 is to be taken of the service and repair history onboard and identifiable Critical Structural Areas and/or Suspect Areas.

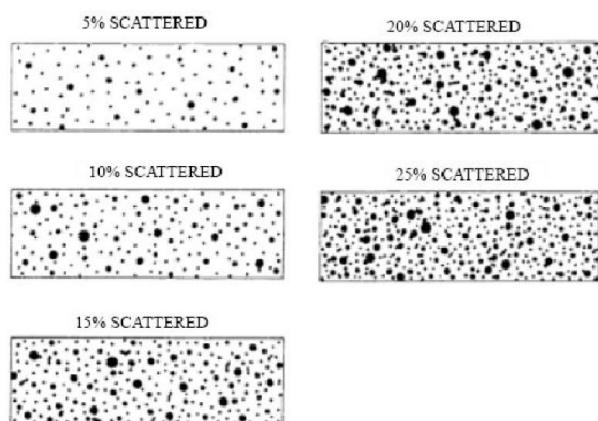
206. **Cargo Area:** Cargo Area is that part of the ship which contains cargo tanks, slop tanks and cargo/ballast pump-rooms, cofferdams, ballast tanks and void spaces adjacent to cargo tanks and also deck areas throughout the entire length and breadth of the part of the ship over the above mentioned spaces.

207. **Pitting Corrosion:** Pitting corrosion is defined as scattered corrosion spots/areas with local material reductions which are greater than the general corrosion in the surrounding area. Pitting intensity is defined in Figure F.F1.205.1.

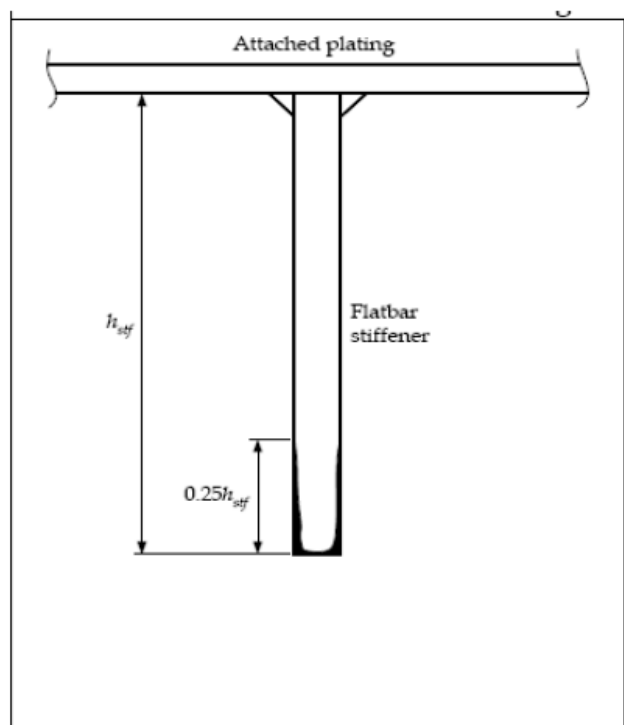
208. **Edge Corrosion:** Edge corrosion is defined as local corrosion at the free edges of plates, stiffeners, primary support members and around openings. An example of edge corrosion is shown in Figures F.F1.206.1 and F.E1.206.2.

209. **Grooving Corrosion:** Grooving corrosion is typically local material loss adjacent to weld joints along abutting stiffeners and at stiffener or plate butts or seams. An example of groove corrosion is shown in Figure F.F1.207.1.

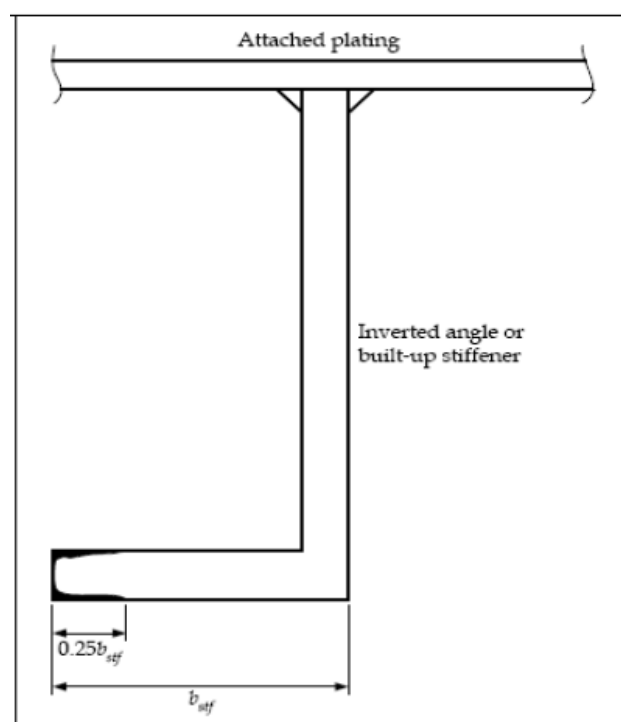
**FIGURE F.F1.205.1- PITTING INTENSITY  
DIAGRAMS**



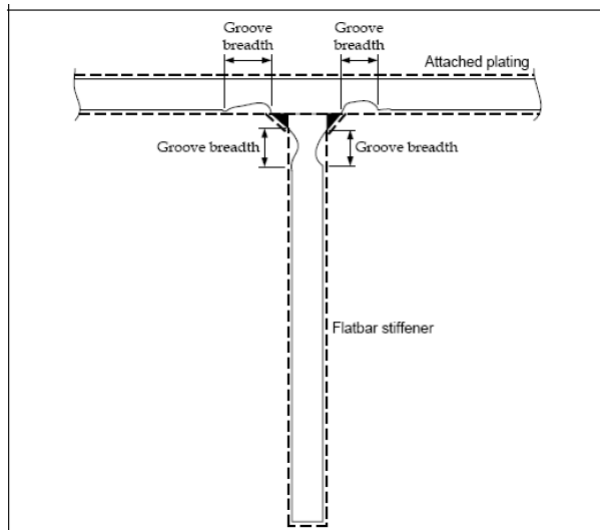
**FIGURE F.F1.206.1 – EDGE CORROSION**



**FIGURE F.F1.206.2 – EDGE CORROSION**



**FIGURE F.F1.207.1 – GROOVING CORROSION**



## **F2. ADDITIONAL REQUIREMENTS FOR ANNUAL SURVEYS – SINGLE SKIN AND DOUBLE SKIN OIL TANKERS**

### **100. Schedule**

101. Annual Surveys are to be held within 3 months before or after anniversary date from the date of the initial classification survey or of the date credited for the last Renewal Survey.

### **200. Scope of hull surveys [IACS UR Z1]**

201. The survey is to consist of an examination for the purpose of ensuring, as far as practicable, that the hull and piping are maintained in a satisfactory condition.

#### **202. Examination of the Hull**

- a. Examination of the hull plating and its closing appliances as far as can be seen.
- b. Examination of watertight penetrations as far as practicable.

#### **203. Examination of weather decks**

- a. Examination of cargo tank openings including gaskets, covers, coamings and flame screens.
- b. Examination of cargo tanks pressure/vacuum valves and flame screens.
- c. Examination of flame screens on vents to all bunker tanks.
- d. Examination of cargo, crude oil washing, bunker and vent piping systems, including vent masts and headers.
- e. Examination of Cargo pump rooms and pipe tunnels if fitted.

204. Examination of all pumproom bulkheads for signs of oil leakage or fractures and, in particular, the sealing arrangements of all penetrations of pumproom bulkheads.

205. Examination of the condition of all piping systems.

206. Examination of all superstructure and deckhouse openings facing the cargo area.

#### **207. Examination of Ballast Tanks**

- a. Examination of Ballast Tanks where required as a consequence of the results of the Renewal Survey and Intermediate Survey is to be carried out. When considered necessary by the surveyor, or when extensive corrosion exists, thickness measurements are to be carried out and if the results of these thickness measurements indicate that Substantial Corrosion is found, the extent of thickness

measurements is to be increased in accordance with Tables T.F4.402. These extended thickness measurements are to be carried out before the survey is credited as completed. Suspect Areas identified at previous surveys are to be examined. Areas of substantial corrosion identified at previous surveys are to have thickness measurements taken.

- b. For vessels built under IACS Common Structural Rules, the identified substantial corrosion areas are required to be examined and additional thickness measurements are to be carried out.
- c. Confirmation that the corrosion prevention system fitted to dedicated ballast water tanks of oil tankers and bulk carriers is maintained (SOLAS 74/00 reg.II-1/3-2);

208. Confirmation, when appropriate, that the requisite arrangements to regain steering capability in the event of the prescribed single failure are being maintained (SOLAS 74/88 reg.II-1/29);

### **300. Cargo area and cargo pump rooms surveys [IACS UR-Z-1]**

301. Check the protection of cargo pump room and in particular:

- a. Check the temperature sensing devices for bulkhead glands and alarms;
- b. Check the interlock between lighting and ventilation;
- c. Check the gas detection system;
- d. Check the bilge level monitoring devices and alarms.
- e. Examination of the cargo tank openings, including gaskets, covers, coamings and screens;
- f. Examination of the cargo tank pressure/vacuum valves and devices to prevent the passage of flame
- g. Examination of the devices to prevent the passage of flame on vents to all bunker, oily-ballast and oily-slop tanks and void spaces, as far as practicable;
- h. Examination of the cargo tank venting, cargo tank purging and gas freeing and other ventilation systems
- i. Examination of the cargo, crude oil washing, ballast and stripping systems both on deck and in the cargo pump rooms and the bunker system on deck;
- j. Examination of that all electrical equipment in dangerous zones is suitable for such locations, is in good condition and is being properly maintained;

- k. Confirmation that potential sources of ignition in or near the cargo pump room are eliminated, such as loose gear, combustible materials, etc., that there are no signs of undue leakage and that access ladders are in good condition;
- l. Examination of all pump room bulkheads for signs of oil leakage or fractures and, in particular, the sealing arrangements of all penetrations of cargo pump room bulkheads;
- m. Examination, as far as practicable, of the cargo, bilge, ballast and stripping pumps for undue gland seal leakage, verification of proper operation of electrical and mechanical remote operating and shutdown devices and operation of cargo pump room bilge system, and checking that pump foundations are intact;
- n. Confirmation that the pump room ventilation system is operational, ducting intact, dampers are operational and screens clean;
- o. Examination of the emergency lighting in all cargo pump rooms of tankers constructed after 1 July 2002 (SOLAS 74/00 reg.II-1/43).

### **400. Instrumentation and safety devices surveys [IACS UR-Z-1]**

- 401. Verification that installed pressure gauges on cargo discharge lines and level indicator systems are operational.
- 402. Examination of cargo tank gauging devices, high level alarms and valves associated with overflow control.

### **500. Fire-fighting systems in the cargo area surveys [IACS UR-Z-1]**

- 501. Examination of the deck foam system, including the supplies of foam concentrate and testing that the minimum number of jets of water at the required pressure in the fire main is obtained when the system is in operation.
- 502. Examination of the fixed fire-fighting system for the cargo pump rooms, and Confirmation of, as far as practicable and when appropriate, the operation of the remote means for closing the various openings.
- 503. Examination of the emergency lighting in all cargo pump rooms of tankers constructed after 1 July 2002.

### **600. Inert gas system surveys [IACS UR-Z-1]**

- 601. The following items are applicable to the survey of inert gas systems:
  - a. Examination of the inert gas system and in particular:



- |  |  |
|--|--|
| <p>b. Examination of externally for any sign of gas or effluent leakage;</p> <p>c. Confirmation of the proper operation of both inert gas blowers;</p> <p>d. observing the operation of the scrubber room ventilation system;</p> <p>e. checking the deck water seal for automatic filling and draining;</p> <p>f. Examination of the operation of all remotely operated or automatically controlled valves and, in particular, the flue gas isolating valves;</p> <p>g. observing a test of the interlocking feature of soot blowers;</p> <p>h. observing that the gas pressure regulating valve automatically closes when the inert gas blowers are secured;</p> <p>i. checking, as far as practicable, the following alarms and safety devices of the inert gas system using simulated conditions where necessary:</p> <p>j. .1 high oxygen content of gas in the inert gas main;</p> <p>k. .2 low gas pressure in the inert gas main;</p> <p>l. .3 low pressure in the supply to the deck water seal;</p> <p>m. .4 high temperature of gas in the inert gas main;</p> <p>n. .5 low water pressure or low water flow rate;</p> <p>o. .6 accuracy of portable and fixed oxygen measuring equipment by means of calibration gas;</p> <p>p. .7 high water level in the scrubber;</p> <p>q. .8 failure of the inert gas blowers;</p> <p>r. .9 failure of the power supply to the automatic control system for the gas regulating valve and to the instrumentation for continuous indication and permanent recording of pressure and oxygen content in the inert gas main;</p> <p>s. .10 high pressure of gas in the inert gas main;</p> <p>t. checking, when practicable, the proper operation of the inert gas system on completion of the checks listed above</p> <p>602. Additional requirements for the Inert Gas System stored in bottles:</p> <p>a. External examination of the inert gas bottles. In case of doubt, an internal examination may be required at surveyor's discretion.</p> <p>b. Inspection and operational test of the safety valves</p> | <p>c. Confirmation that the hydrostatic test of the bottles is in full validity</p> <p>d. Examination of the purifier, circulation pumps, piping and valves</p> <p>e. Confirmation that no alterations have been carried out since the last survey</p> <p><b>700. Access to bow and towing arrangements [IACS UR-Z-1]</b></p> <p>701. Examination of the access to bow arrangement</p> <p>702. Examination of the towing arrangement for tankers of not less than 20,000 tonnes</p> <p><b>800. Steering capability [IACS UR Z1]</b></p> <p>801. Confirming when appropriate that the requisite arrangements to regain steering capability in the event of the prescribed single failure are being maintained.</p> <p><b>900. Corrosion prevention system [IACS UR Z1]</b></p> <p>901. Confirming that the corrosion prevention system fitted to dedicated ballast water tanks of oil tankers and bulk carriers is maintained.</p> <p><b>F3. ADDITIONAL REQUIREMENTS FOR HULL INTERMEDIATE SURVEYS – SINGLE SKIN AND DOUBLE SKIN OIL TANKERS</b></p> <p><b>100. Schedule</b></p> <p>101. The Intermediate Survey is to be held at or between either the 2nd or 3rd Annual Survey.</p> <p>102. Those items which are additional to the requirements of the Annual Surveys may be surveyed either at or between the 2nd and 3rd Annual Survey.</p> <p>103. Concurrent crediting to both Intermediate Survey (IS) and Renewal Survey (SS) for surveys and thickness measurements of spaces are not acceptable.</p> <p><b>200. Scope</b></p> <p>201. General</p> <p>a. The survey extent is dependent on the age of the vessel.</p> <p>b. For weather decks, an examination as far as applicable of cargo, crude oil washing, bunker, ballast, steam and vent piping systems as well as vent masts and headers is to be carried out. If upon examination there is any doubt as to the condition</p> |
|--|--|

of the piping, the piping may be required to be pressure tested, thickness measured or both.

**202. Oil Tankers 5 – 10 Years of Age**, the following is to apply:

- a. All Ballast Tanks are to be examined. When considered necessary by the surveyor, thickness measurement and testing are to be carried out to ensure that the structural integrity remains effective.
- b. A Ballast Tank is to be examined at subsequent annual intervals where:
  - b.1. a hard protective coating has not been applied from the time of construction, or
  - b.2. a soft or semi-hard coating has been applied, or
  - b.3. substantial corrosion is found within the tank, or
  - b.4. the hard protective coating is found to be in less than GOOD condition and the hard protective coating is not repaired to the satisfaction of the Surveyor.
- c. In addition to the requirements above, suspect areas identified at previous surveys are to be examined.

**203. Oil Tankers 10 - 15 years of Age**, the following is to apply:

- a. The requirements of the Intermediate Survey are to be to the same extent as the previous Renewal Survey. However, pressure testing of cargo and ballast tanks and the requirements for longitudinal strength evaluation of Hull Girder as required in F8.101a are not required unless deemed necessary by the attending Surveyor.
- b. In application of the present item F3.203, the intermediate survey may be commenced at the second annual survey and be progressed during the succeeding year with a view to completion at the third annual survey in lieu of the application of F4.104.
- c. In application of the present item F3.203a, an under water survey may be considered in lieu of the requirements of F4.109.

**204. Oil Tankers over 15 years of Age**, the following is to apply:

- a. The requirements of the Intermediate Survey are to be to the same extent as the previous Renewal Survey as required in F4 and F1.300. However, pressure testing of cargo and ballast tanks and the requirements for longitudinal strength evaluation of

Hull Girder are not required unless deemed necessary by the attending Surveyor.

- b. In application of F3.204, the intermediate survey may be commenced at the second annual survey and be progressed during the succeeding year with a view to completion at the third annual survey in lieu of the application of F4.104.
- c. In application of F3.204a, a survey in dry dock is to be part of the intermediate survey. The overall and close-up surveys and thickness measurements, as applicable, of the lower portions of the cargo tanks and water ballast tanks are to be carried out in accordance with the applicable requirements for intermediate surveys, if not already performed.

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

#### **F4. ADDITIONAL REQUIREMENTS FOR HULL RENEWAL SURVEYS – SINGLE SKIN AND DOUBLE SKIN OIL TANKERS**

##### **100. Schedule and scope**

**101.** Renewal Surveys are to be carried out at 5 years intervals to renew the Classification Certificate.

**102.** The first Renewal Survey is to be completed within 5 years from the date of the initial classification survey and thereafter within 5 years from the credited date of the previous Renewal Survey. However, an extension of class of 3 months maximum beyond the 5th year can be granted in exceptional circumstances. In this case, the next period of class will start from the expiry date of the Renewal Survey before the extension was granted.

**103.** For surveys completed within 3 months before the expiry date of the Renewal Survey, the next period of class will start from the expiry date of the Renewal Survey. For surveys completed more than 3 months before the expiry date of the Renewal Survey, the period of class will start from the survey completion date

**104.** The Renewal Survey may be commenced at the 4th Annual Survey and be progressed with a view to completion by the 5th anniversary date. When the Renewal Survey is commenced prior to the 4th Annual Survey, the entire survey is to be completed within 15 months if such work is to be credited to the Renewal Survey.

**105.** Concurrent crediting to both Intermediate Survey and Renewal Survey for surveys and thickness measurements of spaces are not acceptable.

**106.** The Renewal Survey is to include, in addition to the requirements of the Annual Survey, examination, tests and checks of sufficient extent to ensure that the hull and related piping, as required in F4.108, is in a satisfactory condition and is fit for its intended purpose for the new

period of class of 5 years to be assigned, subject to proper maintenance and operation and to periodical surveys being carried out at the due dates.

107. All cargo tanks, Ballast Tanks, including double bottom tanks, pump rooms, pipe tunnels, cofferdams and void spaces bounding cargo tanks, decks and outer hull are to be examined, and this examination is to be supplemented by thickness measurement and testing required in F4.400 and F4.500, to ensure that the structural integrity remains effective. The aim of the examination is to discover Substantial Corrosion, significant deformation, fractures, damages or other structural deterioration, that may be present.

108. Cargo piping on deck, including Crude Oil Washing (COW) piping, Cargo and Ballast piping within the above tanks and spaces are to be examined and operationally tested to working pressure to attending Surveyor's satisfaction to ensure that tightness and condition remain satisfactory. Special attention is to be given to any ballast piping in cargo tanks and cargo piping in ballast tanks and void spaces, and Surveyors are to be advised on all occasions when this piping, including valves and fittings are open during repair periods and can be examined internally.

#### 109. Dry Dock Survey

- a. A survey in dry dock is to be a part of the Renewal Survey. The overall and close-up surveys and thickness measurements, as applicable, of the lower portions of the cargo tanks and ballast tanks are to be carried out in accordance with the applicable

requirements for Renewal Surveys, if not already performed.

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

### 200. Tank protection

201. Where provided, the condition of the corrosion prevention system of cargo tanks is to be examined.

202. A Ballast Tank is to be examined at subsequent annual intervals where:

- a. a hard protective coating has not been applied from the time of construction, or
- b. a soft or semi-hard coating has been applied, or
- c. substantial corrosion is found within the tank, or
- d. the hard protective coating is found to be in less than GOOD condition and the hard protective coating is not repaired to the satisfaction of the Surveyor.

203. Thickness measurements are to be carried out as deemed necessary by the surveyor.

### 300. Extent of Overall and Close-up Survey

301. An Overall Survey of all tanks and spaces is to be carried out at each Renewal Survey. Fuel oil tanks in the cargo length area are to be surveyed as follows:

**FIGURE F.F4.301.1 – OVERALL SURVEYS OF FUEL OIL TANKS IN THE CARGO LENGTH AREA**

Renewal Survey No.1	Renewal Survey No.2	Renewal Survey No.3	Renewal Survey No.4 and Subsequent
Age ≤ 5	5 < Age ≤ 10	10 < Age ≤ 15	15 < Age
None	One	Two	Half, minimum two
Notes 1. These requirements apply to tanks of integral (structural) type. 2. If a selection of tanks is accepted to be examined, then different tanks are to 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 Survey No.3 and subsequent Renewal Surveys, one deep tank for fuel oil in the cargo area is to be included, if fitted.			

302. The minimum requirements for Close-up Surveys at Renewal Survey for single skin bulk carriers are given in Tables T.F4.302.1 and T.F4.302.2. The minimum requirements for Close-up Surveys at Renewal Survey for double skin bulk carriers are given in Figure F.F4.302.2 and Table T.F4.302.2.

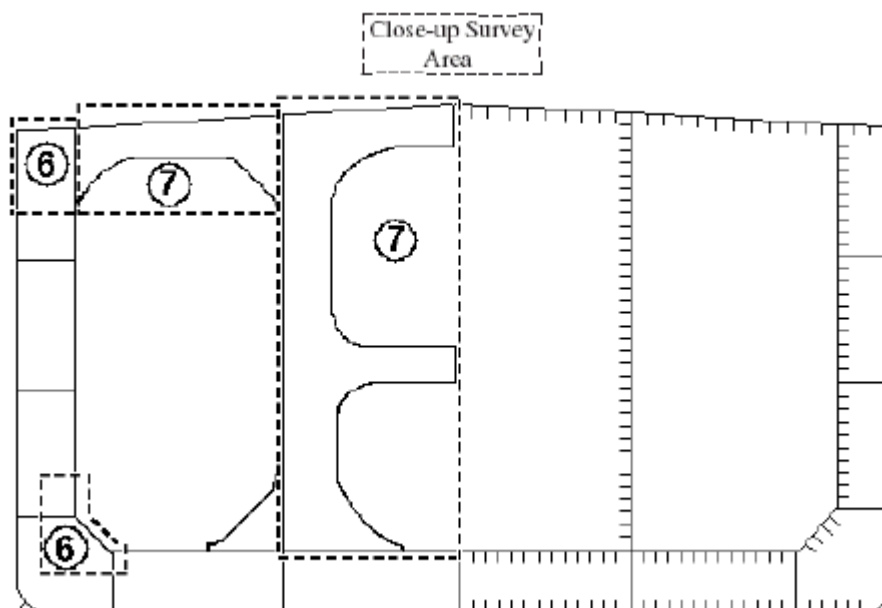
303. The Surveyor may extend the Close-up Survey as deemed necessary taking into account the maintenance of the tanks under survey, the condition of the corrosion prevention system and also in the following cases:

- a. In particular, tanks having structural arrangements or details which have suffered defects in similar tanks or on similar ships according to available information.
- b. In tanks which have structures approved with reduced scantlings due to an approved corrosion control system.

304. For areas in tanks where hard protective coatings are found to be in a GOOD condition, as defined in

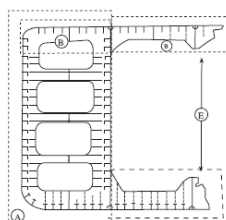
C1.110, the extent of Close-up Surveys according to Table T.F4.302.1. may be specially considered.

**FIGURE F.F4.300.1 - CLOSE-UP SURVEY REQUIREMENTS AND THICKNESS MEASUREMENT FOR DOUBLE HULL OIL TANKERS AREAS (6) AND (7)**

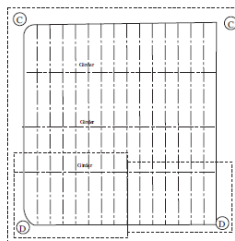


**FIGURE F.F4.302.1 – AREAS SUBJECT TO CLOSE-UP SURVEYS AND THICKNESS MEASUREMENTS – SINGLE SKIN OIL TANKER AND COMBINATION CARRIER (OOC - ORE/OIL CARRIER)**

Oil Tanker Typical transverse section close-up survey Oil Tanker Typical transverse bulkhead

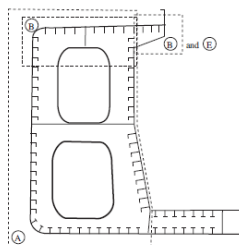


Thickness to be reported on TM3-T and TM4-T as appropriate



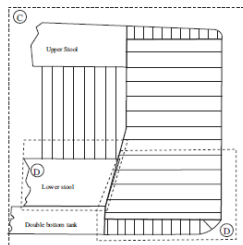
Thickness to be reported on TM5-T

Oil/Ore ship Typical transverse section close-up survey



Thickness to be reported on TM3-T and TM4-T as appropriate

Oil/Ore ship Typical transverse bulkhead

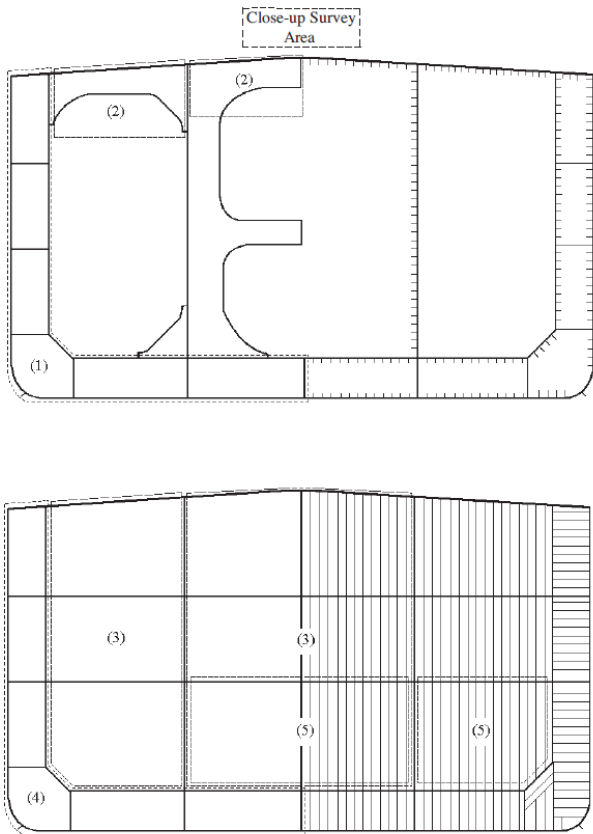


Thickness to be reported on TM5-T

Close-up survey area

Recommendations for the extent and pattern of gaugings are indicated in Table IV of the IACS Unified Requirements

**FIGURE F.F4.302.2 - AREAS SUBJECT TO CLOSE-UP SURVEYS AND THICKNESS MEASUREMENTS –  
DOUBLE SKIN OIL TANKER AREAS (1) TO (5)**



**TABLE T.F4.302.1 - MINIMUM REQUIREMENTS TO CLOSE-UP SURVEYS AT RENEWAL SURVEY OF OIL TANKERS, ORE/OIL SHIPS AND ETC.**

Renewal Survey no. 1	Renewal Survey no. 2	Renewal Survey no. 3	Renewal Survey no. 4
Age ≤ 5	5 < Age ≤ 10	10 < Age ≤ 15	Age > 15
A) ONE WEB FRAME RING -in a ballast wing tank, if any, or - a cargo wing tank used primarily for water ballast	A) ALL WEB FRAME RINGS -in a ballast wing tank, if any, or - a cargo wing tank, used primarily for water ballast)	A) ALL WEB FRAME RINGS - in all ballast tanks  ALL WEB FRAME RINGS -in a cargo wing tank  A minimum of 30% of all web frame rings in each remaining cargo wing tank (see Note 1)	As Renewal Survey No.3
B) ONE DECK TRANSVERSE - in a cargo oil tank	B) ONE DECK TRANSVERSE -in each of the remaining ballast tanks, if any  ONE DECK TRANSVERSE -in a cargo wing tank  ONE DECK TRANSVERSE -in two cargo centre tanks		Additional transverses included as deemed necessary by the RBNA
	C) BOTH TRANSVERSE BULKHEADS -in a wing ballast tank, if any, or -a cargo wing tank used primarily for water ballast	C) ALL TRANSVERSE BULKHEADS - in all cargo and ballast tanks	
D) ONE TRANVERSE BULKHEAD - in a ballast tank  D) ONE TRANSVERSE BULKHEAD - in a cargo oil wing tank  D) ONE TRANSVERSE BULKHEAD - in a cargo oil centre tank	D) ONE TRANSVERSE BULKHEAD -in each remaining ballast tank  D) ONE TRANSVERSE BULKHEAD -in a cargo oil wing tank  D) ONE TRANSVERSE BULKHEAD -in two cargo centre tanks		
		E) A minimum of 30% of deck and bottom transverses including adjacent structural members in each cargo centre tank	
		F) As considered necessary by the surveyor	
A) Complete transverse web frame ring including adjacent structural members B) Deck transverse including adjacent deck structural members C) Transverse bulkhead complete – including girder system and adjacent structural members D) Transverse bulkhead lower part – including girder system and adjacent structural members E) Deck and bottom transverse including adjacent structural members F) Additional complete transverse web frame ring See sketches in Figure F.F4.302.1 Note 1: The 30% is to be rounded up to the next whole integer.			



**TABLE T.F4.302.2 - MINIMUM REQUIREMENTS FOR CLOSE-UP SURVEY AT RENEWAL SURVEY OF DOUBLE HULL OIL TANKERS**

Renewal Survey no. 1	Renewal Survey no. 2	Renewal Survey no. 3	Renewal Survey no. 4
Age ≤ 5	5 < Age ≤ 10	10 < Age ≤ 15	Age > 15
One web frame (1), in a ballast tank (see Note 1)	All web frames (1), in a ballast tank (see Note 1) The knuckle area and the upper part (5 metres approximately) of one web frame in each remaining ballast tank (6)	All web frames (1), in all ballast tanks	As for Renewal Survey for age from 10 to 15 years  Additional transverse areas as deemed necessary by the Society
One deck transverse, in a cargo oil tank (2)	One deck transverse, in two cargo oil tanks (2)	All web frames (7), including deck transverse and cross ties, if fitted, in a cargo oil tank  One web frame (7), including deck transverse and cross ties, if fitted, in each remaining cargo oil tank	
One transverse bulkhead (4), in a ballast tank (see Note 1)	One transverse bulkhead (4), in each ballast tank (see Note 1)	All transverse bulkheads, in all cargo oil (3) and ballast (4) tanks	
One transverse bulkhead (5), in a cargo oil centre tank	One transverse bulkhead (5), in two cargo oil centre tanks		
One transverse bulkhead (5), in a cargo oil wing tank (see Note 2)	One transverse bulkhead (5), in a cargo oil wing tank (see Note 2)		
1), (2), (3), (4), (5), (6) and (7) are areas to be subjected to close-up surveys and thickness measurements (see Figure F.F4.302.2 and Figure F.F4.302.1)			
(1): Web frame in a ballast tank means vertical web in side tank, hopper web in hooper tank, floor in double bottom tank and deck transverse in double deck tank (where fitted), including adjacent structural members. In fore and aft peak tanks web frame means a complete transverse web frame ring including adjacent structural members			
(2): Deck transverse, including adjacent deck structural members (or external structure on deck in way of the tank, where applicable)			
(3): Transverse bulkhead complete in cargo tanks, including girder system, adjacent structural members (such as longitudinal bulkheads) and internal structure of lower and upper stools, where fitted			
(4): Transverse bulkhead complete in ballast tanks, including girder system and adjacent structural members, such as longitudinal bulkheads, girders in double bottom tanks, inner bottom plating, hopper side, connecting brackets			
(5): Transverse bulkhead lower part in cargo tank, including girder system, adjacent structural members (such as longitudinal bulkheads) and internal structure of lower stool, where fitted			
(6): The <i>knuckle area</i> and the upper part (5 metres approximately), including adjacent structural members. 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			
(7): Web frame in a cargo oil tank means deck transverse, longitudinal bulkhead vertical girder and cross ties, where fitted, including adjacent structural members			
Note 1: Ballast tank: means double bottom tank plus double side tank plus double deck tank, as applicable, even if these tanks are separate			
Note 2: Where no centre cargo tanks are fitted (as in case of centre longitudinal bulkhead), transverse bulkheads in wing tanks are to be surveyed			

#### 400. Extent of Thickness Measurement

401. The minimum requirements for thickness measurements at Renewal Survey are given in

a. **Single skin oil tankers:** Table T.F4.401.1.

b. **Double skin oil tankers:** Table T.F4.401.2 .

402. Provisions for extended measurements for areas with Substantial Corrosion are given in

a. **Single skin oil tankers** Table T.F4.402.1 through T.F4.402.4

b. **Double skin oil tankers:** Table T.F4.402.5 through T.F4.402.9

403. and as may be additionally specified in the Survey Programme. These extended thickness measurements are to be carried out before the survey is credited as completed. Suspect Areas identified at previous surveys are to be examined. Areas of substantial corrosion identified at previous surveys are to have thickness measurements taken.

404. The Surveyor may further extend the thickness measurements as deemed necessary.

405. For areas in tanks where hard protective coating are found to be in a GOOD condition, the extent of thickness measurements according to Table T.F4.401.1 or Table T.F4.401.2 may be specially considered.

406. Transverse sections are to be chosen where the largest reductions are suspected to occur or are revealed from deck plating measurements.

407. In cases where two or three sections are to be measured, at least one is to include a Ballast Tank within 0.5L amidships. In case of oil tankers of 130m in length and upwards (as defined in the International Convention on Load Lines in force) and more than 10 years of age, for the evaluation of the ship's longitudinal strength, as required in F8.101(a), the sampling method of thickness measurements is given in Part I, Title 02, Section 2, subchapter F7.

#### 500. Extent of Tank Testing – Single skin bulk carriers

501. The minimum requirements for tank testing at Renewal Survey are given in

a. **Single skin oil tankers:** Table T.F4.501.1.

b. **Double skin oil tankers:** Table T.F4.501.2

502. The Surveyor may extend the tank testing as deemed necessary.

503. Boundaries of ballast tanks are to be tested with a head of liquid to the top of air pipes.

504. Boundaries of cargo tanks are to be tested to the highest point that liquid will rise under service conditions.

**TABLE T.F4.401.1 MINIMUM REQUIREMENTS TO THICKNESS MEASUREMENTS AT RENEWAL(SPECIAL) SURVEY OF OIL TANKERS, ORE/OIL SHIPS AND ETC.**

Renewal Survey no. 1	Renewal Survey no. 2	Renewal Survey no. 3	Renewal Survey no. 4
Age ≤ 5	5 < Age ≤ 10	10 < Age ≤ 15	Age > 15
1. Suspect areas	1. Suspect areas	1. Suspect areas	1. Suspect areas
2. One section of deck plating for the full beam of the ship within the cargo area (in way of a ballast tank, if any, or a cargo tank used primarily for water ballast)	2. Within the cargo area:  1 Each deck plate 2 One transverse section	2. Within the cargo area:  1.Each deck plate 2. Two transverse sections <sup>(1)</sup> 3. All wind and water strakes	2. Within the cargo area:  1. Each deck plate 2. Three transverse sections <sup>(1)</sup> 3. Each bottom plate
	3. Selected wind and water strakes outside the cargo area	3. Selected wind and water strakes outside the cargo area	3. All wind and water strakes, full length
Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Table T.F4.302.1.	Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Table T.F4.302.1.	Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Table T.F4.302.1.	Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Table T.F4.302.1.
(1): at least one section is to include a ballast tank within 0.5L amidships.			

**TABLE T.F4.401.2 MINIMUM REQUIREMENTS FOR THICKNESS MEASUREMENTS AT RENEWAL (SPECIAL) SURVEY OF DOUBLE HULL OIL TANKERS.**

<b>Renewal Survey no. 1</b>	<b>Renewal Survey no. 2</b>	<b>Renewal Survey no. 3</b>	<b>Renewal Survey no. 4</b>
<b>Age <math>\leq 5</math></b>	<b><math>5 &lt; \text{Age} \leq 10</math></b>	<b><math>10 &lt; \text{Age} \leq 15</math></b>	<b>Age <math>&gt; 15</math></b>
1. Suspect areas	1. Suspect areas	1. Suspect areas	1. Suspect areas
	Within the cargo length:  - Two transverse sections of deck plating outside line of cargo hatch openings	Within the cargo area:  - each deck plate outside line of cargo hatch openings - two transverse sections, one in the amidship area, outside line of cargo hatch openings - all wind and water strakes	Within the cargo area:  - each deck plate outside line of cargo hatch openings - three transverse sections, one in the amidship area, outside line of cargo hatch openings - each bottom plate
	Wind and water strakes in way of the two transverse sections considered above.  Selected wind and water strakes outside the cargo length area	Selected wind and water strakes outside the cargo length area.	3. All wind and water strakes, full length
	Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Table T.F4.302.2.	Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Table T.F4.302.2.	Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Table T.F4.302.2.
(1): at least one section is to include a ballast tank within 0.5L amidships.			

**TABLE T.F4.501.1 MINIMUM REQUIREMENTS TO TANK TESTING AT RENEWAL SURVEY OF SINGLE SKIN OIL TANKERS, ORE/OIL SHIPS AND ETC.**

<b>Renewal Survey No1. age <math>\leq 5</math></b>	<b>Renewal Survey No2 and Subsequent age <math>&gt; 5</math></b>
All ballast tank boundaries	All ballast tank boundaries
Cargo tank boundaries facing ballast tanks, void spaces, pipe tunnels, pump-rooms or cofferdams	All cargo tank bulkheads

**TABLE T.F4.501.2 MINIMUM REQUIREMENTS FOR TANK TESTING AT RENEWAL SURVEY OF DOUBLE HULL OIL TANKERS.**

<b>Age of ship (in years at time of renewal survey due date)</b>	
<b>Renewal Survey No1. age <math>\leq 5</math></b>	<b>Renewal Survey No2 and Subsequent age <math>&gt; 5</math></b>
All ballast tank boundaries	All ballast tank boundaries
Cargo tank boundaries facing ballast tanks, void spaces, pipe tunnels, pump-rooms or cofferdams	All cargo tank bulkheads

**TABLES T.F4.402.1 - T.F4.402.4: REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENT AT THOSE AREAS OF SUBSTANTIAL CORROSION. RENEWAL SURVEY OF OIL TANKERS, ORE/OIL SHIPS AND ETC. WITHIN THE CARGO TANK LENGTH:**

**TABLE T.F4.402.1**

<b>BOTTOM, INNER BOTTOM AND HOPPER STRUCTURE</b>		
<b>Structural member</b>	<b>Extent of measurements</b>	<b>Pattern of measurements</b>
1. Bottom plating	Minimum of three bays across tank, including aft bay Measurements around and under all bell mouths	5-point pattern for each panel between longitudinals and webs
2. Bottom Longitudinals	Minimum of three longitudinals in each bay where bottom plating measured	Three measurements in line across the flange and three measurements on vertical web
3. Bottom girders and brackets	At fore and aft transverse bulkhead bracket toes and in centre of tanks	Vertical line of single measurements on web plating with one measurement between each panel stiffener, or a minimum of three measurements. Two measurements across face flat. 5 point pattern on girder/bhd brackets.
4. Bottom transverse webs	3 webs in bays where bottom plating measured, with measurements at both ends and middle	5 point pattern over 2 square metre area. Single measurements on face flat.
5. Panel stiffening	Where provided	Single measurements

**TABLE T.F4.402.2**

<b>DECK STRUCTURE</b>		
<b>Structural member</b>	<b>Extent of measurements</b>	<b>Pattern of measurements</b>
Deck plating	Two bands across tank	Minimum of three measurements per plate per band
Deck longitudinals	Minimum of 3 longitudinals in each of two bays	3 measurements in line vertically on webs, and 2 measurements on flange (if fitted)
Deck girders and brackets	At fore and aft transverse bulkhead, bracket toes and in centre of tanks	Vertical line of single measurements on web plating with one measurement between each panel stiffener, or a minimum of three measurements. Two measurements across face flat. 5 point pattern on girder/bhd brackets.
Deck transverse webs	Minimum of two webs, with measurements at both ends and middle of span	5 point pattern over about 2 square metre areas. Single measurements on face flat.
Panel stiffening	Where provided	Single measurements

TABLE T.F4.402.3

SIDE SHELL AND LONGITUDINAL BULKHEADS		
Structural member	Extent of measurements	Pattern of measurements
1. Deckhead and bottom strakes, and strakes in way of stringer platforms	Plating between each pair of longitudinals in a minimum of three bays	Single measurement
2. All other strakes	Plating between every third pair of longitudinals in same three bays	Single measurement
3. Longitudinals on deckhead and bottom strakes	Each longitudinal in same three bays	Three measurements across web and one measurement on flange
4. All other longitudinals	Every third longitudinal in same three bays	Three measurements across web and one measurement on flange
5. Longitudinals - bracket	Minimum of three at top, middle and bottom of tank in same three bays	5-point pattern over area of bracket
6. Web frames and cross ties	Three webs with minimum of three locations on each web, including in way of cross tie connections	5-point pattern over approximately two square metre area of webs, plus single measurements on flanges of web frame and cross tie face flats

TABLE T.F4.402.4

TRANSVERSE WATERTIGHT AND SWASH BULKHEADS		
Structural member	Extent of measurements	Pattern of measurements
1. Deckhead and bottom strakes, and strakes in way of stringer platforms	Plating between pair of stiffeners at three locations - approx. 1/4, 1/2 and 3/4 width of tank	5 points pattern between stiffeners over 1 metre length
2. All other strakes	Plating between pair of stiffeners at middle location	Single measurement
3. Strakes in corrugated bulkheads	Plating for each change of scantling at centre of panel and at flange of fabricated connection	5-point pattern over about one square metre of plating
4. Stiffeners	Minimum of three typical stiffeners	For web, 5-point pattern over span between bracket connections (two measurements across web at each bracket connection and one at centre of span). For flange, single measurements at each bracket toe and at centre of span
5. Brackets	Minimum of three at top, middle and bottom of tank	5-point pattern over area of bracket
6. Deep webs and girders	Measurements at toe of bracket and at centre of span	For web, 5 point pattern over about 1 square metre. 3 measurements across face flat.
7. Stringer platforms	All stringers with measurements at both ends and middle	5 point pattern over 1 square metre of area plus single measurements near bracket toes and on face flats

**TABLES T.F4.402.5 - T.F4.402.9: REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENTS AT THOSE AREAS OF SUBSTANTIAL CORROSION - RENEWAL SURVEY OF DOUBLE HULL OIL TANKERS WITHIN THE CARGO AREA LENGTH**

**TABLE T.F4.402.5**

<b>BOTTOM, INNER BOTTOM AND HOPPER STRUCTURE</b>		
<b>Structural member</b>	<b>Extent of measurements</b>	<b>Pattern of measurements</b>
Bottom, inner bottom and hopper structure plating	Minimum of three bays across double bottom tank, including aft bay Measurements around and under all suction bell mouths	5-point pattern for each panel between longitudinals and floors
Bottom, inner bottom and hopper structure longitudinals	Minimum of three longitudinals in each bay where bottom plating measured	Three measurements in line across the flange and three measurements on vertical web
Bottom girders, including the watertight ones	At fore and aft watertight floors and in centre of tanks	Vertical line of single measurements on girder plating with one measurement between each panel stiffener, or a minimum of three measurements
Bottom floors, including the watertight ones	Three floors in the bays where bottom plating measured, with measurements at both ends and middle	5-point pattern over two square metre area
Hopper structure web frame ring	Three floors in bays where bottom plating measured	5-point pattern over one square metre of plating. Single measurements on flange
Hopper structure transverse watertight bulkhead or swash bulkhead	- lower 1/3 of bulkhead	- 5-point pattern over one square metre of plating
	- upper 2/3 of bulkhead	- 5-point pattern over two square metre of plating
	- stiffeners (minimum of three)	- For web, 5-point pattern over span (two measurements across web at each end and one at centre of span). For flange, single measurements at each end and centre of span
Panel stiffening	Where applicable	Single measurements



**TABLE T.F4.402.6**

<b>DECK STRUCTURE</b>		
<b>Structural member</b>	<b>Extent of measurements</b>	<b>Pattern of measurements</b>
Deck plating	Two transverse bands across tank	Minimum of three measurements per plate per band
Deck longitudinals	Every third longitudinal in each of two bands with a minimum of one longitudinal	Three measurements in line vertically on webs and two measurements on flange (if fitted)
Deck girders and brackets (usually in cargo tanks only)	At fore and aft transverse bulkhead, bracket toes and in centre of tanks	Vertical line of single measurements on web plating with one measurement between each panel stiffener, or a minimum of three measurements. Two measurements across flange. 5-point pattern on girder/bulkhead brackets
Deck transverse webs	Minimum of two webs, with measurements at both ends and middle of span	5-point pattern over one square metre area. Single measurements on flange
Vertical web and transverse bulkhead in wing ballast tank (two metres from deck)	Minimum of two webs, and both transverse bulkheads	5-point pattern over one square metre area
Panel stiffening	Where applicable	Single measurements

**TABLE T.F4.402.7**

<b>STRUCTURE IN WING BALLAST TANKS</b>		
<b>Structural member</b>	<b>Extent of measurements</b>	<b>Pattern of measurements</b>
Side shell and longitudinal bulkhead plating:  - Upper strake and strakes in way of horizontal girders  - All other strakes	- Plating between each pair of longitudinals in a minimum of three bays (along the tank)  - Plating between every third pair of longitudinals in same three bays	- Single measurement  - Single measurement
Side shell and longitudinal bulkhead longitudinals on:  - Upper strake  - All other strakes	- Each longitudinal in same three bays  - Every third longitudinal in same three bays	- 3 measurements across web and 1 measurement on flange  - 3 measurements across web and 1 measurement on flange
Longitudinals - brackets	Minimum of three at top, middle and bottom of tank in same three bays	5-point pattern over area of bracket
Vertical web and transverse bulkheads (excluding deckhead area):  - Strakes in way of horizontal girders  - Other strakes	- Minimum of two webs and both transverse bulkheads  - Minimum of two webs and both transverse bulkheads	- 5-point pattern over approx. two square metre area  - Two measurements between each pair of vertical stiffeners
Horizontal girders	Plating on each girder in a minimum of three bays	Two measurements between each pair of longitudinal girder stiffeners
Panel stiffening	Where applicable	Single measurements

**TABLE T.F4.402.8**

<b>LONGITUDINAL BULKHEADS IN CARGO TANKS</b>		
<b>Structural member</b>	<b>Extent of measurements</b>	<b>Pattern of measurements</b>
Deckhead and bottom strakes, and strakes in way of the horizontal stringers of transverse bulkheads	Plating between each pair of longitudinals in a minimum of three bays	Single measurement
All other strakes	Plating between every third pair of longitudinals in same three bays	Single measurement
Longitudinals on deckhead and bottom strakes	Each longitudinal in same three bays	Three measurements across web and one measurement on flange
All other longitudinals	Every third longitudinal in same three bays	Three measurements across web and one measurement on flange
Longitudinals - brackets	Minimum of three at top, middle and bottom of tank in same three bays	5-point pattern over area of bracket
Web frames and cross ties	Three webs with minimum of three locations on each web, including in way of cross tie connections	5-point pattern over approximately two square metre area of webs, plus single measurements on flanges of web frame and cross ties
Lower end brackets (opposite side of web frame)	Minimum of three brackets	5-point pattern over approximately two square metre area of brackets, plus single measurements on bracket flanges

**TABLE T.F4.402.9**

<b>TRANSVERSE WATERTIGHT AND SWASH BULKHEADS IN CARGO TANKS</b>		
<b>Structural member</b>	<b>Extent of measurements</b>	<b>Pattern of measurements</b>
Upper and lower stool, where fitted	- Transverse band within 25mm of welded connection to inner bottom/deck plating  - Transverse band within 25mm of welded connection to shelf plate	5-point pattern between stiffeners over one metre length
Deckhead and bottom strakes, and strakes in way of horizontal stringers	Plating between pair of stiffeners at three locations: approximately 1/4, 1/2 and 3/4 width of tank	5-point pattern between stiffeners over one metre length
All other strakes	Plating between pair of stiffeners at middle location	Single measurement
Strakes in corrugated bulkheads	Plating of each change of scantling at centre of panel and at flange of fabricated connection	5-point pattern over about one square metre of plating
Stiffeners	Minimum of three typical stiffeners	For web, 5-point pattern over span between bracket connections (two measurements across web at each bracket connection and one at centre of span). For flange, single measurements at each bracket toe and at centre of span
Brackets	Minimum of three at top, middle and bottom of tank	5-point pattern over area of bracket

## **600. Cargo area and cargo pump rooms surveys**

601. All the cargo piping systems including crude oil washing are to be tested to working pressure to ensure they are in a good operating condition.

602. All ballast lines going through cargo tanks is to be tested to working pressure.

603. In case any of the cargo piping is dismantled or where there are any doubts as to the condition of the piping a hydraulic test is required.

604. All cargo pump rooms boundaries are to be examined.

605. Gas tight sealing devices are to be examined.

## **700. Fire fighting system**

701. See Part I, Title 2, Section 2, Chapter F, item F2.500.

## **800. Inert gas system**

801. Internal examination and thorough cleaning of the scrubber

802. Examination of the inert gas generator, where fitted

803. The water seal on deck to be opened, cleaned and subjected to an internal examination

804. Examination of the purifier cooling water system, including salt water pumps and drains. The pumps to be subjected to an internal examination

805. All valves to be inspected and in case of doubt at surveyor's discretion, tested:

## **900. Emergency towing arrangement**

901. A thorough examination of the towing arrangement is to be carried out, inspecting the following items:

- a. Aft towing arrangement pre-rigged
- b. Forward chafing gear secured to the strong point
- c. Pick up gear
- d. towing pennant
- e. Strong points, fair leads and pedestal

## **F5. DOCUMENTATION ON BOARD**

### **100. General**

101. The owner is to obtain, supply and maintain on board documentation, which is to be readily available for the Surveyor.

102. The documentation is to be kept on board for the life time of the ship.

### **200. Survey Report File**

201. A Survey Report File is to be a part of the documentation on board consisting of

- a. Reports of structural surveys
- b. Executive Hull Summary
- c. Thickness measurement reports

202. The Survey Report File is to be available also in the Owner's and the RBNA's management offices.

### **300. Supporting Documents**

301. The following additional documentation is to be available onboard:

- a. Survey Programme as required by F1.300 until such time as the Renewal Survey or Intermediate Survey, as applicable, has been completed.
- b. Main structural plans of cargo and ballast tanks
- c. Previous repair history
- d. Cargo and ballast history
- e. Extent of use of inert gas plant and tank cleaning procedures
- f. Inspections by ship's personnel with reference to
  - f.1. structural deterioration in general
  - f.2. leakages in bulkheads and piping
  - f.3. condition of corrosion prevention system, if any
- g. A guidance for reporting is shown in Chapter F9.
- h. Any other information that will help identify Critical Structural Areas and/or Suspect Areas requiring inspection.

#### 400. Review of Documentation On Board

401. Prior to survey, the Surveyor is to examine the completeness of the documentation onboard, and its contents as a basis for the survey.

### F6. PROCEDURES FOR THICKNESS MEASUREMENTS

#### 100. General

101. The required thickness measurements, if not carried out by the Society itself, are to be witnessed by a Surveyor of the Society. The Surveyor is to be on board to the extent necessary to control the process.

102. The thickness measurement company is to be part of the survey planning meeting to be held prior to commencing the survey.

103. Thickness measurements of structures in areas where close-up surveys are required shall be carried out simultaneously with close-up surveys.

104. In all cases the extent of the thickness measurements is to be sufficient as to represent the actual average condition.

#### 200. Certification of Thickness Measurement Company

201. The thickness measurements are to be carried out by a qualified company certified by the RBNA.

#### 300. Reporting

301. A thickness measurement report is to be prepared. The report is to give the location of measurements, the thickness measured as well as corresponding original thickness. Furthermore, the report is to give the date when the measurements were carried out, type of measurement equipment, names of personnel and their qualifications and has to be signed by the operator. The thickness measurement report is to follow the principles as specified in the Recommended Procedures for Thickness Measurements for Oil Tankers, Ore/Oil Ships.

302. The Surveyor is to review the final thickness measurement report and countersign the cover page.

### F7. EVALUATION OF SURVEYS

#### 100. Evaluation of Survey Report

101. The data and information on the structural condition of the vessel collected during the survey is to be evaluated for acceptability and continued structural integrity of the vessel.

- a. In case of oil tankers of 130 m in length and upwards (as defined in the International Convention on Load Lines in force), the ship's longitudinal strength is to be evaluated by using the thickness of structural members measured, renewed and reinforced, as appropriate, during the **Renewal survey** carried out after the ship reached 10 years of age in accordance with the criteria for longitudinal strength of the ship's hull girder for oil tankers specified in sub chapter F7.
- b. The final result of evaluation of the ship's longitudinal strength after Renewal or reinforcement work of structural members, if carried out as a result of initial evaluation, is

### F8. SURVEY REPORTING PRINCIPLES

#### 100. General

101. As a principle, for oil tankers subject to ESP, the surveyor is to include the following content in his report for survey of hull structure and piping systems, as relevant for the survey.

102. A survey report is to be generated in the following cases:

- a. In connection with commencement, continuation and / or completion of periodical hull surveys, i.e. annual, intermediate and Renewal surveys, as relevant
- b. When structural damages / defects have been found
- c. When repairs, Renewals or modifications have been carried out
- d. When condition of class (recommendation) has been imposed or deleted

103. The purpose of reporting is to provide:

- a. Evidence that prescribed surveys have been carried out in accordance with applicable classification rules
- b. Documentation of surveys carried out with findings, repairs carried out and condition of class (recommendation) imposed or deleted
- c. Survey records, including actions taken, which shall form an auditable documentary trail. Survey

reports are to be kept in the survey report file required to be on board

- d. Information for planning of future surveys
- e. Information which may be used as input for maintenance of classification rules and instructions

104. When a survey is split between different survey stations, a report is to be made for each portion of the survey. A list of items surveyed, relevant findings and an indication of whether the item has been credited, is to be made available to the next attending surveyor, prior to continuing or completing the survey. Thickness measurement and tank testing carried out is also to be listed for the next surveyor.

## 200. Extent of the survey

201. Identification of compartments where an overall survey has been carried out.

202. Identification of locations, in each tank, where a close-up survey has been carried out, together with information of the means of access used.

203. Identification of locations, in each tank, where thickness measurement has been carried out.

204. Note: As a minimum, the identification of location of close-up survey and thickness measurement is to include a confirmation with description of individual structural members corresponding to the extent of requirements stipulated in Z10.1 based on type of periodical survey and the ship's age. Where only partial survey is required, i.e. one web frame ring / one deck transverse, the identification is to include location within each tank by reference to frame numbers.

205. For areas in tanks where protective coating is found to be in GOOD condition and the extent of close-up survey and / or thickness measurement has been specially considered, structures subject to special consideration are to be identified.

206. Identification of tanks subject to tank testing.

207. Identification of cargo piping on deck, including crude oil washing (COW) piping, and cargo and ballast piping within cargo and ballast tanks, pump rooms, pipe tunnels and void spaces, where:

- a. Examination including internal examination of piping with valves and fittings and thickness measurement, as relevant, has been carried out
- b. Operational test to working pressure has been carried out

## 300. Result of the survey

301. Type, extent and condition of protective coating in each tank, as relevant (rated GOOD, FAIR or POOR).

302. Structural condition of each compartment with information on the following, as relevant:

- a. Identification of findings, such as:
  - a.1. Corrosion with description of location, type and extent
  - a.2. Areas with substantial corrosion
  - a.3. Cracks / fractures with description of location and extent
  - a.4. Buckling with description of location and extent
  - a.5. Indents with description of location and extent
- b. Identification of compartments where no structural damages / defects are found

303. The report may be supplemented by sketches / photos.

304. Thickness measurement report is to be verified and signed by the surveyor controlling the measurements on board.

305. Evaluation result of longitudinal strength of the hull girder of oil tankers of 130 m in length and upwards and over 10 years of age. The following data is to be included, as relevant:

- a. Measured and as-built transverse sectional areas of deck and bottom flanges
- b. Diminution of transverse sectional areas of deck and bottom flanges
- c. Details of Renewals or reinforcements carried out, as relevant.

## 400. Actions taken with respect to findings

401. Whenever the attending surveyor is of the opinion that repairs are required, each item to be repaired is to be identified in a numbered list. Whenever repairs are carried out, details of the repairs effected are to be reported by making specific reference to relevant items in the numbered list.

402. Repairs carried out are to be reported with identification of:

- a. Compartment
- b. Structural member
- c. Repair method (i.e. Renewal or modification) including:

- c.1. Steel grades and scantlings (if different from the original)
- c.2. Sketches/photos, as appropriate
- c.3. Repair extent
- c.4. NDT / Tests

403. For repairs not completed at the time of survey, condition of class (recommendation) is to be imposed with a specific time limit for the repairs. In order to provide correct and proper information to the surveyor attending for survey of the repairs, condition of class (recommendation) is to be sufficiently detailed with identification of each item to be repaired. For identification of extensive repairs, reference may be given to the survey report.

404. When a survey is split between different survey stations, a report is to be made for each portion of the survey. A list of items examined and / or tested (pressure testing, thickness measurements etc.) and an indication of whether the item has been credited, are to be made available to the next attending Surveyor(s), prior to continuing or completing the survey.

405. An Executive Hull Summary of the survey and results is to be issued to the Owner and placed on board the vessel for reference at future surveys. The Executive Hull Summary is to be endorsed by the RBNA's head office or regional managerial office.

## **F9. GUIDELINES FOR TECHNICAL ASSESSMENT IN CONJUNCTION WITH PLANNING FOR ENHANCED SURVEYS OF OIL TANKERS SPECIAL (RENEWAL) SURVEY - HULL**

### **Guidance**

#### **REFERENCES**

1. IACS Unified Requirement Z10.1, "Hull Surveys of Oil Tankers."
2. TSCF, "Guidance Manual for the Inspection and Condition Assessment of Tanker Structures, 1986."
3. TSCF, "Condition Evaluation and Maintenance of Tanker Structures, 1992."

### **100. Introduction**

101. This subchapter F10 contains information and suggestions concerning technical assessments which may be of use in conjunction with the planning of enhanced Renewal Surveys of oil tankers. As indicated in A3.109 they are a recommended tool which may be invoked at the discretion of RBNA, when considered necessary and appropriate, in conjunction with the preparation of the required Survey Programme.

### **200. Purpose and principles**

201. **Purpose:** The purpose of the technical assessments described in subchapter F10 is to assist in identifying critical structural areas, nominating suspect areas and in focusing attention on structural elements or areas of structural elements which may be particularly susceptible to, or evidence a history of, wastage or damage. This information may be useful in nominating locations, areas and tanks for thickness measurement, close-up survey and tank testing. Critical Structural Areas are locations which have been identified from calculations to require monitoring or from the service history of the subject ship or from similar or sister ships (if available) to be sensitive to cracking, buckling or corrosion which would impair the structural integrity of the ship.

202. **Minimum Requirements** However, subchapter F10 may not be used to reduce the requirements pertaining to thickness measurement, close-up survey and tank testing contained in Tables T.F4.302.1, T.F4.302.2, T.F4.501.1, T.F4.501.2, respectively, of Chapter E; which are, in all cases, to be complied with as a minimum.

203. **Timing:** As with other aspects of survey planning, the technical assessments described in these guidelines are to be worked out by the Owner or operator in cooperation with the RBNA well in advance of the commencement of the Renewal Survey, i.e., prior to commencing the survey and normally at least 12 to 15 months before the survey's completion due date.

204. **Aspects to be Considered:** Technical assessments, which may include quantitative or qualitative evaluation of relative risks of possible deterioration, of the following aspects of a particular ship may be used as a basis for the nomination of tanks and areas for survey:

- a. Design features such as stress levels on various structural elements, design details and extent of use of high tensile steel.
- b. Former history with respect to corrosion, cracking, buckling, indents and repairs for the particular ship as well as similar vessels, where available.
- c. Information with respect to types of cargo carried, use of different tanks for cargo/ballast, protection of tanks and condition of coating, if any. Technical assessments of the relative risks of susceptibility to damage or deterioration of various structural elements and areas are to be judged and decided on the basis of recognised principles and practices, such as may be found in publications of the Tanker Structure Cooperative Forum (TSCF), (Refs. 2 and 3).

### **300. Technical assessment**

301 **General:** There are three basic types of possible failure which may be the subject of technical assessment in connection with planning of surveys; corrosion, cracks and buckling. Contact damages are not normally covered by the survey plan since indents are usually noted in



*memoranda and assumed to be dealt with as a normal routine by Surveyors. Technical assessments performed in conjunction with the survey planning process are, in principle to be as shown schematically in Figure F.F10.301.1 depicts, schematically, how technical assessments can be carried out in conjunction with the survey planning process.*

- a. *The approach is basically an evaluation of the risk based on the knowledge and experience related to design and corrosion.*
- b. *The design is to be considered with respect to structural details which may be susceptible to buckling or cracking as a result of vibration, high stress levels or fatigue.*
- c. *Corrosion is related to the ageing process, and is closely connected with the quality of corrosion protection at newbuilding, and subsequent maintenance during the service life.*
- d. *Corrosion may also lead to cracking and/or buckling.*

#### **400. Methods**

*401. Design Details Damage experience related to the ship in question and similar ships, where available, is the main source of information to be used in the process of planning. In addition, a selection of structural details from the design drawings is to be included.*

*402. Typical damage experience to be considered will consist of:*

- a. *Number, extent, location and frequency of cracks;*
- b. *Location of buckles.*

*403. This information may be found in the survey reports and/or the Owner's files, including the results of the Owner's own inspections. The defects should be analyzed, noted and marked on sketches.*

*404. In addition, general experience is to be utilized. For example, reference should be made to TSCF's "Guidance Manual for the Inspection and Condition Assessment of Tanker Structures," (Ref. 2), which contains a catalogue of typical damages and proposed repair methods for various tanker structural details.*

*405. Such figures are to be used together with a review of the main drawings, in order to compare with the actual structure and search for similar details which may be susceptible to damage.*

*406. An example is shown in F.F10.406.1.*

*407. The review of the main structural drawings, in addition to using the above mentioned figures, should include checking for typical design details where cracking has been experienced. The factors contributing to damage are to be carefully considered.*

*408. The use of high tensile steel (HTS) is an important factor. Details showing good service experience where ordinary, mild steel has been used may be more susceptible to damage when HTS, and its higher associated stresses, are utilized. There is extensive and, in general, good experience, with the use of HTS for longitudinal material in deck and bottom structures. Experience in other locations, where the dynamic stresses may be higher, is less favourable, e.g. side structures.*

*409. In this respect, stress calculations of typical and important components and details, in accordance with the latest Rules or other relevant methods, may prove useful and are to be considered. The selected areas of the structure identified during this process are to be recorded and marked on the structural drawings to be included in the Survey Programme.*

#### **500. Corrosion**

*501. In order to evaluate relative corrosion risks, the following information is generally to be considered:*

- a. *Usage of Tanks and Spaces*
- b. *Condition of Coatings*
- c. *Cleaning Procedures*
- d. *Previous Corrosion Damage*
- e. *Ballast use and time for Cargo Tanks*
- f. *Corrosion Risk Scheme (See Ref. 3, Table 3.1)*
- g. *Location of Heated Tanks*

*502. Ref. 3 gives definitive examples which can be used for judging and describing coating condition, using typical pictures of conditions.*

*503. The evaluation of corrosion risks is to be based on information in Ref. 3, together with relevant information on the anticipated condition of the ship as derived from the information collected in order to prepare the Survey Programme and the age of the ship.*

*504. The various tanks and spaces are to be listed with the corrosion risks nominated accordingly.*

#### **600. Locations for Close-up Survey and Thickness Measurement**

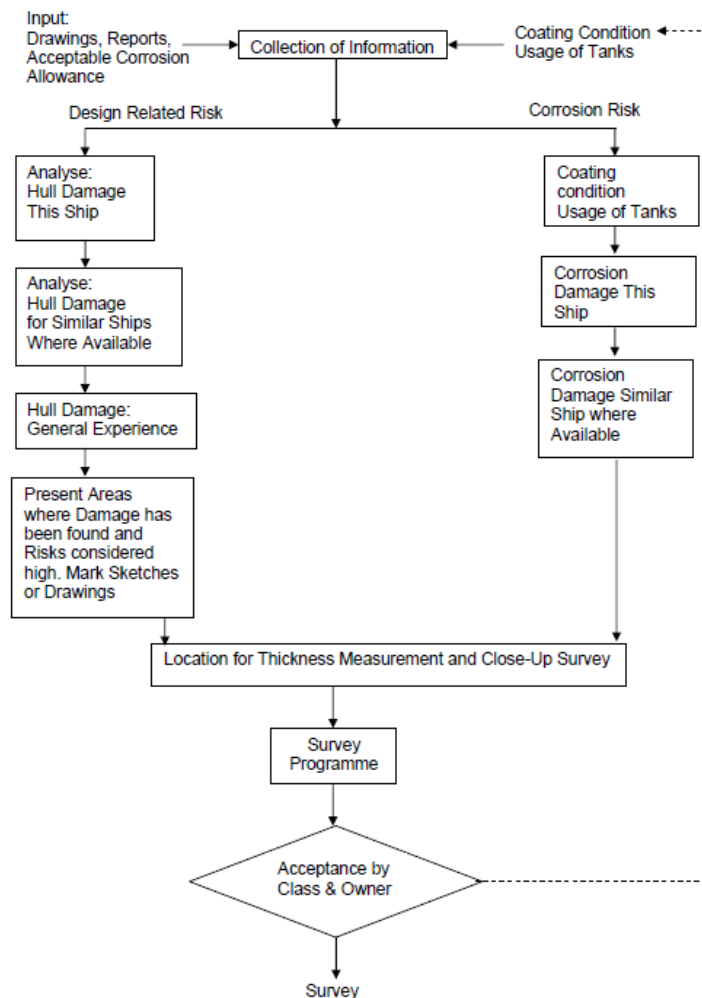
*601. On the basis of the table of corrosion risks and the evaluation of design experience, the locations for initial close-up survey and thickness measurement (sections) may be nominated.*

*602. The sections subject to thickness measurement are to normally be nominated in tanks and spaces where corrosion risk is judged to be the highest.*

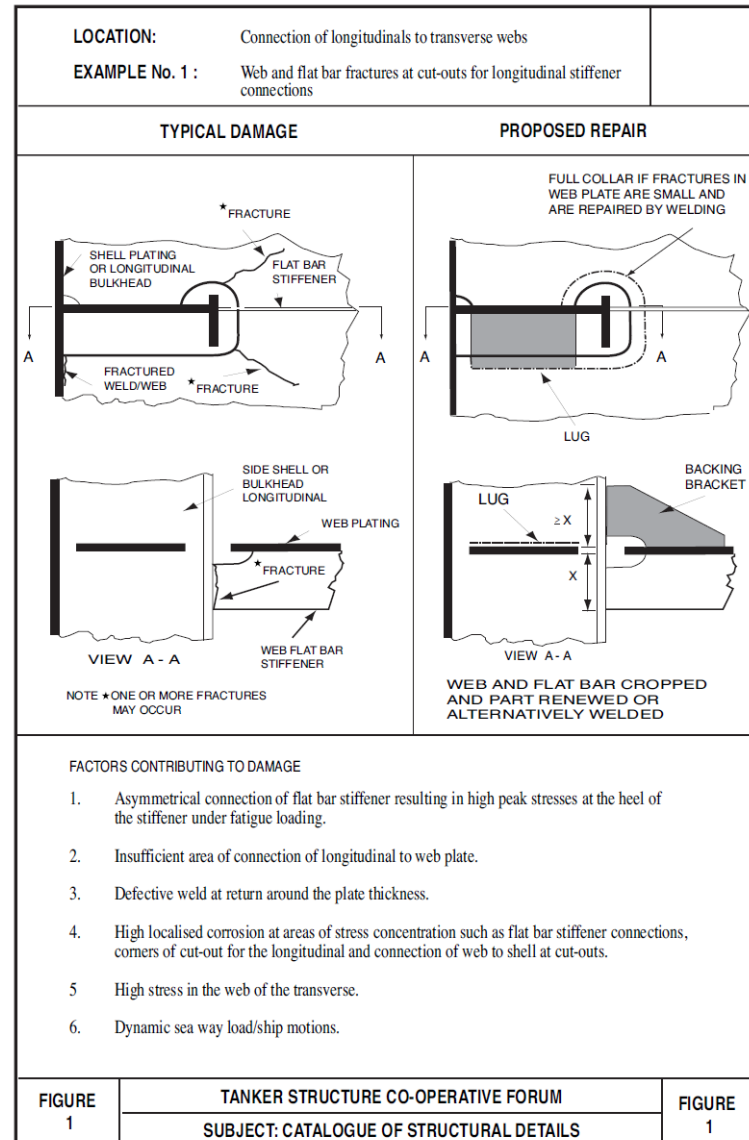
603. The nomination of tanks and spaces for close-up survey should, initially, be based on highest corrosion risk, and should always include ballast tanks. The principle for

the selection is to be that the extent is increased by age or where information is insufficient or unreliable.

**FIGURE F.F10.301.1: TECHNICAL ASSESSMENT AND THE SURVEY PLANNING PROCESS**



**FIGURE F.F10.406.1: TYPICAL DAMAGE AND REPAIR EXAMPLE (REPRODUCED FROM REF. 2)**



*End of guidance*

## F11. CRITERIA FOR LONGITUDINAL STRENGTH OF HULL GIRDER FOR OIL TANKERS [UR Z10.1 UR Z10.4 Annex III (general)]

### 100. General

101. These criteria are to be used for the evaluation of longitudinal strength of the ship's hull girder as required by sub chapter F8 item F8.101.a.

102. In order that ship's longitudinal strength to be evaluated can be recognized as valid, fillet welding between longitudinal internal members and hull envelopes are to be in sound condition so as to keep integrity of longitudinal internal members with hull envelopes.

### 200. Evaluation of longitudinal strength

201. On oil tankers of 130 m in length and upwards and of over 10 years of age, the longitudinal strength of the ship's hull girder is to be evaluated in compliance with the requirements of this annex on the basis of the thickness measured, renewed or reinforced, as appropriate, during the renewal survey. The condition of the hull girder for longitudinal strength evaluation is to be determined in accordance with the methods specified in subchapter F7.

202. Calculation of transverse sectional areas of deck and bottom flanges of hull girder

- a. The transverse sectional areas of deck flange (deck plating and deck longitudinals) and bottom flange (bottom shell plating and bottom longitudinals) of

the ship's hull girder are to be calculated by using the thickness measured, renewed or reinforced, as appropriate, during the special(renewal) survey.

- b. If the diminution of sectional areas of either deck or bottom flange exceeds 10% of their respective as-built area (i.e. original sectional area when the ship was built), either one of the following measures is to be taken:
  - b.1. to renew or reinforce the deck or bottom flanges so that the actual sectional area is not less than 90% of the as-built area; or
  - b.2. to calculate the actual section moduli ( $Z_{act}$ ) of transverse section of the ship's hull girder by applying the calculation method specified in Part II, Title 32, Section 2, Chapter G, item G3.700, by using the thickness measured, renewed or reinforced, as appropriate, during the special (renewal) survey.

#### 203. Requirements for transverse section modulus of hull girder

- a. The actual section moduli of transverse section of the ship's hull girder calculated in accordance with the foregoing paragraph F11.202."b2" is to satisfy either of the following provisions, as applicable:
  - a.1. for ships constructed on or after 1 July 2002, the actual section moduli ( $Z_{act}$ ) of the transverse section of the ship's hull girder calculated in accordance with the requirements of the foregoing paragraph F11.202."b2" is not to be less than the diminution limits determined by the RBNA\*; or
  - a.2. for ships constructed before 1 July 2002, the actual section moduli ( $Z_{act}$ ) of the transverse section of the ship's hull girder calculated in accordance with the requirements of the foregoing paragraph F11.202."b2" is to meet the criteria for minimum section modulus for ships in service required by the RBNA, provided that in no case  $Z_{act}$  is to be less than the diminution limit of the minimum section modulus ( $Z_{mc}$ ) as specified in Part II, title 32, Section 2, Chapter G. item G3.800

#### Notes:

\* The actual transverse section modulus of the hull girder of oil tankers calculated under paragraph F11.202."b1" is not to be less than 90% of the required section modulus for new buildings specified in IACS Unified Requirements of Part II, Title 11, Section 2, Chapter H\* or Part II, Title 11, Section 2, Subchapter G, whichever is the greater.

\*  $C = 1.0$  cm is to be used for the purpose of this calculation.

**CHAPTER G**  
**ADDITIONAL REQUIREMENTS FOR HULL**  
**SURVEYS OF CHEMICAL TANKERS**  
**[IACS UR Z10.3]**

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**G1. GENERAL**  
**[UR Z10.3 and parts of IACS UR Z1]**

**100. Application**

101. The requirements apply to all self-propelled Chemical Tankers with integral tanks i.e. vessels with IMO certificate of fitness for the carriage of dangerous chemicals in bulk. If a chemical tanker is constructed with both integral and independent tanks, these requirements are applicable only to that portion of the cargo length containing integral tanks. Combined gas carriers/chemical tankers with independent tanks within the hull, are to be surveyed as gas carriers.

102. The requirements apply to surveys of hull structure and piping systems in way of cargo tanks, pump rooms, cofferdams, pipe tunnels, void spaces within the cargo area and all ballast tanks. The requirements are additional to the classification requirements applicable to the remainder of the ship. The requirements are not applicable for independent tanks on deck.

103. The requirements contain the minimum extent of examination, thickness measurements and tank testing. The survey is to be extended when Substantial Corrosion and/or structural defects are found and include additional Close-up Survey when necessary.

**200. Definitions**

201. In addition to Chapter A, A1.200, the following definitions apply:

202. **Chemical Tanker** : a ship constructed or adapted and used for the carriage in bulk of any liquid product listed in Chapter 17 of the International Code For The Construction And Equipment Of Ships Carrying Dangerous Chemicals In Bulk, IBC Code.

## **G2. ADDITIONAL REQUIREMENTS FOR HULL AND CARGO MACHINERY ANNUAL SURVEYS –CHEMICAL TANKERS**

### **100. Schedule**

101. Annual Surveys are to be held within 3 months before or after anniversary date from the date of the initial classification survey or of the date credited for the last Renewal Survey.

### **200. Scope**

201. The survey is to consist of an examination for the purpose of ensuring, as far as practicable, that the hull and piping are maintained in a satisfactory condition.

202. Examination of the Hull

- a. Examination of the hull plating and its closing appliances as far as can be seen.
- b. Examination of watertight penetrations as far as practicable.

203. Examination of weather decks.

- a. Examination of cargo tank openings including gaskets, covers, coamings and flame screens.
- b. Examination of cargo tanks pressure/vacuum valves and flame screens.
- c. Examination of flame screens on vents to all bunker tanks.

(DA) 1.

- d. Examination of cargo, bunker and vent piping systems, including vent masts and headers.

204. Examination of all pump room bulkheads for signs of leakage or fractures and, in particular, the sealing arrangements of all penetrations of pump room bulkheads.

205. Examination of the condition of all piping systems.

### **[IACS UR Z1]**

206. Examination, as far as practicable, the cargo, bilge, ballast and stripping pumps for undue gland seal leakage, verification of proper operation of electrical and mechanical remote operating and shutdown devices and operation of cargo pump room bilge system and of the pump foundations. **[UR Z1]**

207. Confirmation of, when appropriate, that the requisite arrangements to regain steering capability in the event of the prescribed single failure are being maintained. **[IACS UR Z1]**

208. Examination of access to bow arrangement. **[IACS UR Z1]**

### **300. Examination of ballast tanks**

301. Examination of ballast tanks where required as a consequence of the results of the Renewal Survey (see G4.205) and Intermediate Survey is to be carried out (see G3.202 and G3.202.b). When considered necessary by the surveyor, or when extensive corrosion exists, thickness measurements are to be carried out and if the results of these thickness measurements indicate that Substantial Corrosion is found, the extent of thickness measurements is to be increased in accordance with Table T.G4.402.1 through T.G4.402.4. These extended thickness measurements are to be carried out before the survey is credited as completed. Suspect Areas identified at previous Surveys are to be examined. Areas of substantial corrosion identified at previous surveys are to have thickness measurements taken.

302. Confirmation of that the corrosion prevention system fitted to dedicated ballast water tanks of oil tankers and bulk carriers is maintained (SOLAS 74/00 reg.II-1/3-2) **[UR Z1]**

### **400. Cargo pump room and tunnels [IACS UR Z1]**

401. Examination of all pump room bulkheads for signs of chemical leakage or fractures and, in particular, the sealing arrangements of all penetrations of pump room bulkheads.

402. Examination of the condition of all piping systems.

### **500. Cargo area and cargo pump rooms [IACS UR Z1]**

501. Confirmation of that potential sources of ignition in or near the cargo pump room are eliminated, such as loose gear, combustible materials, etc., that there are no signs of undue leakage and that access ladders are in good condition.

502. Confirmation of that all electrical equipment in dangerous zones is suitable for such locations, is in satisfactory condition and has been properly maintained.

503. Examination of all pump room bulkheads for signs of cargo leakage or fractures and, in particular, the sealing arrangements of all penetrations of pump room bulkheads.

504. Confirmation of that the pump room ventilation system is operational, ducting intact, dampers are operational and screens clean.

505. Examination of the emergency lighting in all cargo pump rooms of tankers constructed after 1 July 2002.

506. Confirmation of that wheelhouse doors and windows, side scuttles and windows in superstructure and deckhouse ends facing the cargo area are in a satisfactory condition.



507. Confirmation of that removable pipe lengths or other approved equipment necessary for cargo separation are available in the pump room and are in a satisfactory condition.

508. Examination of all pump room bulkheads for signs of cargo leakage or fractures and, in particular, the sealing arrangements of all penetrations of pump room bulkheads.

509. Confirmation of that the remote operation of the cargo pump bilge system is satisfactory.

510. Examination of the bilge and ballast arrangements and Confirmation of that pumps and pipelines are identified.

511. Confirmation of, when applicable, that the bow or stern loading and unloading arrangements are in order and testing the means of communication and the remote shut down for the cargo pumps.

512. Examination of the cargo transfer arrangements and Confirmation of that any hoses are suitable for their intended purpose and, where appropriate, type-approved or marked with date of testing.

513. Examination of, when applicable, the cargo heating or cooling systems, including any sampling arrangements, and Confirmation of that the means for measuring the temperature and associated alarms are operating satisfactorily.

514. Examination of, as far as practicable, the cargo tank vent system, including the pressure/vacuum valves and secondary means to prevent over- or under pressure and devices to prevent the passage of flame.

515. Examination of, as far as practicable, and confirmation of the satisfactory operation of, the arrangements for the ventilation of spaces normally entered during cargo handling operations and other spaces in the cargo area.

## **600. Instrumentation and safety devices [UR Z1]**

601. Verifying that installed pressure gauges on cargo discharge lines and level indicator systems are operational.

602. Examination of the gauging devices, high-level alarms and valves associated with overflow control.

603. Confirmation of, as far as practicable, that the intrinsically safe systems and circuits used for measurement, monitoring, control and communication purposes in all hazardous locations are being properly maintained.

604. Confirmation that the system for continuous monitoring of the concentration of flammable vapours is satisfactory.

605. Examination of the equipment for personnel protection and in particular that:

- a. the protective clothing for crew engaged in loading and discharging operations and its stowage is in a satisfactory condition;
- b. the required safety equipment and associated breathing apparatus and associated air supplies and, when appropriate, emergency-escape respiratory and eye protection, are in a satisfactory condition and are properly stowed;
- c. medical first-aid equipment, including stretchers and oxygen resuscitation equipment are in a satisfactory condition;
- d. arrangements have been made for the antidotes for the cargoes actually carried to be on board;
- e. decontamination arrangements and eyewashes are operational;
- f. the required gas detection instruments are on board and arrangements have been made for the supply of the appropriate vapour detection tubes;
- g. the arrangements for the stowage of cargo samples are satisfactory;

607. Confirmation that sampling points or detector heads are located in suitable positions in order that potentially dangerous leakages are readily detected.

## **700. Fire fighting systems in cargo area [UR Z1]**

701. Examination of the fixed fire-fighting system for the cargo pump room and the deck foam system for the cargo area and Confirmation of that their means of operation are clearly marked.

702. Confirmation of that the condition of the portable fire extinguishing equipment for the cargoes to be carried in the cargo area is satisfactory

**800. Inert gas system and inert / padding/drying gas [UR Z1]**

801. Confirmation of that arrangements for sufficient gas to be carried or generated to compensate for normal losses, and that the means provided for monitoring ullage spaces, are satisfactory.

802. Confirmation of that arrangements are made for sufficient medium to be carried where drying agents are used on air inlets to cargo tanks.

**900. Emergency towing arrangements [UR Z1]**

901. Examination of the towing arrangement for tankers of not less than 20,000 tonnes deadweight.

**G3. ADDITIONAL REQUIREMENTS FOR HULL INTERMEDIATE SURVEYS – CHEMICAL TANKERS**

**100. Schedule**

101. The Intermediate Survey is to be held at or between either the 2<sup>nd</sup> or 3<sup>rd</sup> Annual Survey.

102. Those items which are additional to the requirements of the Annual Surveys may be surveyed either at or between the 2<sup>nd</sup> and 3<sup>rd</sup> Annual Survey.

103. Concurrent crediting to both Intermediate Survey (IS) and Renewal Survey (RS) for surveys and thickness measurements of spaces are not acceptable.

**200. Scope**

201. General

- a. The survey extent is dependent on the age of the vessel, specified in items from 202 to 204 below.
- b. For weather decks, an examination as far as applicable of cargo, bunker, ballast, steam and vent piping systems as well as vent masts and headers is to be carried out. If upon examination there is any doubt as to the condition of the piping, the piping may be required to be pressure tested, thickness measured or both.

202. **Chemical Tankers 5 – 10 Years of Age**, the following is to apply:

- a. For ballast tanks, an Overall Survey of Representative Tanks selected by the Surveyor is to be carried out. If such inspections reveal no visible structural defects, the examination may be limited

to a verification that the hard protective coating remains in GOOD condition.

- b. A Ballast Tank is to be examined at subsequent annual intervals where:
  - b.1. a hard protective coating has not been applied from the time of construction, or
  - b.2. a soft or semi-hard coating has been applied, or
  - b.3. substantial corrosion is found within the tank, or
  - b.4. the hard protective coating is found to be in less than GOOD condition and the hard protective coating is not repaired to the satisfaction of the Surveyor.
- c. In addition to the requirements above, suspect areas identified at previous surveys are to be examined.

203. **Chemical Tankers 10 - 15 years of Age**, the following is to apply:

- a. The requirements of the Intermediate Survey are to be to the same extent as the previous Renewal Survey as required in G4 and G1.501-G1.509. However, pressure testing of cargo and ballast tanks is not required unless deemed necessary by the attending Surveyor.
- b. In application of G3.203a, the intermediate survey may be commenced at the second annual survey and be progressed during the succeeding year with a view to completion at the third annual survey in lieu of the application of G4.104.
- c. In application of G3.203a, an under water survey may be considered in lieu of the requirements of G4.204.

204. **Chemical Tankers over 15 years of Age**, the following is to apply:

- a. The requirements of the Intermediate Survey are to be to the same extent as the previous Renewal Survey. However, pressure testing of cargo and ballast tanks is not required unless deemed necessary by the attending Surveyor.
- b. In application of G3.204a, the intermediate survey may be commenced at the second annual survey and be progressed during the succeeding year with a view to completion at the third annual survey in lieu of the application of G4.104
- c. In application of G3.204a, a survey in dry dock is to be part of the intermediate survey. The overall and close-up surveys and thickness measurements, as applicable, of the lower portions of the cargo tanks and water ballast tanks are to be carried out in

accordance with the applicable requirements for intermediate surveys, if not already performed.

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

### 300. Cargo area and cargo pump rooms

301. A general examination of the electrical equipment and cables in dangerous zones such as cargo pump rooms and areas adjacent to cargo tanks to check for defective equipment, fixtures and wiring. The insulation resistance of the circuits should be tested and in cases where a proper record of testing is maintained, consideration should be given to accepting recent readings

302. Confirmation that spares for the cargo area mechanical ventilation fans are available on board.

303. Examination of vent line drainage arrangements

304. Confirmation, where applicable, that pipelines and independent cargo tanks are electrically bonded to the hull

### 400. Inert Gas system

401. The requirements of Part I, Title 02, Section 2, Chapter F, item F2.600 are applicable.

## G4. ADDITIONAL REQUIREMENTS FOR HULL RENEWAL SURVEYS – CHEMICAL TANKERS.

### 100. Schedule

101. Renewal Surveys are to be carried out at 5 years intervals to renew the Classification Certificate.

102. The first Renewal Survey is to be completed within 5 years from the date of the initial classification survey and thereafter within 5 years from the credited date of the previous Renewal Survey. However, an extension of class of 3 months maximum beyond the 5th year can be granted in exceptional circumstances. In this case, the next period of class will start from the expiry date of the Renewal Survey before the extension was granted.

103. For surveys completed within 3 months before the expiry date of the Renewal Survey, the next period of class will start from the expiry date of the Renewal Survey. For surveys completed more than 3 months before the expiry date of the Renewal Survey, the period of class will start from the survey completion date.

104. The Renewal Survey may be commenced at the 4th Annual Survey and be progressed with a view to completion by the 5th anniversary date. When the Renewal Survey is commenced prior to the 4th Annual Survey, the entire survey is to be completed within 15 months if such work is to be credited to the Renewal Survey.

105. Concurrent crediting to both Intermediate Survey (IS) and Renewal Survey (RS) for surveys and thickness measurements of spaces are not acceptable.

### 200. Scope

201. The Renewal Survey is to include, in addition to the requirements of the Annual Survey, examination, tests and checks of sufficient extent to ensure that the hull and related piping, as required in G4.203, is in a satisfactory condition and is fit for its intended purpose for the new period of class of 5 years to be assigned, subject to proper maintenance and operation and to periodical surveys being carried out at the due dates..

202. All cargo tanks, ballast tanks, including double bottom tanks, pump rooms, pipe tunnels, cofferdams and void spaces bounding cargo tanks, decks and outer hull are to be examined, and this examination is to be supplemented by thickness measurement and testing, as required in G4.400 and G4.500, to ensure that the structural integrity remains effective. The aim of the examination is to discover Substantial Corrosion, significant deformation, fractures, damages or other structural deterioration, that may be present.

203. Cargo piping on deck and cargo and ballast piping within the above tanks and spaces are to be examined and operationally tested to working pressure to attending Surveyor's satisfaction to ensure that tightness and condition remain satisfactory. Special attention is to be given to any ballast piping in cargo tanks and cargo piping in ballast tanks and void spaces, and Surveyors are to be advised on all occasions when this piping, including valves and fittings are open during repair periods and can be examined internally.

### 204. Dry Dock Survey

a. A survey in dry dock is to be a part of the Renewal Survey. The overall and close-up surveys and thickness measurements, as applicable, of the lower portions of the cargo tanks and ballast tanks are to be carried out in accordance with the applicable requirements for Renewal Surveys, if not already performed.

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

### 205. Tank Protection

a. Where provided, the condition of the corrosion prevention system of cargo tanks is to be examined.

b. A Ballast Tank is to be examined at subsequent annual intervals where:

b.1. a hard protective coating has not been applied from the time of construction, or

- b.2. a soft or semi-hard coating has been applied, or
- b.3. substantial corrosion is found within the tank, or
- b.4. the hard protective coating is found to be in less than GOOD condition and the hard protective coating is not repaired to the satisfaction of the Surveyor.

206. Thickness measurements are to be carried out as deemed necessary by the surveyor.

### 300. Extent of Overall and Close-up Survey

301. An Overall Survey of all tanks and spaces is to be carried out at each Renewal Survey.

302. The minimum requirements for Close-up Surveys at Renewal Survey are given in Tables T.G4.302.1 and T.G4.302.2. The survey of stainless steel tanks may be carried out as an overall survey supplemented by Close-up Survey as deemed necessary by the surveyor.

303. The Surveyor may extend the Close-up Survey as deemed necessary taking into account the maintenance of the tanks under survey, the condition of the corrosion prevention system and also in the following cases:

- a. In particular, tanks having structural arrangements or details which have suffered defects in similar tanks or on similar ships according to available information.
- b. In tanks which have structures approved with reduced scantlings due to an approved corrosion control system.

304. For areas in tanks where hard protective coatings are found to be in a GOOD condition, as defined in C1.110 the extent of Close-up Surveys according to Tables T.G4.302.1 through T.G4.302.2 may be specially considered.

### 400. Extent of Thickness Measurement

401. The minimum requirements for thickness measurements at Renewal Survey are given in T.G4.401.1. Thickness measurement of stainless steel hull structure and piping may be waived, except for clad steel plating.

402. Provisions for extended measurements for areas with Substantial Corrosion are given in, T.G4.402.1 through T.G4.402.4, and as may be additionally specified in the Survey Programme, as required in G1.501 through G1.509. These extended thickness measurements are to be carried out before the survey is credited as completed. Suspect Areas identified at previous Renewal Surveys are to be examined. Areas of substantial corrosion identified at previous surveys are to have thickness measurements taken.

403. The Surveyor may further extend the thickness measurements as deemed necessary.

404. For areas in tanks where hard protective coating are found to be in a GOOD condition, as defined in C1.110, the extent of thickness measurements according to Table T.G4.401.1 may be specially considered.

405. Transverse sections are to be chosen where the largest reductions are suspected to occur or are revealed from deck plating measurements.

406. In cases where two or three sections are to be measured, at least one is to include a Ballast Tank within 0.5L amidships.

### 500. Extent of Tank Testing

501. The minimum requirements for tank testing at Renewal Survey are given in Table T.G4.501.1. Pressure testing of cargo tanks may be accepted based on a confirmation from the Master stating that the pressure testing has been carried out according to the requirements with a satisfactory result.

502. The Surveyor may extend the tank testing as deemed necessary.

503. Boundaries of ballast tanks are to be tested with a head of liquid to the top of air pipes.

504. Boundaries of cargo tanks are to be tested to the highest point that liquid will rise under service conditions.

505. The testing of 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.

### 506. Chemical Tankers over 10 Years of Age

a. Selected steel cargo pipes outside cargo tanks and ballast pipes passing through cargo tanks are to be:

- a.1. Thickness measured at random or selected pipe lengths to be opened for internal inspection;
- a.2. Pressure tested to the maximum working pressure.

b. Special attention is to be given to cargo/slop discharge piping through Ballast Tanks and void spaces.

### 600. Cargo area and cargo pump rooms surveys RBNA

601. A general examination of the electrical equipment and cables in dangerous zones such as cargo pump rooms and areas adjacent to cargo tanks to check for defective equipment, fixtures and wiring. The insulation resistance of the circuits should be tested and in cases where a proper

record of testing is maintained, consideration should be given to accepting recent readings

602. Confirmation that spares for the cargo area mechanical ventilation fans are available on board.

603. Dismantling of ballast and tripping pumps for internal inspection

604. In case the vessel is fitted with a washing system, piping, valves, pumps and deck mounted washing machines are to be examined and tested.

605. Cargo heating/cooling system is to be inspected and if deemed necessary by the surveyor, pressure tested.

606. Heat exchangers to be inspected internally.

607. Non sparking fans to be inspected internally.

### **700. Fire fighting system**

701. See Part I, Title 2, Section 2, Chapter F, item F2.500.

### **800. Inert gas system**

701. The requirements of Part I, Title 02, Section 2, Chapter F, item F2.600 are applicable.

### **900. Emergency towing arrangement**

801. A thorough examination of the towing arrangement is to be carried out, inspecting the following items:

- a. Aft towing arrangement pre-rigged
- b. Forward chafing gear secured to the strong point
- c. Pick up gear
- d. Ttowing pennant
- e. Strong points, fair leads and pedestal

## **G5. DOCUMENTATION ON BOARD [IACS 10.3 – Section 6]**

### **100. General**

101. The owner is to obtain, supply and maintain on board documentation on board which is to be readily available for the Surveyor.

102. The documentation is to be kept on board for the life time of the ship.

### **200. Survey Report File**

201. A Survey Report File is to be a part of the documentation on board consisting of

- a. Reports of structural surveys
- b. Executive Hull Summary
- c. Thickness measurement reports

202. The Survey Report File is to be available also in the Owner's and the RBNA's management offices.

### **300. Supporting Documents**

301. The following additional documentation is to be available onboard:

- a. Survey Programme required by A3.100 until such time as the Renewal Survey or Intermediate Survey, as applicable, has been completed.
- b. Main structural plans of cargo and ballast tanks
- c. Previous repair history
- d. Cargo and ballast history
- e. Extent of use of inert gas plant and tank cleaning procedures
- f. Inspections by ship's personnel with reference to
  - f.1. structural deterioration in general
  - f.2. leakages in bulkheads and piping
  - f.3. condition of corrosion prevention system, if any
- g. Any other information that will help identify Critical Structural Areas and/or Suspect Areas requiring inspection.

### **400. Review of Documentation On Board**

401. Prior to survey, the Surveyor is to examine the completeness of the documentation onboard, and its contents as a basis for the survey.

## **G6. PROCEDURES FOR THICKNESS MEASUREMENTS**

### **100. General**

101. The required thickness measurements, if not carried out by the RBNA itself, are to be witnessed by a Surveyor of the RBNA. The Surveyor is to be on board to the extent necessary to control the process.

102. The thickness measurement company is to be part of the survey planning meeting to be held prior to commencing the survey.

103. Thickness measurements of structures in areas where close-up surveys are required shall be carried out simultaneously with close-up surveys.

104. In all cases the extent of the thickness measurements is to be sufficient as to represent the actual average condition.

### **200. Certification of Thickness Measurement Company**

201. The thickness measurements are to be carried out by a qualified company certified by the RBNA according to principles stated in Tables T.G4.402.1 - T.G4.402.4.

### **300. Reporting**

301. A thickness measurement report is to be prepared. The report is to give the location of measurements, the thickness measured as well as corresponding original thickness. Furthermore, the report is to give the date when the measurements were carried out, type of measurement equipment, names of personnel and their qualifications and has to be signed by the operator. The thickness measurement report is to follow the principles as specified in the Recommended Procedures for Thickness Measurements of Chemical Tankers, contained in:

- a. For Single Hull Chemical Tankers, please refer to Annex II of URZ10.1
- b. For Double Hull Chemical Tankers, please refer to Annex II of URZ10.4

302. The Surveyor is to review the final thickness measurement report and countersign the cover page.



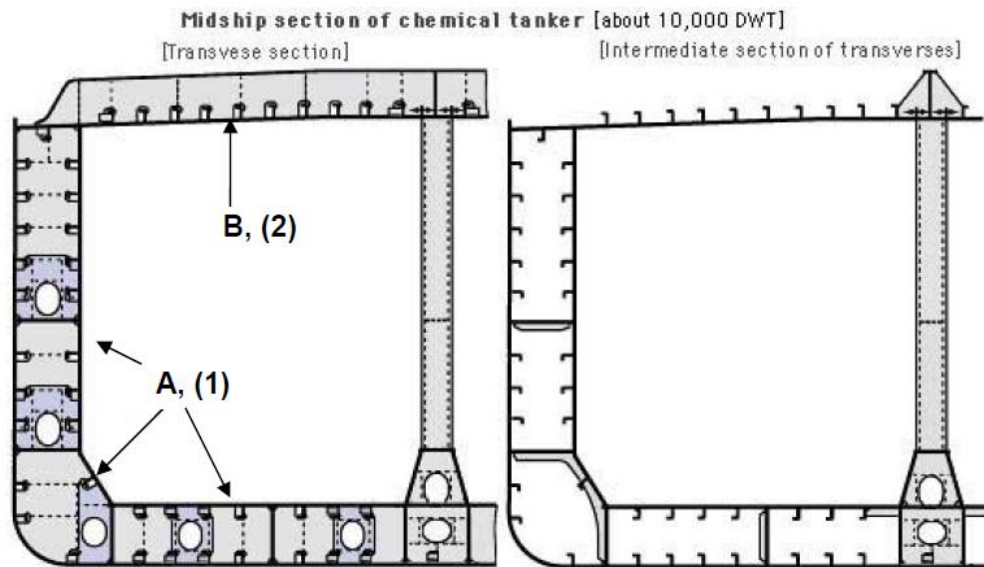
**TABLE T.G4.302.1 MINIMUM REQUIREMENTS FOR CLOSE-UP SURVEY AT RENEWAL SURVEY OF SINGLE SKIN CHEMICAL TANKERS**

Renewal Survey no. 1	Renewal Survey no. 2	Renewal Survey no. 3	Renewal Survey no. 4
Age ≤ 5	5 < Age ≤ 10	10 < Age ≤ 15	Age > 15
A) ONE WEB FRAME RING -in a ballast wing tank,	A) ALL WEB FRAME RINGS -in a ballast wing tank, or double bottom ballast tank (see Note I)	A) ALL WEB FRAME RINGS - in all ballast tanks	As class renewal (special) survey for ships between 10 and 15 years of age  Additional transverses included as deemed necessary by the RBNA
B) ONE DECK TRANSVERSE - in a cargo tank or on deck	B) ONE DECK TRANSVERSE -in each remaining ballast tanks or on deck  -in a cargo wing tank or on deck  -in two cargo centre tanks or on deck	A)ALL WEB FRAME RINGS -in a cargo wing tank  A) ONE WEB FRAME RING - in each remaining cargo tank	
D) ONE TRANSVERSE BULKHEAD -lower part in a ballast tank  -lower part in a cargo wing tank  -lower part in a cargo centre tank (see Note II)	C) BOTH TRANSVERSE BULKHEADS -in a ballast wing tank, if any,  D) ONE TRANSVERSE BULKHEAD -lower part in each remaining ballast tank  - lower part in two cargo centre tanks (see Note II)  - in lower part in a cargo wing tank	C) ALL TRANSVERSE BULKHEADS  - in all cargo and ballast tanks	
Note I: Ballast double hull tank: means double bottom tank plus double side tank plus double deck tank, as applicable, even if these tanks are separate. Note II: Where no centre cargo tanks are fitted (as in case of centre longitudinal bulkhead), transverse bulkheads in wing tanks are to be surveyed.  A-D: are areas to be subjected to close-up surveys and thickness measurements (see Fig. F.G4.300.1 and F.G4.300.2).  A) Complete transverse web frame ring including adjacent structural members. B) Deck transverse including adjacent deck structural members. C) Transverse bulkhead complete - including girder system and adjacent structural members. D) Transverse bulkhead lower part - including girder system and adjacent structural members.			

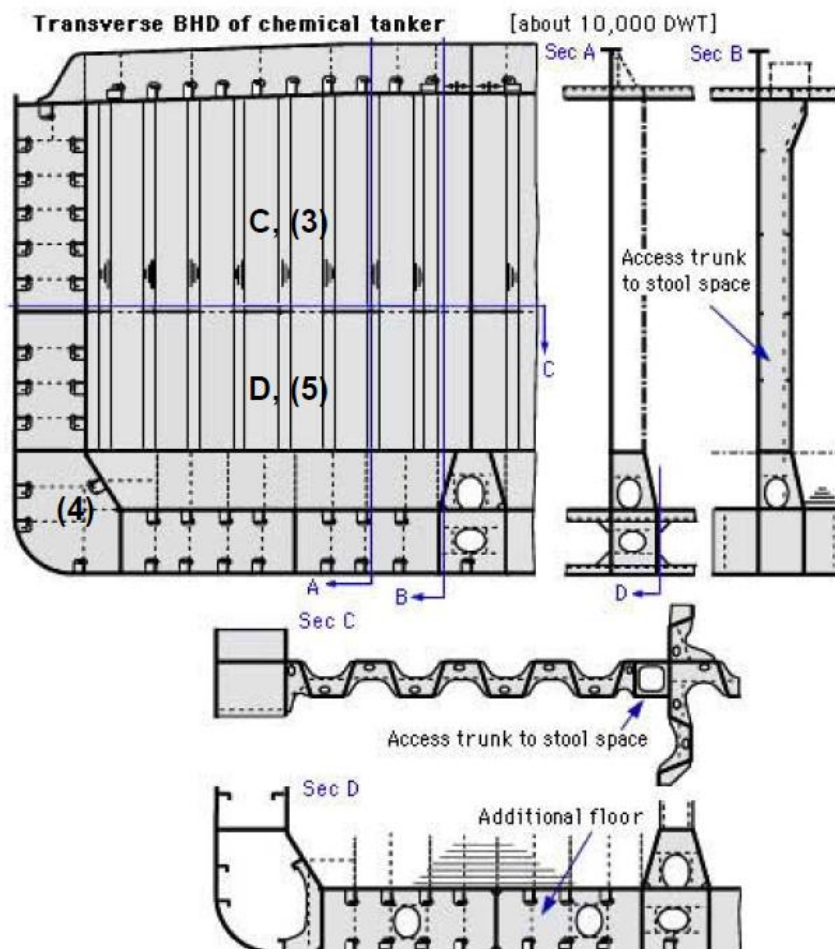
**TABLE T.G4.302.2 - MINIMUM REQUIREMENTS FOR CLOSE-UP SURVEY AT RENEWAL SURVEY OF DOUBLE SKIN CHEMICAL TANKERS**

Renewal Survey no. 1	Renewal Survey no. 2	Renewal Survey no. 3	Renewal Survey no. 4
Age ≤ 5	5 < Age ≤ 10	10 < Age ≤ 15	Age > 15
(1) ONE WEB FRAME RING  - a ballast double hull tank (see Note I)	(1) ALL WEB FRAME RINGS -in a ballast wing tank, or double bottom ballast tank (see Note I)	(1) ALL WEB FRAME RINGS - in all ballast tanks	As class renewal survey for ships between 10 and 15 years of age
(2) ONE DECK TRANSVERSE - in a cargo tank or on deck	(6) THE KNUCKLE AREA AND THE UPPER PART (3 metres approx) of one web frame in each remaining ballast tank	(7) ALL WEB FRAME RINGS -in a cargo wing tank	
(4) ONE TRANSVERSE BULKHEAD  - in a ballast tank (see Note I)	(2) ONE DECK TRANSVERSE  - in two cargo tanks	(7) ONE WEB FRAME RING - in each remaining cargo tank	Additional transverses included as deemed necessary by the RBNA
(5) ONE TRANSVERSE BULKHEAD -  in a cargo wing tank	(4) ONE TRANSVERSE BULKHEAD -in each ballast tank (see Note I)	(3) ALL TRANSVERSE BULKHEADS - in all cargo tanks	
in a cargo centre tank(see Note II)	(5) ONE TRANSVERSE BULKHEAD - in two cargo centre tanks (see Note II) - in a cargo wing tank	(4) ALL TRANSVERSE BULKHEADS - in all ballast tanks	
<p>(1), (2), (3), (4), (5), (6) and (7) are areas to be subjected to close-up surveys and thickness measurements (see Figures F.G4.300.1 - F.G4.300.3).</p> <p>(1): Web frame in a ballast tank means vertical web in side tank, hopper web in hopper tank, floor in double bottom tank and deck transverse in double deck tank (where fitted), including adjacent structural members. In fore and aft peak tanks web frame means a complete transverse web frame ring including adjacent structural members.</p> <p>(2): Deck transverse, including adjacent deck structural members (or external structure on deck in way of the tank, where applicable).</p> <p>(3): Transverse bulkhead complete in cargo tanks, including girder system, adjacent structural members (such as longitudinal bulkheads) and internal structure of lower and upper stools, where fitted.</p> <p>(4): Transverse bulkhead complete in ballast tanks, including girder system and adjacent structural members, such as longitudinal bulkheads, girders in double bottom tanks, inner bottom plating, hopper side, connecting brackets.</p> <p>(5): Transverse bulkhead lower part in cargo tank, including girder system, adjacent structural members (such as longitudinal bulkheads) and internal structure of lower stool, where fitted.</p> <p>(6): The <i>knuckle area</i> and the upper part (3 metres approximately), including adjacent structural members. <i>Knuckle area</i> 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.</p> <p>(7): Web frame in a cargo tank means deck transverse, longitudinal bulkhead vertical girder and cross ties, where fitted, including adjacent structural members.</p> <p><b>Note I:</b> Ballast double hull tank: means double bottom tank plus double side tank plus double deck tank, as applicable, even if these tanks are separate.</p> <p><b>Note II:</b> Where no centre cargo tanks are fitted (as in the case of centre longitudinal bulkhead), transverse bulkheads in wing tanks are to be surveyed.</p>			

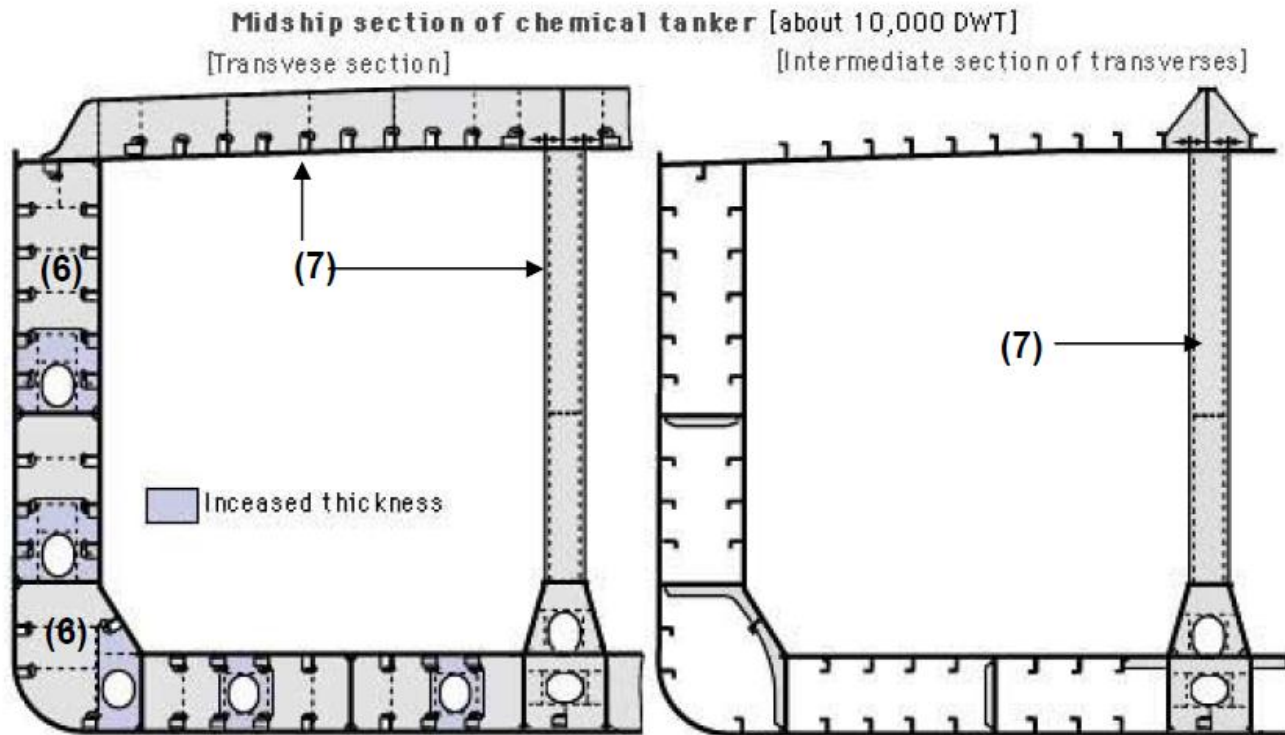
**FIGURE F.G4.300.1.- REPRESENTATIVE TRANSVERSE SECTION OF CHEMICAL TANKER. AREAS A & B AND 1 AND 2**



**FIGURE F.G4.300.2.- REPRESENTATIVE TRANSVERSE SECTION OF CHEMICAL TANKER. AREAS C & D AND 3, 4 AND 5**



**FIGURE F.G4.300.3.- REPRESENTATIVE TRANSVERSE SECTION OF CHEMICAL TANKER. AREAS 6 AND 7**



**TABLE T.G4.401.1 MINIMUM REQUIREMENTS FOR THICKNESS MEASUREMENTS AT SPECIAL (RENEWAL) SURVEY OF CHEMICAL TANKERS**

<b>Renewal Survey no. 1 Age ≤ 5</b>	<b>Renewal Survey no. 2 5 &lt; Age ≤ 10</b>	<b>Renewal Survey no. 3 10 &lt; Age ≤ 15</b>	<b>Renewal Survey no. 4 Age &gt; 15</b>
1. Suspect areas	1. Suspect areas	1. Suspect areas	1. Suspect areas
2. One section of deck plating for the full beam of the ship within the cargo area (in way of a ballast tank, if any, or a cargo tank used primarily for water ballast)	2. Within the cargo area:  1. Each deck plate 2. One transverse section	2. Within the cargo area:  1. Each deck plate 2. Two transverse sections <sup>(1)</sup> 3. All wind and water strakes	2. Within the cargo area:  1. Each deck plate 2. Three transverse sections <sup>(1)</sup> 3. Each bottom plate
	3. Selected wind and water strakes outside the cargo area	3. Selected wind and water strakes outside the cargo area	3. All wind and water strakes, full length
Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Tables T.G4.302.1 and T.G4.302.2	Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Tables T.G4.302.1 and T.G4.302.2	Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Tables T.G4.302.1 and T.G4.302.2	Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Tables T.G4.302.1 and T.G4.302.2
<sup>(1)</sup> at least one section is to include a ballast tank within 0,5L amidships			

**TABLE T.G4.501.1 MINIMUM REQUIREMENTS FOR TANK TESTING AT RENEWAL SURVEY OF CHEMICAL TANKERS**

<b>Renewal Survey No. 1 age ≤ 5</b>	<b>Renewal Survey No.2 and subsequent age &gt; 5</b>
All ballast tank boundaries	All ballast tank boundaries
Cargo tank boundaries facing ballast tanks, void spaces, pipe tunnels, pump-rooms or cofferdams	All cargo tank bulkheads

**TABLES T.G4.402.1- T.G4.402.4 - REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENTS AT THOSE AREAS OF SUBSTANTIAL CORROSION. RENEWAL SURVEY OF CHEMICAL TANKERS WITHIN THE CARGO AREA LENGTH.**

**TABLE T.G4.402.1**

<b>BOTTOM, INNER BOTTOM AND HOPPER STRUCTURE</b>		
<b>Structural member</b>	<b>Extent of measurements</b>	<b>Pattern of measurements</b>
Bottom, inner bottom and hopper structure plating	Minimum of three bays across tank, including aft bay Measurements around and under all suction bell mouths	5-point pattern for each panel between longitudinals and floors
Bottom, inner bottom and hopper structure longitudinals	Minimum of three longitudinals in each bay where bottom plating measured	Three measurements in line across the flange and three measurements on vertical web
Bottom girders, including the watertight ones	At fore and aft watertight floors and in centre of tanks	Vertical line of single measurements on girder plating with one measurement between each panel stiffener, or a minimum of three measurements. The measurements across face flat where fitted.
Bottom floors, including the watertight ones	Three floors in the bays where bottom plating measured, with measurements at both ends and middle	5-point pattern over two square metre area
Hopper structure web frame ring	Three floors in bays where bottom plating measured	5-point pattern over one square metre of plating. Single measurements on flange
Hopper structure transverse watertight bulkhead or swash bulkhead	- lower 1/3 of bulkhead	- 5-point pattern over one square metre of plating
	- upper 2/3 of bulkhead	- 5-point pattern over two square metre of plating
	- stiffeners (minimum of three)	- For web, 5-point pattern over span (two measurements across web at each end and one at centre of span). For flange, single measurements at each end and centre of span
Panel stiffening	Where applicable	Single measurements

**TABLE T.G4.402.2**

<b>DECK STRUCTURE</b>		
<b>Structural member</b>	<b>Extent of measurements</b>	<b>Pattern of measurements</b>
Deck plating	Two transverse bands across tank	Minimum of three measurements per plate per band
Deck longitudinals	Every third longitudinal in each of two bands with a minimum of one longitudinal	Three measurements in line vertically on webs and two measurements on flange (if fitted)
Deck girders and brackets	At fore and aft transverse bulkhead, bracket toes and in centre of tanks	Vertical line of single measurements on web plating with one measurement between each panel stiffener, or a minimum of three measurements. Two measurements across flange. 5-point pattern on girder/bulkhead brackets
Deck transverse webs	Minimum of two webs, with measurements at both ends and middle of span	5-point pattern over one square metre area. Single measurements on flange
Vertical web and transverse bulkhead in wing ballast tank (two metres from deck)	Minimum of two webs, and both transverse bulkheads	5-point pattern over one square metre area
Panel stiffening	Where applicable	Single measurements



**TABLE T.G4.402.3**

<b>SIDE SHELL AND LONGITUDINAL BULKHEADS</b>		
<b>Structural member</b>	<b>Extent of measurements</b>	<b>Pattern of measurements</b>
Side shell and longitudinal bulkhead plating:  - Deckhead and bottom strakes, and strakes in way of horizontal girders - All other strakes	- Plating between each pair of longitudinals in a minimum of three bays (along the tank)  - Plating between every third pair of longitudinals in same three bays	Single measurement
Side shell and longitudinal bulkhead longitudinals on: - Deckhead and bottom strakes  - All other strakes	- Each longitudinal in same three bays  - Every third longitudinal in same three bays	3 measurements across web and 1 measurement on flange
Longitudinals - bracket	Minimum of three at top, middle and bottom of tank in same three bays	5-point pattern over area of bracket
Vertical web and transverse bulkheads of double side tanks (excluding deck area):  - Strakes in way of horizontal girders  - Other strakes	- Minimum of two webs and both transverse bulkheads  - - Minimum of two webs and both transverse bulkheads	- 5-point pattern over approx. two square metre area  a. - Two measurements between each pair of vertical stiffeners
6. Web frames and cross ties for other tanks than double side tanks	Three webs with minimum of three locations on each web, including in way of cross tie connections and lower end bracket	5-point pattern over approximately two square metre area of webs, plus single measurements on flanges of web frame and cross ties
Horizontal girders	Plating on each girder in a minimum of three bays	Two measurements between each pair of longitudinal girder stiffeners
Panel stiffening	Where applicable	Single measurements

**TABLE T.G4.402.4**

<b>TRANSVERSE WATERTIGHT AND SWASH BULKHEADS</b>		
<b>Structural member</b>	<b>Extent of measurements</b>	<b>Pattern of measurements</b>
Upper and lower stool, where fitted	<ul style="list-style-type: none"> <li>- Transverse band within 25mm of welded connection to inner bottom/deck plating</li> <li>- Transverse band within 25mm of welded connection to shelf plate</li> </ul>	5-point pattern between stiffeners over one metre length
Deckhead and bottom strakes, and strakes in way of horizontal stringers	Plating between pair of stiffeners at three locations: approximately 1/4, 1/2 and 3/4 width of tank	5-point pattern between stiffeners over one metre length
All other strakes	Plating between pair of stiffeners at middle location	Single measurement
Strakes in corrugated bulkheads	Plating for each change of scantling at centre of panel and at flange of fabricated connection	5-point pattern over about one square metre of plating
Stiffeners	Minimum of three typical stiffeners	For web, 5-point pattern over span between bracket connections (two measurements across web at each bracket connection and one at centre of span). For flange, single measurements at each bracket toe and at centre of span
Brackets	Minimum of three at top, middle and bottom of tank	5-point pattern over area of bracket
Horizontal stringers	All stringers with measurements at both ends and middle.	5-point pattern over one square metre area, plus single measurements near bracket toes and on flanges
Deep webs and girders	Measurements at toe of bracket and at centre of span	For web, 5 point pattern over about 1 square metre.  3 measurements across face flat.

## **G7. EVALUATION OF SURVEYS** **[IACS UR Z10.3]**

### **100. Evaluation of Survey Report**

101. The data and information on the structural condition of the vessel collected during the survey is to be evaluated for acceptability and continued structural integrity of the vessel.

## **G8. SURVEY REPORTING PRINCIPLES** **[IACS UR Z10.3 Table VIII]**

### **100. General**

101. As a principle, for chemical tankers subject to ESP, the surveyor is to include the following content in his report for survey of hull structure and piping systems, as relevant for the survey.

102. A survey report is to be generated in the following cases:

- a. In connection with commencement, continuation and / or completion of periodical hull surveys, i.e. annual, intermediate and Renewal surveys, as relevant
- b. When structural damages / defects have been found
- c. When repairs, Renewals or modifications have been carried out
- d. When condition of class (recommendation) has been imposed or deleted

103. The purpose of reporting is to provide:

- a. Evidence that prescribed surveys have been carried out in accordance with applicable classification rules
- b. Documentation of surveys carried out with findings, repairs carried out and condition of class (recommendation) imposed or deleted
- c. Survey records, including actions taken, which shall form an auditable documentary trail. Survey reports are to be kept in the survey report file required to be on board
- d. Information for planning of future surveys
- e. Information which may be used as input for maintenance of classification rules and instructions

104. When a survey is split between different survey stations, a report is to be made for each portion of the survey. A list of items surveyed, relevant findings and an indication of whether the item has been credited, is to be made available to the next attending surveyor, prior to

continuing or completing the survey. Thickness measurement and tank testing carried out is also to be listed for the next surveyor.

### **200. Extent of the survey**

201. Identification of compartments where an overall survey has been carried out.

202. Identification of locations, in each tank, where a close-up survey has been carried out, together with information of the means of access used.

203. Identification of locations, in each tank, where thickness measurement has been carried out.

204. *Note: As a minimum, the identification of location of close-up survey and thickness measurement is to include a confirmation with description of individual structural members corresponding to the extent of requirements stipulated in this Chapter G based on type of periodical survey and the ship's age. Where only partial survey is required, i.e. one web frame ring / one deck transverse, the identification is to include location within each tank by reference to frame numbers.*

205. For areas in tanks where protective coating is found to be in GOOD condition and the extent of close-up survey and / or thickness measurement has been specially considered, structures subject to special consideration are to be identified.

206. Identification of tanks subject to tank testing.

207. Identification of cargo piping on deck and cargo and ballast piping within cargo and ballast tanks, pump rooms, pipe tunnels and void spaces, where:

- a. Examination including internal examination of piping with valves and fittings and thickness measurement, as relevant, has been carried out
- b. Operational test to working pressure has been carried out

### **300. Result of the survey**

301. Type, extent and condition of protective coating in each tank, as relevant (rated GOOD, FAIR or POOR).

302. Structural condition of each compartment with information on the following, as relevant:

- a. Identification of findings, such as:
  - a.1. Corrosion with description of location, type and extent
  - a.2. Areas with substantial corrosion
  - a.3. Cracks / fractures with description of location and extent

- a.4. Buckling with description of location and extent
  - a.5. Indents with description of location and extent
  - b. Identification of compartments where no structural damages / defects are found
303. The report may be supplemented by sketches / photos.

#### 400. Actions taken with respect to findings

401. Whenever the attending surveyor is of the opinion that repairs are required, each item to be repaired is to be identified in a numbered list. Whenever repairs are carried out, details of the repairs effected are to be reported by making specific reference to relevant items in the numbered list.

402. Repairs carried out are to be reported with identification of:

- a. Compartment
- b. Structural member
- c. Repair method (i.e. Renewal or modification) including:
  - c.1. Steel grades and scantlings (if different from the original)
  - c.2. Sketches/photos, as appropriate
- d. Repair extent
- e. NDT / Tests

403. For repairs not completed at the time of survey, condition of class (recommendation) is to be imposed with a specific time limit for the repairs. In order to provide correct and proper information to the surveyor attending for survey of the repairs, condition of class (recommendation) is to be sufficiently detailed with identification of each item to be repaired. For identification of extensive repairs, reference may be given to the survey report.

404. When a survey is split between different survey stations, a report is to be made for each portion of the survey. A list of items examined and / or tested (pressure testing, thickness measurements etc.) and an indication of whether the item has been credited, are to be made available to the next attending Surveyor(s), prior to continuing or completing the survey.

405. An Executive Hull Summary of the survey and results is to be issued to the Owner and placed on board the vessel for reference at future surveys. The Executive Hull Summary is to be endorsed by the RBNA's head office or regional managerial office.

## G9. GUIDELINES FOR TECHNICAL ASSESSMENT IN CONJUNCTION WITH PLANNING FOR ENHANCED SURVEYS OF CHEMICAL TANKERS RENEWAL SURVEY - HULL

### REFERENCES

1. IACS Unified Requirement Z10.3, "Hull Surveys of Chemical Tankers."
2. TSCF, "Guidelines for the Inspection and Maintenance of Double Hull Tanker Structures, 1995."
3. TSCF, "Guidance Manual for Tanker Structures, 1997."

### 100. Introduction

101. These guidelines contain information and suggestions concerning technical assessments which may be of use in conjunction with the planning of enhanced Renewal Surveys of chemical tankers. As indicated in A3.109 the guidelines are a recommended tool which may be invoked at the discretion of RBNA, when considered necessary and appropriate, in conjunction with the preparation of the required Survey Programme.

### 200. Purpose and principles

201. Purpose: The purpose of the technical assessments described in these guidelines is to assist in identifying critical structural areas, nominating suspect areas and in focusing attention on structural elements or areas of structural elements which may be particularly susceptible to, or evidence a history of, wastage or damage. This information may be useful in nominating locations, areas and tanks for thickness measurement, close-up survey and tank testing. Critical Structural Areas are locations which have been identified from calculations to require monitoring or from the service history of the subject ship or from similar or sister ships (if available) to be sensitive to cracking, buckling or corrosion which would impair the structural integrity of the ship.

202. Minimum Requirements However, these guidelines may not be used to reduce the requirements pertaining to thickness measurement, close-up survey and tank testing contained in Tables T.G4.302.1, T.G4.302.2, T.G4.401.1 and T.G4.501.1; which are, in all cases, to be complied with as a minimum.

203. Timing: As with other aspects of survey planning, the technical assessments described in these guidelines are to be worked out by the Owner or operator in cooperation with the RBNA well in advance of the commencement of the Renewal Survey, i.e., prior to commencing the survey and normally at least 12 to 15 months before the survey's completion due date.

204. Aspects to be Considered: technical assessments, which may include quantitative or qualitative evaluation of relative risks of possible deterioration, of the following aspects of a particular ship may be used as a basis for the nomination of tanks and areas for survey:

- a. *Design features such as stress levels on various structural elements, design details and extent of use of high tensile steel.*
- b. *Former history with respect to corrosion, cracking, buckling, indents and repairs for the particular ship as well as similar vessels, where available.*
- c. *Information with respect to types of cargo carried, use of different tanks for cargo/ballast, protection of tanks and condition of coating, if any.*

### 300. Technical assessment

301 *There are three basic types of possible failure which may be the subject of technical assessment in connection with planning of surveys; corrosion, cracks and buckling. Contact damages are not normally covered by the survey plan since indents are usually noted in memoranda and assumed to be dealt with as a normal routine by Surveyors. Technical assessments performed in conjunction with the survey planning process are, in principle, to be as shown schematically in Figure F.G10.301.1 depicts, schematically, how technical assessments can be carried out in conjunction with the survey planning process.*

- a. *The approach is basically an evaluation of the risk based on the knowledge and experience related to design and corrosion.*
- b. *The design is to be considered with respect to structural details which may be susceptible to buckling or cracking as a result of vibration, high stress levels or fatigue.*
- c. *Corrosion is related to the ageing process, and is closely connected with the quality of corrosion protection at newbuilding, and subsequent maintenance during the service life.*
- d. *Corrosion may also lead to cracking and/or buckling.*

### 400. Methods

401. *Design Details: damage experience related to the ship in question and similar ships, where available, is the main source of information to be used in the process of planning. In addition, a selection of structural details from the design drawings is to be included.*

402. *Typical damage experience to be considered will consist of:*

- a. *Number, extent, location and frequency of cracks;*
- b. *Location of buckles.*

403. *This information may be found in the survey reports and/or the Owner's files, including the results of the Owner's own inspections. The defects should be analyzed, noted and marked on sketches.*

404. *In addition, general experience is to be utilized. For example, reference is to be made to the two TSCF's publications mentioned in Ref.2 and Ref.3, which contain a catalogue of typical damages and proposed repair methods for various tanker structural details.*

405. *Such figures are to be used together with a review of the main drawings, in order to compare with the actual structure and search for similar details which may be susceptible to damage.*

406. *An example is shown F.G10.406.1. In particular, Chapter 3 of Ref.2 deals with various aspects specific to double hull tankers, such as stress concentration locations, misalignment during construction, corrosion trends, fatigue considerations and areas requiring special attention, which are to be considered in working out the survey planning.*

407. *The review of the main structural drawings, in addition to using the above mentioned figures, should include checking for typical design details where cracking has been experienced. The factors contributing to damage are to be carefully considered.*

408. *The use of high tensile steel (HTS) is an important factor. Details showing good service experience where ordinary, mild steel has been used may be more susceptible to damage when HTS, and its higher associated stresses, are utilized. There is extensive and, in general, good experience, with the use of HTS for longitudinal material in deck and bottom structures. Experience in other locations, where the dynamic stresses may be higher, is less favourable, e.g. side structures.*

409. *In this respect, stress calculations of typical and important components and details, in accordance with the latest Rules or other relevant methods, may prove useful and are to be considered. The selected areas of the structure identified during this process are to be recorded and marked on the structural drawings to be included in the Survey Programme.*

### 500. Corrosion

501. *In order to evaluate relative corrosion risks, the following information is generally to be considered:*

- a. *Usage of Tanks and Spaces*
- b. *Condition of Coatings*
- c. *Cleaning Procedures*
- d. *Previous Corrosion Damage*
- e. *Ballast use and time for Cargo Tanks*
- f. *Corrosion Risk Scheme (See Ref. 3, Table 3.1)*
- g. *Location of Heated Tanks*

502. *Ref. 3 gives definitive examples which can be used for judging and describing coating condition, using typical pictures of conditions.*

503. *The evaluation of corrosion risks is to be based on information in Ref. 3, together with relevant information on the anticipated condition of the ship as derived from the information collected in order to prepare the Survey Programme and the age of the ship.*

504. *The various tanks and spaces are to be listed with the corrosion risks nominated accordingly. Special attention is to be given to the areas where the double hull tanker is particularly exposed to corrosion. To do this end, the specific aspects addressing corrosion in double hull tankers indicated in 3.4 (Corrosion trends) of Ref.2 are to be taken into account.*

#### **600. Locations for Close-up Survey and Thickness Measurement**

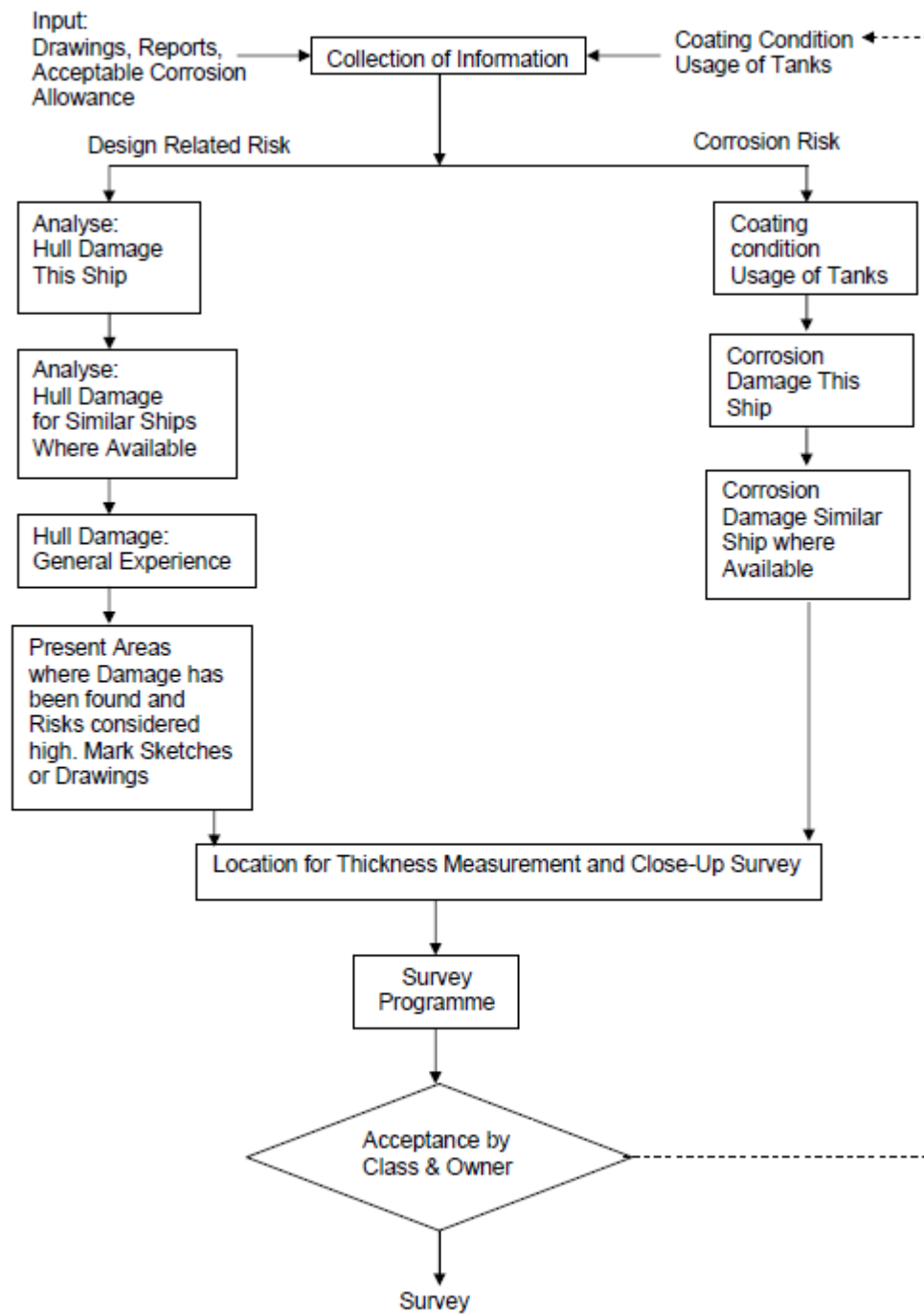
601. *On the basis of the table of corrosion risks and the evaluation of design experience, the locations for initial close-up survey and thickness measurement (sections) may be nominated.*

602. *The sections subject to thickness measurement are to normally be nominated in tanks and spaces where corrosion risk is judged to be the highest.*

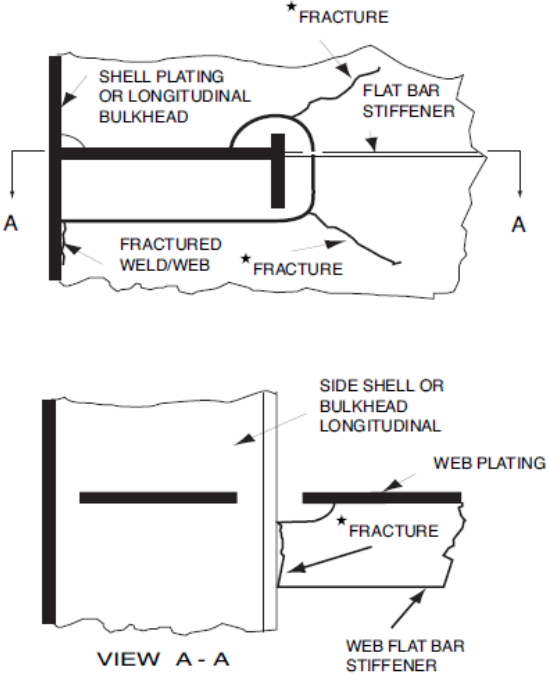
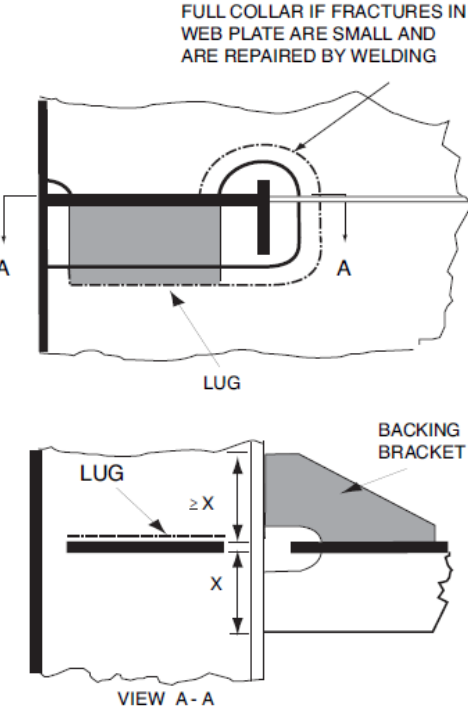
603. *The nomination of tanks and spaces for close-up survey should, initially, be based on highest corrosion risk, and should always include ballast tanks. The principle for the selection is to be that the extent is increased by age or where information is insufficient or unreliable.*



**FIGURE F.G10.301.1 – TECHNICAL ASSESSMENT AND THE SURVEY PLANNING PROCESS**



**F.G10.406.1 – TYPICAL DAMAGE AND REPAIR EXAMPLE (REPRODUCED FROM REF. 2)**

<b>LOCATION:</b> Connection of longitudinals to transverse webs <b>EXAMPLE No. 1 :</b> Web and flat bar fractures at cut-outs for longitudinal stiffener connections		
<b>TYPICAL DAMAGE</b>		<b>PROPOSED REPAIR</b>
 <p>NOTE *ONE OR MORE FRACTURES MAY OCCUR</p>		 <p>WEB AND FLAT BAR CROPPED AND PART RENEWED OR ALTERNATIVELY WELDED</p>
<b>FACTORS CONTRIBUTING TO DAMAGE</b> <ol style="list-style-type: none"> <li>1. Asymmetrical connection of flat bar stiffener resulting in high peak stresses at the heel of the stiffener under fatigue loading.</li> <li>2. Insufficient area of connection of longitudinal to web plate.</li> <li>3. Defective weld at return around the plate thickness.</li> <li>4. High localised corrosion at areas of stress concentration such as flat bar stiffener connections, corners of cut-out for the longitudinal and connection of web to shell at cut-outs.</li> <li>5. High stress in the web of the transverse.</li> <li>6. Dynamic sea way load/ship motions.</li> </ol>		
<b>FIGURE 1</b>	<b>TANKER STRUCTURE CO-OPERATIVE FORUM</b> <b>SUBJECT: CATALOGUE OF STRUCTURAL DETAILS</b>	<b>FIGURE 1</b>

## CHAPTER H ADDITIONAL REQUIREMENTS FOR HULL SURVEYS OF LIQUID GAS CARRIERS [IACS UR Z7.2]

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#### H1. GENERAL [UR Z7.2]

#### 100. Application

101. The requirements apply to all self-propelled ships carrying liquefied gases in bulk.

102. The requirements apply to surveys of hull structure and piping systems except piping covered by the present Title 2 Section 2 Chapter H7 in way of pump rooms, compressor cofferdams, pipe tunnels, void spaces and fuel oil tanks within the cargo area and all ballast tanks. The requirements are additional to the classification requirements applicable to the remainder of the ship.

103. The requirements contain the minimum extent of examination, thickness measurements and tank testing. The survey is to be extended when substantial corrosion and / or structural defects are found and include additional close up surveys when necessary.

#### 200. Definitions

201. **Ballast Tank:** a tank which is used solely for the carriage of salt water ballast.

202. **Overall Survey:** a survey intended to report on the overall condition of the hull structure and determine the extent of additional Close-up Surveys.

203. **Close-up Survey:** a survey where the details of structural components are within the close visual inspection range of the surveyor, i.e. normally within reach of hand.

204. **Transverse Section:** includes all longitudinal members such as plating, longitudinals and girders at the deck, side, bottom, inner bottom and longitudinal bulkheads.

205. **Representative Tank:** are those 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 is to be taken of the service and repair history onboard and identifiable Critical Structural Areas and/or Suspect Areas.

206. **Critical Structural Area:** are locations which have been identified from calculations to require monitoring or from the service history of the subject ship or from similar or sister ships (if available) to be sensitive to cracking, buckling or corrosion which would impair the structural integrity of the ship.

207. **Suspect Area:** are locations showing Substantial Corrosion and/or are considered by the Surveyor to be prone to rapid wastage.

208. **Substantial Corrosion:** is an extent of corrosion such that assessment of corrosion pattern indicates wastage in excess of 75% of allowable margins, but within acceptable limits.

209. **Corrosion Prevention System:** is normally considered a full hard protective coating. **Hard Protective Coating** is usually to be epoxy coating or equivalent. Other coating systems, which are neither soft nor semi-hard coatings, may be considered acceptable as alternatives provided that they are applied and maintained in compliance with the manufacturer's specifications.

210. **Coating Condition:** is defined as follows:

- a. **GOOD** condition with only minor spot rusting.
- b. **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
- c. **POOR** condition with general breakdown of coating over 20% or more, or hard scale at 10% or more, of areas under consideration.

211. **Cargo Area:** is that part of the ship which contains cargo tanks, slop tanks and cargo/ballast pump-rooms, cofferdams, ballast tanks and void spaces adjacent to cargo tanks and also deck areas throughout the entire length and breadth of the part of the ship over the above mentioned spaces.

212. **Special consideration:** or specially considered (in connection with close-up surveys and thickness measurements) means sufficient close-up inspection and thickness measurements are to be taken to confirm the actual average condition of the structure under the coating.

213. **Prompt and Thorough Repair:** is 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 classification, or recommendation.

## **H2. ADDITIONAL REQUIREMENTS FOR HULL ANNUAL SURVEYS – LIQUID GAS CARRIERS**

### **100. Schedule**

101. Annual Surveys are to be held within 3 months before or after anniversary date from the date of the initial classification survey or of the date credited for the last Renewal Survey.

### **200. Scope**

201. The survey is to consist of an examination for the purpose of ensuring, as far as practicable, that the hull and piping are maintained in a satisfactory condition.

### **202. Examination of the Hull**

- a. Examination of the hull plating and its closing appliances as far as can be seen.
- b. Examination of watertight penetrations as far as practicable.

### **203. Examination of weather decks**

- a. Examination of flame screens on vents to all bunker tanks.
- b. Examination of bunker and vent piping systems.

204. Examination of all pump room and compressor room bulkheads and, as far as practicable, pipe tunnels if fitted

- a. Examination of all pump room and compressor room bulkheads for signs of leakage or fractures and, in particular, the sealing arrangements of all penetrations of pump room and compressor room bulkheads.
- b. Examination of the condition of all piping systems, except those covered by Chapter H, Subchapter H7 above .

Note: for survey of air pipes, flames screens, air vents and ventilators: [UR Z7]

- c. Examination of the weld connection between air pipes and deck plating;
- d. External examination of all air pipe heads installed on the exposed decks
- e. Examination of flame screens, air vents to all bunker tanks
- f. Examination of ventilators, including closing devices, if any [UR Z1]
- g. Examining as far as practicable, the cargo, bilge, ballast and tripping pumps for undue gland seal

leakage, verification of proper operation of electrical and mechanical remote operating and shutdown devices and operation of cargo pump room bilge system, and checking that pump foundations are intact [UR Z1]

- h. Confirming that the pump room ventilation system is operational, ducting intact, dampers are operational and screens clean [UR Z1]

205. Examination of the cargo tank openings, including gaskets, covers, coamings and screens. [UR Z1]

206. Examining access to bow arrangement [UR Z1]

207. Examining the bow arrangement for tankers of not less than 20.000 tonnes deadweight [UR Z1]

208. Examination of the devices to prevent the passage of flame on vents to all bunker, oily-ballast and oily-slop tanks and void spaces, as far as practicable [UR Z1]

209 Confirmation of, when appropriate, that the requisite arrangements to regain steering capability in the event of the prescribed single failure are being maintained [UR Z1]

210. Examination of the cargo tank pressure/vacuum valves and devices to prevent the passage of flame [UR Z1]

211. Examination of the cargo tank venting, cargo tank purging and gas freeing and other ventilation systems [UR Z1]

212. Confirmation of that any special arrangements to survive conditions of damage are in order [UR Z1]

213. Confirmation of that the wheelhouse doors and windows, side scuttles and windows in superstructure and deckhouse ends in the cargo area are in a satisfactory condition [UR Z1]

### 300. Suspect Areas

301. Suspect Areas identified at previous surveys are to be examined. Thickness measurements are to be taken of the areas of substantial corrosion and the extent of thickness measurements is to be increased to determine the extent of areas of substantial corrosion. These extended thickness measurements are to be carried out before the annual survey is credited as completed.

### 400. Examination of Ballast Tanks

401. Examination of ballast tanks when required as a consequence of the results of the Renewal Survey and Intermediate Survey is to be carried out. When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurement is to be carried out. If the results of these thickness measurements indicate that Substantial Corrosion is found, then the extent of thickness measurements are to be increased to determine the extent of areas of substantial corrosion. These extended thickness measurements are to be carried out before the annual survey is credited as completed. Table T.3.401.2 My be used as a reference.

### 500. Periodical surveys of cargo installations on ships carrying liquefied gases in bulk

See Subchapter H6.

### **H3. ADDITIONAL REQUIREMENTS FOR HULL INTERMEDIATE SURVEYS – LIQUID GAS CARRIERS**

#### **100. Schedule**

101. The Intermediate Survey is to be held at or between either the 2<sup>nd</sup> or 3<sup>rd</sup> Annual Survey.

102. Those items which are additional to the requirements of the Annual Surveys may be surveyed either at or between the 2<sup>nd</sup> and 3<sup>rd</sup> Annual Survey.

103. A survey planning meeting is to be held prior to the commencement of the survey.

104. Concurrent crediting to both Intermediate Survey (IS) and Renewal Survey (RS) for surveys and thickness measurements of spaces are not acceptable.

#### **200. Scope**

201. The scope of the second or third annual survey is to be extended to include the following:

202. Ballast tanks

- a. For ships between 5 and 10 years of age, an overall survey of representative ballast tanks is to be carried out. If there is no hard protective coating, soft or semi-hard coating or POOR coating condition, the examination is to be extended to other ballast tanks of the same type.
- b. For ships over 10 years of age, an overall survey of all ballast tanks is to be carried out.
- c. If such examinations reveal no visible structural defects, the examination may be limited to a verification that the corrosion prevention system remains efficient.
- d. For ballast tanks, excluding double bottom tanks, if there is no hard protective coating, soft or semi-hard coating, or POOR coating condition and it is not renewed, the tanks in question are to be internally examined at annual intervals.
- e. When such conditions are found in double bottom ballast tanks, the tanks in question may be internally examined at annual intervals.
- f. The minimum requirements for close-up surveys at intermediate survey are given in Table T.H3.202.1.

#### **300. Cargo area and cargo pump and control rooms [UR Z1]**

301. Confirming, where applicable, that pipelines and independent cargo tanks are electrically bonded to the hull.

302. Generally examining the electrical equipment and cables in dangerous zones such as cargo pump rooms and

areas adjacent to cargo tanks to check for defective equipment, fixtures and wiring. The insulation resistance of the circuits should be tested and in cases where a proper record of testing is maintained consideration should be given to accepting recent readings.

303. Confirming that spares are provided for cargo area mechanical ventilation fans.

304. Confirming that the heating arrangements, if any, for steel structures are satisfactory.

#### **400. Periodical surveys of cargo installations on ships carrying liquefied gases in bulk – intermediate survey**

See Subchapter H7.

### **H4. ADDITIONAL REQUIREMENTS FOR HULL RENEWAL SURVEYS – LIQUID GAS CARRIERS**

#### **100. Schedule**

101. Renewal Surveys are to be carried out at 5 years intervals to renew the Classification Certificate.

102. The first Renewal Survey is to be completed within 5 years from the date of the initial classification survey and thereafter within 5 years from the credited date of the previous Renewal Survey. However, an extension of class of 3 months maximum beyond the 5th year can be granted in exceptional circumstances. In this case, the next period of class will start from the expiry date of the Renewal Survey before the extension was granted.

103. For surveys completed within 3 months before the expiry date of the Renewal Survey, the next period of class will start from the expiry date of the Renewal Survey. For surveys completed more than 3 months before the expiry date of the Renewal Survey, the period of class will start from the survey completion date.

104. The Renewal Survey may be commenced at the 4th Annual Survey and be progressed with a view to completion by the 5th anniversary date. When the Renewal Survey is commenced prior to the 4th Annual Survey, the entire survey is to be completed within 15 months if such work is to be credited to the Renewal Survey.

105. A survey planning meeting is to be held prior to the commencement of the survey.

106. Concurrent crediting to both Intermediate Survey (IS) and Renewal Survey (SS) for surveys and thickness measurements of spaces are not acceptable.

#### **200. Scope**

201. The Renewal Survey is to include, in addition to the requirements of the Annual Survey, examination, tests and



checks of sufficient extent to ensure that the hull and related piping, is in a satisfactory condition and is fit for its intended purpose for the new period of class of 5 years to be assigned, subject to proper maintenance and operation and to periodical surveys being carried out at the due dates.

202. Ballast tanks, including double bottom tanks, pump rooms, compressor rooms, pipe tunnels, cofferdams and void spaces bounding cargo tanks, decks and outer hull are to be examined, and this examination is to be supplemented by thickness measurement and testing to ensure that the structural integrity remains effective. The aim of the examination is to discover Substantial Corrosion, significant deformation, fractures, damages or other structural deterioration, that may be present.

203. All piping systems within the above spaces, except those covered by the present Chapter H, Subchapter 9 are to be examined and operationally tested to working pressure to attending Surveyor's satisfaction to ensure that tightness and condition remain satisfactory.

204. The survey extent of ballast tanks converted to void spaces is to be specially considered in relation to the requirements for ballast tanks.

205. Note: For survey of automatic air pipes refer to Chapter C, C2.522 above.

#### 206. Dry Dock Survey

- a. A survey in dry dock is to be a part of the Renewal Survey. The overall and close-up surveys and thickness measurements, as applicable, of the lower portions of the cargo tanks and ballast tanks are to be carried out in accordance with the applicable requirements for Renewal Surveys, if not already performed.
- b. Note: Lower portions of the cargo and ballast tanks are considered to be the parts below light ballast water line.

#### 207. Tank Protection

- a. Where provided, the condition of corrosion prevention system of ballast tanks is to be examined. For tanks used for water ballast, excluding double bottom tanks, where a hard protective coating is found in POOR condition and it is not renewed, where soft or semi-hard coating has been applied, or where a hard protective coating was not applied from time of construction, the tanks in question are to be examined at annual intervals. Thickness measurements are to be carried out as deemed necessary by the surveyor.
- b. When such breakdown of hard protective coating is found in water ballast double bottom tanks and it is not renewed, where a soft or semi-hard coating has been applied, or where a hard protective coating was not applied from the time of construction, the

tanks in question may be examined at annual intervals. When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurements are to be carried out.

- c. Where the hard protective coating in ballast tanks is found to be in a GOOD condition, the extent of close-up surveys and thickness measurements may be specially considered.

### 300. Extent of Overall and Close-up Survey

301. An Overall Survey of all tanks and spaces, excluding fuel oil, lube oil and fresh water tanks, is to be carried out at each Renewal Survey.

- a. Note: For fuel oil, lube oil and fresh water tanks, reference is to be made to Chapter D6. [UR Z7, Table 4.]

302. The minimum requirements for close-up surveys at Renewal Survey are given in Table T.H4.302.1

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

304. For areas in tanks where hard protective coatings are found to be in a GOOD condition, the extent of Close-up Surveys according to Table T.H4.302.1 may be specially considered.

305. Note: For examination of automatic air pipe heads, reference is to be made to Chapter C, C2.522.

### 400. Extent of Thickness Measurement

401. The minimum requirements for thickness measurements at Renewal Survey are given in Table T.H4.401.1.

402. The Surveyor may extend the thickness measurements as deemed necessary. When thickness measurements indicate substantial corrosion, the extent of thickness measurements is to be increased to determine the extent of areas of substantial corrosion. See Table T.H4;402.1.

403. For areas in tanks where hard protective coatings are found to be in a GOOD condition the extent of thickness measurement according to T.H4.401.1 may be specially considered.

404. Transverse sections are to be chosen where the largest reductions are suspected to occur or are revealed from deck plating measurements.

### 500. Extent of Tank Testing

501. All boundaries of water ballast tanks and deep tanks used for water ballast within the cargo area are to be pressure tested. For fuel oil tanks, the representative tanks are to be pressure tested.

502. The Surveyor may extend the tank testing as deemed necessary.

503. Tank testing of fuel oil tanks is to be carried out with a head of liquid to the highest point that liquid will rise under service conditions. Tank testing of fuel oil tanks 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.

**600. Periodical surveys of cargo installations on ships carrying liquefied gases in bulk – renewal survey**

See Subchapter H9.

**H5. PROCEDURES FOR THICKNESS MEASUREMENTS**

**100. General**

101. The required thickness measurements, if not carried out by the Society itself, are to be witnessed by a Surveyor of the Society. The Surveyor is to be on board to the extent necessary to control the process.

102. The thickness measurement company is to be part of the survey planning meeting to be held prior to commencing the survey.

103. Thickness measurements of structures in areas where close-up surveys are required shall be carried out simultaneously with close-up surveys.

104. In all cases the extent of the thickness measurements is to be sufficient as to represent the actual average condition.

**200. Certification of Thickness Measurement Company**

201. The thickness measurements are to be carried out by a qualified company certified by the RBNA according to principles in Part I, Title 01, Section 2, Chapter F, item F4.601.

**300. Reporting**

301. A thickness measurement report is to be prepared. The report is to give the location of measurements, the thickness measured as well as corresponding original thickness. Furthermore, the report is to give the date when the measurements were carried out, type of measurement equipment, names of personnel and their qualifications and has to be signed by the operator.

302. The Surveyor is to review the final thickness measurement report and countersign the cover page

**TABLE T.H3.202.1 TABLE OF THE MINIMUM REQUIREMENTS FOR CLOSE-UP SURVEY AT HULL  
INTERMEDIATE SURVEYS OF LIQUEFIED GAS CARRIERS**

10 < age ≤ 15	age > 15
<p>Close-up survey of:</p> <ul style="list-style-type: none"> <li>- all web frames and both transverse bulkheads in a representative ballast tank (1) and (2)</li> <li>- the upper part of one web frame in another representative ballast tank</li> <li>- one transverse bulkhead in another representative ballast tank (2)</li> </ul>	<p>Close-up survey of:</p> <ul style="list-style-type: none"> <li>-all web frames and both transverse bulkheads in two representative ballast tanks (1) and (2)</li> </ul>
<p>(1) Complete transverse web frame including adjacent structural members</p> <p>(2) Transverse bulkhead complete, including girder system and adjacent members, and adjacent longitudinal bulkhead structure</p> <p>Note 1: Ballast tanks include topside, double hull side, double bottom, hopper side, or any combined arrangement of the aforementioned, and peak tanks where fitted.</p> <p>Note 2: For areas in tanks where protective coating is found to be in GOOD condition, the extent of close-up survey may be specially considered by the Classification Society.</p> <p>Note 3: 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 by the Classification Society.</p> <p>Note 4: The extent of close-up surveys may be extended by the Surveyor as deemed necessary, taking into account the maintenance of the tanks under survey, the condition of the corrosion prevention system and also in the following cases:</p> <ul style="list-style-type: none"> <li>- in particular, in tanks having structural arrangements or details which have suffered defects in similar tanks, or on similar ships according to available information;</li> <li>- in tanks having structures approved with reduced scantlings.</li> </ul>	

**TABLE T.H4.302.1 TABLE OF THE MINIMUM REQUIREMENTS FOR CLOSE-UP SURVEY AT HULL  
RENEWAL SURVEYS OF LIQUEFIED GAS CARRIERS**

Special Survey No.1 (age ≤ 5)	Special Survey No.2 (5 < age ≤ 10)	Special Survey No.3 and subsequent (age > 10)
One web frame in a representative ballast tank of the topside, hopper side and double hull side type (1)  One transverse bulkhead in a ballast tank (3)	All web frames in a ballast tank, which is to be a double hull side tank or a topside tank. If such tanks are not fitted, another ballast tank is to be selected (1)  One web frame in each remaining ballast tank (1)  One transverse bulkhead in each ballast tank (2)	All web frames in all ballast tanks (1)  All transverse bulkheads in all ballast tanks (2)
<p>(1) Complete transverse web frame including adjacent structural members.  (2) Transverse bulkhead complete, including girder system and adjacent members, and adjacent longitudinal bulkhead structure.  (3) Transverse bulkhead lower part including girder system and adjacent structural members.</p> <p>Note 1: Ballast tanks include topside, double hull side, double bottom, hopper side, or any combined arrangement of the aforementioned, and peak tanks where fitted.</p> <p>Note 2: For areas in tanks where coatings are found to be in GOOD condition, as defined in 1.2.10, the extent of close-up surveys may be specially considered by the Classification Society.</p> <p>Note 3: 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 by the Classification Society.</p> <p>Note 4: The Surveyor may extend the close-up survey as deemed necessary, taking into account the maintenance of the tanks under survey, the condition of the corrosion prevention system and also in the following cases:</p> <ul style="list-style-type: none"> <li>- in particular, in tanks having structural arrangements or details which have suffered defects in similar tanks, or on similar ships according to available information;</li> <li>- in tanks having structures approved with reduced scantlings.</li> </ul>		

**TABLE T.H4.401.1 TABLE OF MINIMUM REQUIREMENTS FOR THE THICKNESS MEASUREMENT AT HULL RENEWAL SURVEY OF LIQUEFIED GAS CARRIERS**

Special Survey No.1 age ≤ 5	Special Survey No.2 5 < age ≤ 10	Special Survey No.3 10 < age ≤ 15	Special Survey No.4 and subsequent age > 15
One section of deck plating for the full beam of the ship within 0.5 L amidships in way of a ballast tank, if any	Within the cargo area:  - each deck plate  - one transverse section within 0.5 L amidships in way of a ballast tank, if any	Within the cargo area:  - each deck plate  - two transverse sections (1)  - all wind and water strakes	Within the cargo area:  - each deck plate  - three transverse sections (1)  - each bottom plate  - duct keel plating and internals
	Selected wind and water strakes outside the cargo area	Selected wind and water strakes outside the cargo area	All wind and water strakes, full length
Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to Close-up Survey according to Table I	Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to Close-up Survey according to Table I	Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to Close-up Survey according to Table I	Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to Close-up Survey according to Table I
Suspect areas	Suspect areas	Suspect areas	Suspect areas
(1) at least one section is to include a ballast tank within 0,5L amidships, if any  Note 1: 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.  Note 2: For areas in spaces where coatings are found to be in GOOD condition, as defined in 1.2.10, the extent of thickness measurements may be specially considered by the Classification Society.  Note 3: The Surveyor may extend the thickness measurements as deemed necessary. Where substantial corrosion, as defined in 1.2.8, is found, the extent of thickness measurements is to be increased to the satisfaction of the Surveyor.			

**TABLE T.H4.401.2 GUIDANCE FOR ADDITIONAL THICKNESS MEASUREMENTS IN WAY OF SUBSTANTIAL CORROSION**

STRUCTURAL MEMBER	EXTENT OF MEASUREMENT	PATTERN OF MEASUREMENT
Plating	Suspect area and adjacent plates	5 point pattern over 1 square metre
Stiffeners	Suspect area	3 measurements each in line across web and flange

## **H6. PERIODICAL SURVEYS OF CARGO INSTALLATIONS ON SHIPS CARRYING LIQUEFIED GASES IN BULK** [IACS UR Z1 and UR Z16]

### **100. General** [UR Z16]

101. The Surveys required herein are relevant to ships designed for the carriage of liquefied gases in bulk. These requirements are related to cargo installations and are

additional to those already specified in sub chapter H2 to H5.

102. The surveys are intended to include all installations and equipment related to the carriage and handling of liquefied gases.

103. The annual survey is preferably to be carried out during a loading or discharging operation. Access for cargo tanks or inerted hold spaces, necessitating gas-

freeing/aerating will normally not be necessary unless required by the Rules of the individual Society.

104. The intermediate survey required in Subchapter H7, intends to supplement the annual survey by testing cargo handling installations with related automatic control, alarm and safety systems for correct functioning. The intermediate survey is preferably to be carried out with the ship in a gas-free condition. The extent of the testing required for the intermediate survey will normally be such that the survey cannot be carried out during a loading or discharging operation.

105. Survey intervals are to be in accordance with Subchapter H2 for annual surveys, H3 for intermediate surveys and H4 for renewal surveys. The surveys are intended to include all installations and equipment related to the carriage and handling of liquefied gases. These survey requirements do not cover fire protection, fire fighting installation portable equipment and personnel protection equipment.

106. The annual survey preferably to be carried out during a loading or discharging operation. Access for cargo tanks or inerted hold spaces, necessitating gas-freeing / aeration will normally not be necessary unless required by the RBNA Rules in specific cases.

## **H7. PERIODICAL SURVEYS OF CARGO INSTALLATIONS ON SHIPS CARRYING LIQUEFIED GASES IN BULK– ANNUAL SURVEY** **[IACS UR Z1 and UR Z16]**

### **100. General** **[UR Z16]**

101. The log books are to be examined with regard to correct functioning of the cargo containment and cargo handling systems. The hours per day of the re-liquefaction plants or the boil-off rate is to be considered.

102. All accessible gas-tight bulkhead penetrations including gas-tight shaft sealing are to be visually examined.

103. The means for accomplishing gas tightness of the wheelhouse doors and windows is to be examined. All windows and side scuttles within the area required to be of the fixed type (non-opening) are to be examined for gas tightness. The closing devices for all air intakes and openings into accommodation spaces, service spaces, machinery spaces, control stations and approved openings in superstructures and deckhouses facing the cargo area or bow and stern loading/unloading arrangements, are to be examined.

### **200. Cargo handling systems**

201. The cargo handling piping and machinery, e.g. cargo and process piping, cargo heat exchangers, vaporizers, pumps, compressors and cargo hoses are in general to be visually examined, as far as possible, during operation. **[UR Z16]**

#### **[UR Z1]**

202. Confirming that any special arrangements to survive conditions of damage are in order, and:

- a. The log books are to be examined with regard to correct functioning of the cargo containment and cargo handling systems.
- b. The hours per day of the re-liquefaction plants or the boil-off rate is to be considered.

203. All accessible gas-tight bulkhead penetrations including gas-tight shaft sealing are to be visually examined.

204. Confirming that the wheelhouse doors and windows, side scuttles and windows in superstructure and deckhouse ends in the cargo area are in a satisfactory condition:

- a. The means for accomplishing gas tightness of the wheelhouse doors and windows is to be examined.



b. All windows and side scuttles within the area required to be of the fixed type (non-opening) are to be examined for gas tightness.

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

205. Examining the cargo and process piping, including the expansion arrangements, insulation from the hull structure, pressure relief and drainage arrangements:

a. The cargo handling piping and machinery, e.g. cargo and process piping, cargo heat exchangers, vaporizers, pumps, compressors and cargo hoses are in general to be visually examined, as far as possible, during operation.

206. Examination of the emergency lighting in all cargo pump rooms of tankers constructed after 1 July 2002

207. Confirmation of that the manually operated emergency shutdown system together with the automatic shutdown of the cargo pumps and compressors are satisfactory

208. Examination of the cargo control room:

209. Examination of the gas detection arrangements for cargo control rooms and the measures taken to exclude ignition sources where such spaces are not gas-safe.

210. Confirmation of the arrangements for the air locks are being properly maintained.

211. Examination of, as far as practicable, the bilge, ballast and oil fuel arrangements.

212. Examination of, when applicable, the bow or stern loading and unloading arrangements with particular reference to the electrical equipment, fire-fighting arrangements and means of communication between the cargo control room and the shore location.

213. Confirmation of that portable or fixed drip trays or deck insulation for cargo leakage is in order.

214. Examination of the cargo and process piping, including the expansion arrangements, insulation from the hull structure, pressure relief and drainage arrangements.

### **300. Cargo containment venting systems:**

#### **[UR Z16]**

301. Venting systems, including protection screens if provided, for the cargo tanks, inter-barrier spaces and hold spaces are to be visually examined externally.

#### **[UR Z1]**

302. It is to be verified that the cargo tank relief valves are sealed and that the certificate for the relief valves opening/closing pressures is onboard.

303. Examination of, as far as practicable, and confirmation of the satisfactory operation of, the arrangements for the mechanical ventilation of spaces in the cargo area normally entered during cargo handling.

304. Examination of, and confirmation of the satisfactory operation of, the arrangements for the mechanical ventilation of spaces normally entered other than those covered by Part II, Title 34, Section 2;

305. Confirmation of that electrical equipment in gas-dangerous spaces and zones is in a satisfactory condition and is being properly maintained

306. Confirmation of that the cargo tank and inter-barrier space pressure and relief valves, including safety systems and alarms, are satisfactory

307. Confirmation of that any liquid and vapour hoses are suitable for their intended purpose and, where appropriate, type-approved or marked with date of testing

### **400. Instrumentation and safety systems**

#### **[UR Z16]**

401. The instrumentation of the cargo installations with regard to pressure, temperature and liquid level is to be verified in good working order by one or more of the following methods:

- a. Visual external examination;
- b. Comparing of read outs from different indicators;
- c. Consideration of read outs with regard to the actual cargo and/or actual conditions;
- d. Examination of maintenance records with reference to cargo plant instrumentation maintenance manual;
- e. Verification of calibration status of the measuring instruments.

402. The logbooks are to be examined for confirmation that the emergency shutdown system has been tested.

#### **[UR Z1]**

403. Examination of the arrangements for the cargo pressure/temperature control including, when fitted, any refrigeration system and confirmation of that any associated alarms are satisfactory

404. Examination of, and testing as appropriate and as far as practicable, the liquid level indicators, overflow control, pressure gauges, high pressure and, when applicable, low pressure alarms, and temperature indicating devices for the cargo tanks

405. Examination of, and testing as appropriate, the gas detection equipment

406. Confirming that two sets of portable gas detection equipment suitable for the cargoes to be carried and a suitable instrument for measuring oxygen levels have been provided.

407. Confirming that the manually operated emergency shutdown system together with the automatic shutdown of the cargo pumps and compressors are satisfactory.

408. Confirming that the sealing arrangements at the gas domes are satisfactory.

#### **500. Environmental control for cargo containment systems**

[UR Z16]

501. Inert gas/dry air installations including the means for prevention of backflow of cargo vapour to gas-safe spaces are to be verified as being in satisfactory operating condition.

502. 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.

[UR Z1]

503. Confirmation of that arrangements are made for sufficient inert gas to be carried to compensate for normal losses and that means are provided for monitoring the spaces

504. Confirmation of that the use of inert gas has not increased beyond that needed to compensate for normal losses by examination of records of inert gas usage

505. Confirmation of that any air-drying system and any inter-barrier and hold space purging inert gas system are satisfactory

#### **600. Fire fighting systems**

[UR Z1]

601. Examining the arrangements for the fire protection and fire extinction and testing the remote means of starting one main fire pump.

602. Examining the fixed fire-fighting system for the cargo pump room and confirming that its means of operation is clearly marked.

603. Examining the water spray system for cooling, fire protection and crew protection and confirming that its means of operation is clearly marked.

604. Examining the dry chemical powder fire-extinguishing system for the cargo area and confirming that its means of operation is clearly marked.

605. Examining the fixed installation for the gas-dangerous spaces and confirming its means of operation is clearly marked.

### **H8. PERIODICAL SURVEYS OF CARGO INSTALLATIONS ON SHIPS CARRYING LIQUEFIED GASES IN BULK-INTERMEDIATE SURVEYS [IACS UR Z1 and UR Z16]**

#### **100. General**

101. The requirements of Section sub chapter H7 apply with the following additions:

#### **200. Instrumentation and safety systems**

201. The instrumentation of the cargo installation with regard to pressure, temperature and liquid level is to be visually examined and to be tested by changing the pressure, temperature and level 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 is to include testing of alarm and safety functions.

202. The piping of the gas detection system is to be visually inspected for corrosion and damage as far as practicable. The integrity of the suction lines between suction points and analyzing units is to be verified as far as possible. Gas Detectors are to be calibrated or verified with sample gases.

203. The emergency shutdown system is to be tested, without flow in the pipe lines, to verify that the system will cause the cargo pumps and compressors to stop.

#### **300. Electrical equipment**

301. Electrical equipment in gas-dangerous spaces and zones is to be examined as far as practicable with particular respect to the following:

- a. Protective earthing (Spot check).
- b. Integrity of enclosures.
- c. Damage of outer sheath of cables.

- d. Function testing of pressurized equipment and of associated alarms.
- e. Testing of systems for de-energizing non-certified safe electrical equipment located in spaces protected by air-locks, such as electrical motor-rooms, cargo control rooms, etc.
- f. Testing of insulation resistance of circuits. Such measurements are only to be made when the ship is in a gas-free or inerted condition. Where proper records of testing are maintained consideration may be given to accepting recent readings by the ship's crew.

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

## **H9. SURVEYS OF CARGO INSTALLATIONS ON SHIPS CARRYING LIQUEFIED GASES IN BULK – RENEWAL SURVEY [IACS UR Z16]**

### **100. General**

The requirements of sub chapter H8 apply with the following additions.

### **200. Cargo containment survey**

- 201. All cargo tanks are to be examined internally.
- 202. Special attention is to 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 arrangement is such that the insulation cannot be examined, the surrounding structures of wing tanks, double bottom tanks and cofferdams are to be examined for cold spots when the cargo tanks are in the cold condition unless voyage records together with the instrumentation give sufficient evidence of the integrity of the insulation system.

### **300. Non-destructive testing:**

301. Non-destructive testing is to supplement cargo tank inspection with special attention to be given to the integrity of the main structural members, tank shell and highly stressed parts, including welded connections as deemed necessary by the surveyor. However, 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:

- a. cargo tanks supports and anti-rolling/anti-pitching devices,
- b. web frames or stiffening rings,
- c. swash bulkhead boundaries,
- d. dome and stump connections to tank shell,
- e. foundations for pumps, towers, ladders, etc.,
- f. pipe connections.

302. 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.

303. The tightness of all cargo tanks is to 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 utilize this equipment for the tightness test of independent tanks below deck.

304. Where findings at the inspection of Subchapter H9. 100 to H9.300 or an examination of the voyage records raises doubts as to the structural integrity of a cargo tank, a hydraulic or hydro-pneumatic test is to be carried out. For integral tanks and for independent tanks type A and B, the test pressure is to be in accordance with Part II, Title 34 as appropriate. For independent tanks type C, the test pressure is not to be less than 1.25 times the MARVS.

305. At every other Renewal Survey (i.e., 2nd, 4th, 6th, etc.), all independent cargo tanks type C are to be either:

- a. Hydraulically or hydro-pneumatically tested to 1.25 times MARVS, followed by non-destructive testing in accordance with H9.300, or
- b. Subjected to a thorough, planned non-destructive testing. This testing is to be carried out in accordance with a programme specially prepared for the tank design. If a special programme does not exist, the following applies:
  - b.1. cargo tank supports and anti-rolling/anti-pitching devices,
  - b.2. stiffening rings,

- b.3. Y-connections between tank shell and a longitudinal bulkhead of bilobe tanks,
- b.4. swash bulkhead boundaries,
- b.5. dome and sump connections to the tank shell,
- b.6. foundations for pumps, towers, ladders etc.,
- b.7. pipe connections.
- b.8. At least 10% of the length of the welded connections in each of the above mentioned areas is to be tested. This testing is to be carried out internally and externally as applicable.
- c. Insulation is to be removed as necessary for the required non-destructive testing.

*Guidance*

*Any one or both of the above listed two alternatives may be chosen*

*End of guidance*

306. As far as practicable all hold spaces and hull insulation (if provided), secondary barriers and tank supporting structures are to be visually examined. The secondary barrier of all tanks is to be checked for their effectiveness by means of a pressure/vacuum test, a visual examination or another acceptable method.

307. For membrane and semi-membrane tanks systems, inspection and testing are to be carried out in accordance with programmes specially prepared in accordance with an approved method for the actual tank system.

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

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

310. The pressure/vacuum relief valves, rupture disc and other pressure relief devices for interbarrier spaces and hold spaces are to be opened, examined, tested and readjusted as necessary, depending on their design.

311. The pressure relief valves for the cargo tanks are to be opened for examination, adjusted, function tested, and sealed. If the cargo tanks are equipped with relief valves with non-metallic membranes in the main or pilot valves, such non-metallic membranes are to be replaced. Where a proper record of continuous overhaul and retesting of

individually identifiable relief valves is maintained, consideration will be given to acceptance on the basis of opening, internal examination, and testing of a representative sampling of valves, including each size and type of liquefied gas or vapor relief valve in use, provided there is logbook evidence that the remaining valves have been overhauled and tested since crediting of the previous Renewal Survey.

### **300. Piping systems**

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

302. The pressure relief valves are to be function-tested. A random selection of valves is to be opened for examination and adjusted.

### **400. Components**

401. Cargo pumps, compressors, process pressure vessels, liquid nitrogen tanks, heat exchangers and other components, including prime movers, used in connection with cargo handling and methane boil-off burning are to be examined as required in Part I Section 2 Chapter C, Subchapter C7, item C7.300 .of the Rules for periodical survey of machinery.

### **500. Other systems**

2501. Systems for removal of water or cargo from interbarrier spaces and holds are to be examined and tested as deemed necessary.

502. All gas-tight bulkheads are to be inspected. The effectiveness of gas-tight shaft sealing is to be verified.

503. The following equipment is to be examined: hoses and spool pieces used for segregation of piping systems for cargo, inert gas and bilging.

504. It is to be verified that all cargo piping systems are electrically bonded to the hull.

## CHAPTER I SURVEY REQUIREMENTS FOR SHELL AND INNER DOOR FOR Ro-Ro SHIPS [IACS UR Z24]

### CHAPTER CONTENTS

- I1. APPLICATION
- I2. DEFINITIONS
- I3. ANNUAL SURVEY
- I4. RENEWAL SURVEY
- I5. MINIMUM REQUIREMENTS FOR CLOSE-UP SURVEYS OF DOORS, LOCKING, SECURING AND SUPPORTING DEVICES AND FITTINGS

## I1. APPLICATION

### 100. Application

101. These requirements are applicable to the survey of bow, inner, side shell and stern doors of Ro-Ro passenger (Ro-Pax) and Ro-Ro cargo ships, to the extent appropriate to the arrangement and equipment of each ship. The requirements are additional to the classification requirements applicable to the remainder of the ship. Refer to Part I, Title 02, Section 2, Chapter C, Subchapter C.4 and C.6.

102. Special consideration may be given in application of relevant sections of this Chapter to commercial vessels owned or chartered by Governments, which are utilized in support of military operations or service.

#### *Guidance*

*For an illustrated guide, please refer to IACS UR-Z24.*

*End of guidance*

## I2. DEFINITIONS

### 100. Definitions

101. **Ro-Ro Ship:** For the purpose of this Chapter I2, a Ro-Ro ship is a ship fitted with a loading ramp which enables wheeled vehicles to be rolled-on and rolled-off the ship.

102. **Ro-Ro passenger ship (Ro-Pax):** Ro-Ro passenger ship a passenger ship with Ro-Ro spaces or special category spaces.

103. **Ro-Ro spaces:** spaces not normally sub-divided in any way and normally extending to either a substantial length or the entire length of the ship, in which motor

vehicles with fuel in their tanks for their own propulsion and / or goods (packaged or in bulk, in or on rail or road cars, vehicles (including road or rail tankers), trailers, containers, pallets, demountable tanks or in or on similar stowage units or, other receptacles) can be loaded and unloaded normally in a horizontal direction.

104. **Special category spaces:** those enclosed vehicle spaces above or below the bulkhead deck, into and from which vehicles can be driven and to which passengers have access. Special category spaces may be accommodated on more than one deck provided that the total overall clear height for vehicles does not exceed 10m.

105. **Securing device:** a device used to keep the door closed by preventing it from rotating about its hinges.

106. **Supporting device:** a device used to transmit external or internal loads from the door to a securing device and from the securing device to the ship's structure, or a device other than a securing device, such as a hinge, stopper or other fixed device, that transmits loads from the door to the ship's structure.

107. **Locking device:** a device that locks a securing device in the closed position.

108. **Close-Up Survey:** a survey where the details of structural components are within the close visual inspection range of the surveyor, i.e. normally within reach of hand.

## I3. ANNUAL SURVEY

### 100. Annual Survey

101. The survey is to consist of an examination to verify, as far as is practicable, that the bow, inner, side shell and stern doors are maintained in a satisfactory condition.

102. Confirmation is to be obtained that no unapproved changes have been made to the bow, inner, side shell and stern doors since the last survey.

103. Documents: if an Operating and Maintenance Manual (OMM) is required, it is to be verified that an approved copy is on board and any possible modifications are included. It is to be verified that documented operating procedures for closing and securing doors are kept on board and posted at an appropriate place. The surveyor shall examine the OMM with special attention to the register of inspections and its contents as a basis for the survey.

104. Structural examination: Bow, inner, side shell and stern doors are to be examined with particular attention paid to:

- a. Structural arrangement of doors including plating, secondary stiffeners, primary structure, hinging arms and welding;



- b. Shell structure surrounding the opening of the doors and the securing, supporting and locking devices including shell plating, secondary stiffeners, primary structure, and welding;
- c. Hinges and bearings, thrust bearings;
- d. Hull and door side supports for securing, supporting and locking devices;
- e. Close-up survey of securing, supporting and locking devices including welding, refer to Subchapter I5 below.

105. Whenever a crack is found, an examination with NDT is to be carried out in the surrounding area and for similar items as considered necessary by the surveyor.

106. **Measurement of clearances:** 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.

107. **Sealing arrangement:** an examination of packing material / rubber gaskets and retaining bars or channels, including welding is to be carried out.

108. **Drainage arrangement:** an examination of drainage arrangement, including bilge wells and drain pipes is to be carried out, where fitted. A test of the bilge system between the inner and outer doors is to be carried out.

109. **Function test of doors:** checking of the satisfactory operation of the bow, inner, side shell and stern doors during a complete opening and closing operation is to be made, as applicable, including:

- a. Proper working of the hinging arms and hinges;
- b. Proper engagement of the thrust bearings;
- c. Device for locking the door in the open position;
- d. Securing, supporting and locking devices;
- e. Proper sequence of the interlock system for the opening / closing system and the securing and locking devices;
- f. Mechanical lock of the securing devices;
- g. Proper locking of hydraulic securing devices in the event of a loss of the hydraulic fluid, according to the procedure provided by the OMM;

- h. Correct indication of open / closed position of doors and securing / locking devices at navigation bridge and other control stations;
- i. Isolation of the hydraulic securing / locking devices from other hydraulic systems;
- j. Confirmation that the operating panels are inaccessible to unauthorized persons;
- k. Verification that a notice plate giving instructions to the effect that all securing devices are to be closed and locked before leaving harbour is placed at each operating panel and supplemented by warning indicator lights;
- l. Examination of electrical equipment for opening, closing and securing the doors.

110. **Function test of the indicator system:** Checking of the satisfactory operation of the indicator system, where fitted, is to be carried out, as applicable, including:

- a. Proper visible indication and audible alarm on the navigation bridge panel, according to the selected function "harbour / sea voyage" and on the operating panel;
- b. Lamp test function on both panels;
- c. Verification that it is not possible to turn off the indicator light on both panels;
- d. Verification of fail safe performance, according to the procedure provided by the OMM;
- e. Confirmation that power supply for indicator system is supplied by the emergency source or other secure power supply and independent of the power supply for operating the doors;
- f. Proper condition of sensors and protection from water, ice formation and mechanical damage.

111. **Test of water leakage detection system:** Where fitted, the water leakage detection system is to be tested including proper audible alarm on the navigation bridge panel and on the engine control room panel, according to the procedure provided by the OMM.

112. **Test of television surveillance system:** Where fitted, the television surveillance system is to be tested including proper indication on the navigation bridge monitor and on the engine control room monitor.

113. **Tightness test:** A hose test or equivalent is to be carried out. If the visual examination and function test have shown satisfactory results, the tightness test of shell doors on Ro-Ro cargo ships need not be carried out unless considered necessary by the attending surveyor.



**114. NDT and Thickness Measurements:** When considered necessary by the surveyor, NDT and thickness measurements may be required after visual examination and function test.

## **14. RENEWAL SURVEYS**

### **100. Renewal Survey**

101. The Renewal Survey is to include, in addition to the requirements of the Annual Survey, examination, tests and checks of sufficient extent to verify that the bow, inner, side shell and stern doors, are in satisfactory condition and considered able to remain in compliance with applicable requirements, subject to proper maintenance and operation in accordance with the Operation and Maintenance Manual (OMM) or manufacturer's recommendations and the periodical surveys being carried out at the due dates for the five year period until the next Renewal Survey.

102. The examinations of the doors are to be supplemented by thickness measurements and testing to verify compliance with applicable requirements so that the structural and weathertight integrity remain effective. The aim of the examination is to identify corrosion, significant deformation, fractures, damages or other structural deterioration, that may be present.

103. The bow, inner, side shell and stern doors are to be surveyed as follows:

- a. A survey of the items listed in I3.104, including close-up survey of securing, supporting and locking devices, together with welding, is to be carried out. Reference is made to Chapter I5.
- b. Non-destructive testing and thickness measurements are to be carried out on securing, supporting and locking devices, including welding, to the extent considered necessary by the surveyor. Whenever a crack is found, an examination with NDT is to be carried out in the surrounding area and for similar items as considered necessary by the surveyor.
- c. The maximum thickness diminution of hinging arms, securing, supporting and locking devices is to be treated according to the normal procedure for each RBNA for primary structures, but is not to be more than 15% of the as-built thickness or the maximum corrosion allowance of that Society, whichever is less. RBNA may consider specific cases provided that the relevant documents are presented for approval.
- d. Checking the effectiveness of sealing arrangements by hose testing or equivalent is to be carried out.
- e. 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.

- f. The non-return valves of the drainage system are to be dismantled and examined.

## **I5. MINIMUM REQUIREMENTS FOR CLOSE-UP SURVEYS OF DOORS, LOCKING, SECURING AND SUPPORTING DEVICES AND FITTINGS**

[IACS UR Z24 Table V]

### **100. Minimum Requirements for Close-Up Surveys of Doors, Locking, Securing and Supporting Devices and Fittings**

101. The following is a list of the devices and fittings and associated welding to be subject to close-up survey by the attending Surveyor.

- a. Cylinder securing pins, supporting brackets, back-up brackets (where fitted) and their welded connections;
- b. Hinge pins, supporting brackets, back-up brackets (where fitted) and their welded connections;
- c. Locking hooks, securing pins, supporting brackets, back-up brackets (where fitted) and their welded connections;
- d. Locking pins, supporting brackets, back-up brackets (where fitted) and their welded connections;
- e. Locating and stopper devices and their welded connections.

## CHAPTER J REQUIREMENTS FOR THE SURVEYOR

### CHAPTER CONTENTS

#### J1. HOW TO CONTROL THE THICKNESS MEASUREMENT PROCESS

#### J2. REQUIREMENT FOR CERTAIN ESP SURVEYS

### J1. HOW TO CONTROL THE THICKNESS MEASUREMENT PROCESS [IACS Rec 77]

#### 100. Application

101. The present Chapter J is applicable to any thickness measurement surveys irrespective of the vessel's gross tonnage. Reference is made to Chapter A above, item A2.900.

#### 200. Survey meeting

201. Prior to commencement of the survey, as required by Chapter A, Subchapters A2 and A3, a meeting is to be held between the attending surveyor(s), the owner's representative(s) in attendance and the thickness measurement firm's representative(s) so as to ensure the safe and efficient execution of the surveys and thickness measurements to be carried out onboard.

202. It is recommended that thickness measurements should be carried out in a single operation, by one thickness measurement firm. If, however, thickness measurements are carried out in several operations during the allowable period for the survey and/or by different thickness measurement firms, separate survey meetings should be held at each time.

203. Items that should be addressed and agreed in this meeting are among others:

- a. schedule for thickness measurements ;
- b. provisions for thickness measurements (personal safety, means of access, cleaning and de-scaling as appropriate, illumination, ventilation) ;
- c. planned scope of survey:
  - c.1. mandatory extent of thickness measurements (according to the type of vessel as defined in A1.)
  - c.2. areas subject to close-up surveys and thickness measurements including areas previously identified with substantial corrosion, if applicable.

- d. availability onboard of drawings with original scantlings ;
- e. allowable thickness diminution;
- f. taking representative readings in general and where uneven corrosion / pitting is found;
- g. procedure for additional readings of areas with substantial corrosion, if applicable (according to the type of vessel as defined in A1);
- h. communication between surveyor(s), thickness measurement operator(s) and owner's representative(s):
  - h.1. reporting of thickness measurements on regular basis;
  - h.2. prompt notification of the surveyor in case of findings;
  - h.3. excessive and/or extensive corrosion or pitting / grooving of any significance;
  - h.4. structural defects like buckling, fractures and deformed structures;
  - h.5. detached and/or holed structure;
  - h.6. corrosion of welds;
- i. the thickness measurement firm should provide information related to:
  - i.1. equipment to be used;
  - i.2. personnel records of operators scheduled for thickness measurements onboard.
- j. documented record of the survey meeting.

#### 300. Location of the thickness measurements

301. The surveyor should decide final extent and location of thickness measurements after overall survey of representative spaces onboard. In case the owner prefers to commence the thickness measurements prior to the overall survey then the surveyor shall advise that the planned extent and locations of thickness measurements are subject to confirmation during the overall survey. Based on findings, the surveyor may require that additional thickness measurements have to be taken.

#### 400. Monitoring the process

401. Prior to commencing the thickness measurements, the surveyor should:
- a. check type of equipment and verify that equipment is calibrated according to recognized national / international standards and properly labeled;

- b. witness calibration appropriate for size and type of material;
- c. be satisfied with operator's skills and competence;
- d. ensure that the thickness measurement operator will be using instruments using pulsed echo technique (either with oscilloscope or digital instruments using multiple echo). Single echo instruments may be used on uncoated surfaces, which have been properly cleaned.

402. The surveyor should direct the gauging operation by selecting locations such that readings taken represent, on average, the condition of the structure for that area.

403. Thickness measurements mainly to evaluate the extent of corrosion, which may affect the hull girder strength, should be carried out in a systematic manner of all longitudinal structural members. The surveyor should be in attendance during this process.

404. Thickness measurements of structures in areas where close-up surveys are required shall be carried out simultaneously with the close-up surveys in order to facilitate a meaningful survey.

405. The surveyor may specially consider the extent of thickness measurements of structures within spaces where the protective coating is found to be in GOOD condition.

406. Where thickness measurements indicate substantial corrosion or excessive diminution the surveyor should direct locations for additional thickness measurements in order to delineate areas of substantial corrosion and to identify structural members for repairs / renewals.

## 500 Review and verification

501. Upon completion of the thickness measurements, the surveyor should confirm that no further gauging are needed, or specify additional gauging.

502. If extent of thickness measurements has been reduced, the surveyor's special consideration should be reported.

503. In case thickness measurements are partly carried out, the extent of remaining thickness measurements should be reported for the use of the next surveyor.

504. Surveyor should confirm that the proper thickness measurement reporting forms were used if the ship is under the ESP programme.

505. Upon completion of the thickness measurements onboard, the surveyor should verify and keep a copy of the preliminary thickness measurement report signed by the operator.

506. Upon review that the final gauging report is consistent with the preliminary report, the Surveyor is to countersign the cover page of the final report. The

Surveyor should keep the preliminary report, as a minimum, until the review is completed.

507. Excessive corrosion is an extent of corrosion that exceeds the allowable limit. Extensive corrosion is an extent of corrosion consisting of hard and/or loose scale, including pitting, over 70% or more of the area under consideration, accompanied by evidence of thickness diminution.

## J2. REQUIREMENT FOR CERTAIN ESP SURVEYS [IACS PR20]

### 100. Requirements

101. The objective of this requirement is to improve the quality of surveys. Taking into consideration, the size of vessels and scope of surveys for vessels noted below, it is more effective to have more than one surveyor examine the required spaces, holds or tanks and to provide mutual support and consultation during the surveys in recommending repairs and actions required for conditions of Class / Recommendations.

102. On ships 20,000 tonnes DWT and above, subject to ESP, starting with renewal survey No.3 (after 15 years), all special and intermediate hull classification surveys are to be carried out by at least two exclusive surveyors. On bulk carriers 100,000 dwt and above of single side skin construction the intermediate hull classification survey between 10 and 15 years of age is to be performed by two exclusive surveyors.

103. This requires that at least two exclusive surveyors attend on board at the same time to perform the required survey where complete with relevant laws and regulations. On dual class vessels, the requirement for two surveyors may be fulfilled by having one surveyor attend from each Society.

104. Though each attending surveyor is not required to perform all aspects of the required survey, they are required to consult with each other and to do joint overall and close-up surveys to the extent necessary to determine the condition of the vessel. The extent of these surveys should be sufficient for the surveyors to agree on actions required to complete the survey with respect to renewals, repairs, and other recommendations or conditions of class. Each surveyor is required to co-sign the survey report or indicate their concurrence in an equivalent manner.

105. The following surveys may be witnessed by a single Surveyor:

- a. -Thickness measurements in accordance with Procedural Requirement 19;
- b. Tank testing in accordance with the applicable Part II, Title 11, Chapter T, Subchapter T.6;

- c. -Repairs carried out in association with Intermediate and Special Hull Classification Survey, the extent of which have been agreed upon by the required two surveyors during the course of the surveys.

106. Surveyors used to fulfil this requirement are to be qualified in the survey processes involved.

107. The onboard attendance of the surveyors is to be documented according to the RBNA procedures.

#### J4. GUIDELINES FOR CONSTRUCTION, INSTALLATION, MAINTENANCE AND INSPECTION/SURVEY OF MEANS OF EMBARKATION AND DISEMBARKATION

##### Guidance

MSC.1/Circ. 1331 refers to:

##### Quote

*Guidelines for construction, installation, maintenance and inspection/survey of means of embarkation and disembarkation*

##### Application

*This document is intended to provide Guidelines for the construction, installation, maintenance and inspection/survey of means of embarkation and disembarkation required under regulation II-1/3-9 of the 1974 SOLAS Convention, adopted by resolution MSC.256(84). Where means of embarkation and disembarkation other than those specifically covered by these Guidelines are fitted, an equivalent level of safety should be provided.*

##### Unquote

*The text of IACS Rec 119 refers to the uniform application of such regulations.*

##### End of guidance

#### 100. Uniform application of solas reg. II-1/3-9 in association with msc.1/circ.1331 [IACS REC 119]

101. The applied loads for new and existing Winches, Accommodation Ladders and Ship's Gangways during initial, annual and renewal surveys of Safety Equipment are given in Table T.J4.101.1 below:

**TABLE T.J4.101.1 - APPLIED LOADS FOR NEW AND EXISTING WINCHES, ACCOMMODATION LADDERS AND SHIP'S GANGWAYS DURING INITIAL, ANNUAL AND RENEWAL SURVEYS OF SAFETY EQUIPMENT**

Survey	Testing	Winch/Accommodation Ladder <sup>[1]</sup> Arrangement	Gangway <sup>[2]</sup>
Initial Installation <sup>[4]</sup>	Static Load Test (no permanent deformation permitted)	Apply load per §5.3.2 uniformly with winch suspending ladder in horizontal position	n/a
	Operational Test	Apply §3.6.2 with weight of ladder only (raise and lower ladder at least twice)	n/a
Renewal (5 years) <sup>[3] [5]</sup>	Static Load Test (no permanent deformation permitted)	Apply load per §5.3.2 <sup>[2]</sup> uniformly with winch holding ladder in horizontal position	Apply §5.1.2.2 with load per §5.3.2 <sup>[3]</sup> applied uniformly to gangway in horizontal position
	Operational Test	Raise and lower ladder once (weight of ladder only)	n/a
Annual <sup>[5]</sup>	No load testing to be carried out; only examination of components		
1 - Includes landing platforms if fitted 2 - Only when carried onboard the ship 3 - If MWL unknown for existing gangways/ladders, owner nominates load as per §5.3.2 4 - Ships Constructed on/after 1 Jan 2010 and Equipment replaced on existing ships on/after 1 Jan 2010 5 - All installations, regardless of installation or ship construction date § refers to paragraphs from MSC.1/Circ.1331			

102. Measurement of deflections is not required after testing. Instead, a visual inspection should be carried out to ensure that there is no damage or permanent deformation after testing.

*Quote*

**INSTALLATION**

**3.1 Location:** *as far as practicable, the means of embarkation and disembarkation should be sited clear of the working area and should not be placed where cargo or other suspended loads may pass overhead.*

*Unquote*

103. The tests required in MSC.1/Circ.1331 paragraphs 5.1.1.2 for accommodation ladders, 5.1.2.2 for gangways and 5.2.2 for winches should be carried out with:

- a. a static test by applying the test load as required in paragraph 5.3.2; and
- b. an operational test (raising and lowering) with only the weight of accommodation ladder and no additional test load and are to be completed at the time of the passenger ship safety survey or cargo ship safety equipment survey, not later than 5 years after 1 Jan 2010 for existing arrangements on existing ships and, thereafter, at intervals no more than 5 years measured from the completion of the first test.

**Guidance**

**Definitions**

- **Accommodation ladders** are ladders usually built from aluminium which are fitted with curved steps adequate to grant secure stepping at a range of inclination angles. Such ladders can rotate laterally and longitudinally.
- **Gangways** are rigid structures which are placed in ships having small freeboards such as in supply offshore vessels. There may be a winch to handle the gangway.

**Text of MSC.1/Circ.1331 for tests:**

**5.1.1 Accommodation ladder**

**5.1.1.1** *The following items should be thoroughly examined during annual surveys required by SOLAS regulations I/7 and I/8 and checked for satisfactory condition of the accommodation ladder:*

- *steps;*
- *platforms;*
- *all support points such as pivots, rollers, etc.;*
- *all suspension points such as lugs, brackets, etc.;*
- *stanchions, rigid handrails, hand ropes and turntables;*

- *davit structure, wire and sheaves, etc.; and*
- *any other relevant provisions stated in these Guidelines.*

**5.1.1.2** *At every five-yearly survey, upon completion of the examination required by paragraph 5.1.1.1, the accommodation ladder should be operationally tested with the specified maximum operational load of the ladder.*

**5.1.2 Gangway**

**5.1.2.1** *The following items should be thoroughly examined during annual surveys required by SOLAS regulations I/7 and I/8 and checked for satisfactory condition of the gangway:*

- .1 *treads;*
- .2 *side stringers, cross-members, decking, deck plates, etc.;*
- .3 *all support points such as wheel, roller, etc.;*
- .4 *stanchions, rigid handrails, hand ropes; and*
- .5 *any other relevant provisions stated in these Guidelines.*

**5.1.2.2** *At every five-yearly survey, upon completion of the examination required by paragraph 5.1.2.1, the gangway should be operationally tested with the specified maximum operational load of the gangway.*

**5.2 Winch**

**5.2.1** *During annual surveys required by SOLAS regulations I/7 and I/8, the following items should be examined for satisfactory condition:*

- .1 *brake mechanism including condition of brake pads and band brake, if fitted;*
- .2 *remote control system; and*
- .3 *power supply system (motor).*

**5.2.2** *At every five-yearly survey, upon completion of the examination required by paragraph 5.2.1, the winch should be operationally tested with the specified maximum operational load of the accommodation ladder.*

*End of guidance*



## **CHAPTER K**

### **SURVEY GUIDELINES FOR TANKS IN WHICH SOFT COATINGS HAVE BEEN APPLIED**

#### **[IACS REC 116]**

#### **CHAPTER CONTENTS**

#### **K1. SURVEY GUIDELINES FOR TANKS IN WHICH SOFT COATINGS HAVE BEEN APPLIED**

##### **[IACS REC 116]**

#### **K1. SURVEY GUIDELINES FOR TANKS IN WHICH SOFT COATINGS HAVE BEEN APPLIED**

##### **100. Introduction**

101. The requirements in the present Chapter K a solution on the method of the 5 year field procedure given in table 1.1.3 of MSC.288 (87).

##### **200 Years field exposure**

201. Coating manufacturer's records, should include the information indicated in item 202 and should be examined to confirm coating system has 5 years field exposure, and the current product is the same as that being assessed.

##### **202. Manufacturer's Records**

- a. Original application records
- b. Original coating specification
- c. Original technical data sheet
- d. Current formulation's unique identification (Code or number)
- e. If the mixing ratio of base and curing agent has changed, a statement from the coating manufacturer confirming that the composition of the mixed product is the same as the original composition. This should be accompanied by an explanation of the modifications made.
- f. Current technical data sheet for the current production site
- g. Specific Gravity (SG) and Infra Red (IR) identification of original product
- h. SG and IR identification of the current product
- i. If original SG and IR cannot be provided then a statement from the coating manufacturer confirming the readings for the current product are the same as those of the original

203. Either class survey records should be reviewed, or a joint (coating manufacturer and RO) survey of cargo tanks of a selected vessel should be carried out, to verify compliance with the requirements of item 201 and 207. The reporting of the coating condition in both cases should be in accordance with the principles given in section 4 of MSC.1/Circ. 1330.

204. The selected vessel should have cargo tanks in regular use, of which:

- a. At least one tank is exposed to minimum temperature of 60 degree C plus or minus 3 degree
- b. For field exposure the ship should be trading in varied trade routes and carrying substantial varieties of crude oils including highest temperature and lowest pH limits to provide a realistic sample: for example, three ships in three different trade areas with different varieties of crude cargoes

205. In the case that the selected vessel does not meet the requirements in item 204 then the limitations on lowest pH and highest temperature of crude oils carried should be clearly stated on the type approval certificate.

206. In all cases of approval by field exposure for 5 years, the shop primer should be removed prior to application of the approved epoxy based system coating, unless it can be confirmed that the shop primer applied during construction, is identical in formulation to that applied in the selected vessel used as a basis of the approval.

207. All cargo tanks should be in "GOOD" condition excluding mechanical damages, without touch up or repair in the prior 5 years.

- a. "Good" is defined as: Condition with spot rusting on less than 3% of the area under consideration without visible failure of the coating. Rusting at edges or welds, must be on less than 20% of edges or welds in the area under consideration." "Area under consideration" is the area defined as per PSPC-COT 4.4 and 4.5. In evaluating the figures given in the definition, an under deck area and an inner bottom area are to be treated separately.

208. If the applied NDFT is greater than required by the PSPC, the applied NDFT should be the minimum to be applied during construction. This will be reported prominently on the Type Approval Certificate.

209. If the results of the inspection are satisfactory, a Type Approval Certificate should be issued to include both the epoxy based system and the shop primer. The Type Approval Certificate should allow the use of the epoxy based system either with the named shop primer or on bare prepared steel. The Type Approval Certificate should reference the inspection report which should also form part of the Coating Technical File.

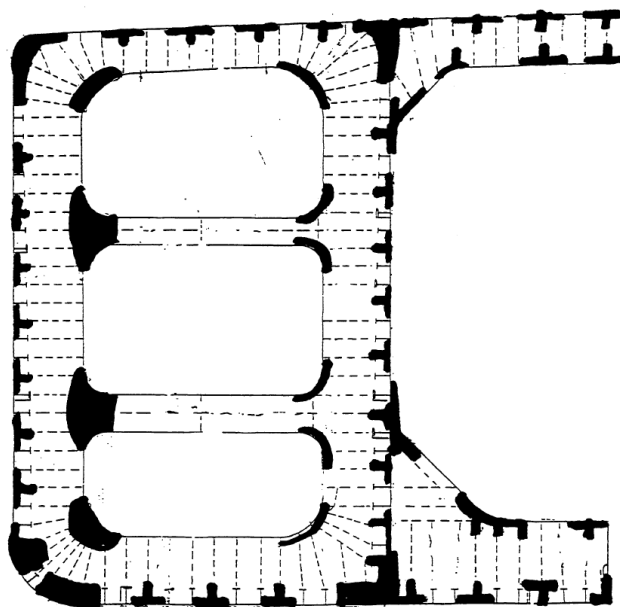


210. The Type Approval Certificate should be considered invalid if the formulation of either the epoxy based system or the shop primer is changed. It is the

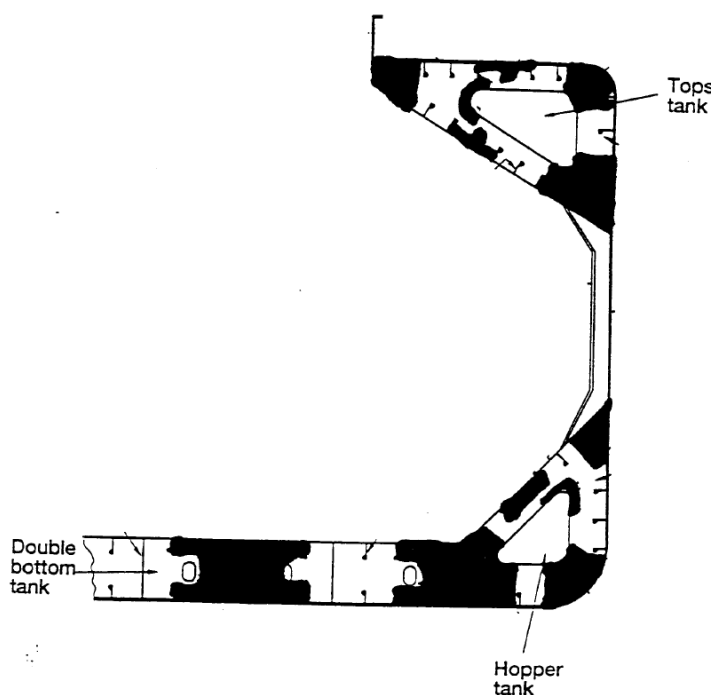
responsibility of the coating manufacturer to inform the RO that provided the Type Approval of any changes to the formulation.

**FIGURE F.K1.203.1 - SHADED AREAS INDICATE GUIDANCE FOR THE REMOVAL OF SOFT COATINGS AT ONE TRANSVERSE RING FRAME IN EACH TANK REQUIRING OVERALL SURVEY.**

### OIL CARRIER



### Bulk Carrier



## CHAPTER L TOLERANCE LIMITS IN SURVEYS

### CHAPTER CONTENTS

- L1. HULL TOLERANCES AND WEAR
- L2. SHAFTLINE TOLERANCES AND WEAR
- L3. PROPELLER FITTING TO TAILSHAFT
- L4. RECOMMENDED MAXIMUM ALLOWABLE RUDDER PINTLE CLEARANCE
- L5. TOLERANCES IN SHIPBUILDING AND REPAIRS

### L1. HULL TOLERANCES AND WEAR

#### 100. Application

101. Where the thickness measurements of the hull plating, web of the structural members, and the Measurements of the nominal anchor chain diameter present wear exceeding the allowable limits, the affected areas or anchor chain shots are to be replaced.

102. Where the thickness of plates and members or anchor chain diameters as built are larger than those stipulated by the Rules, the Rule values are to be taken into account when assessing the allowable wear.

#### 103. Diminution limit of minimum longitudinal strength of ships in service

- a. The diminution limit of the minimum section modulus ( $Z_{mc}$ ) of oil tankers in service is given by the following formula:

$$Z_{mc} = cL^2 B(C_b + 0.7)k \quad (\text{cm}^3)$$

where

$L$  = Length of ships.  $L$  is the distance, in metres, on the summer load waterline from the fore side of stem to the after side of the rudder post, or the centre of the rudder stock if there is no rudder post.  $L$  is not to be less than 96%, and need not be greater than 97%, of the extreme length on the summer load waterline. In ships with unusual stern and bow arrangement the length  $L$  may be specially considered.

$B$  = Greatest moulded breadth in metres.

$C_b$  = Moulded block coefficient at draught  $d$  corresponding to summer load waterline, based on  $L$  and  $B$ .  $C_b$  is not to be taken less than 0.60.

$$C_b = \frac{\text{moulded displacement (m}^3\text{) at draught } d}{L \times B \times d}$$

$$c = 0.9 c_n$$

$$c_n = 10.75 - \left( \frac{300 - L}{100} \right)^{1.5} \quad \text{for } 130 \text{ m} \leq L \leq 300 \text{ m}$$

$$c_n = 10.75 \quad \text{for } 300 \text{ m} \leq L \leq 350 \text{ m}$$

$$c_n = 10.75 - \left( \frac{L - 350}{150} \right)^{1.5} \quad \text{for } 350 \text{ m} \leq L \leq 500 \text{ m}$$

$k$  = material factor, e.g.

$k = 1.0$  for mild steel with yield stress of 235N/mm<sup>2</sup> and over;

$k = 0.78$  for high tensile steel with yield stress of 315N/mm<sup>2</sup> and over;

$k = 0.72$  for high tensile steel with yield stress of 355N/mm<sup>2</sup> and over.

#### 200. Tolerance in the longitudinal strength

201. Allowable reduction in the hull girder actual section modulus: 10%.

#### 300. Tolerance in localized strength

301. Allowable reduction in the scantlings of plates and stiffener webs:

- a. regions within the midship 0.5  $L$ : 20%;
- b. regions within the ends of 0.25  $L$ : 25%;

302. The tolerance for bending between stiffeners in plating on existing vessels is:

- a.  $2.6 * t + 10\%$  for  $t \leq 16.7 \text{ mm}$ ;
- b.  $2.1 * t$  for  $t > 16.7 \text{ mm}$ .

where:

$t$  = thickness of plating,

303. The tolerance for pitting wells combined with their dispersions is given in the following Table T.L1.303.1 – Dispersion of corrosion pitting wells to illustrate the dispersion.

**TABLE T.L1.303.1 – DISPERSION OF CORROSION  
PITTING WELLS**

Dispersion (%)	Average maximum depth (% of the original thickness)
isolated	35,0
5	31,5
10	32,0
15	30,5
20	29,0
25	27,5
30	28,0
40	23,0
50	40,0

304. If the intensity of the pitting in an area where a coating is required is greater than 15% (see Table T.L1.303.1) measurements are to be taken of the thickness to verify the extent of pitting corrosion.

305. In cases where the pitting exceeds 15%, an area of 300 mm or more from the most affected part by pitting is to be cleaned up to the metal and the thickness is to be measured in five of the largest pitting wells within the

clean area. The lowest thickness measured out of the five wells should be taken as the thickness to be recorded.

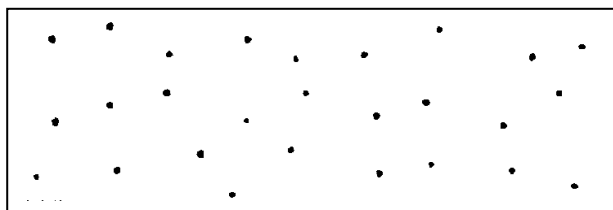
306. The minimum thickness in the remaining pitting wells, grooving channels or other local areas is not to exceed:

- 75% of the original thickness of the frames, bilge brackets and flanges of side transverses
- 90% of the original side shell plating and inclined plating of the hopper and top side tanks over a width of 30 mm on each side of the frame, without being greater than the  $t$  for renewal.

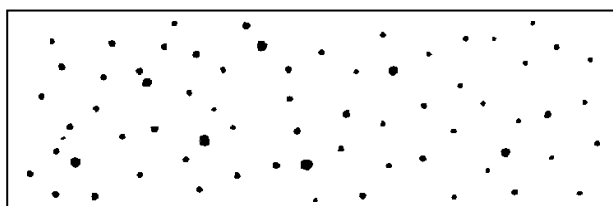
307 The application of fibrous materials (plastic or epoxy compounds) is recommended as a means to stop or to interrupt or to reduce the corrosion process, but is not considered acceptable for repair where the pitting wells exceed the maximum allowable limits. Repairs by welding may be accepted only when carried out in accordance with procedures previously approved by RBNA.

**TABLE T.L1.302.1 – PITTING INTENSITY DIAGRAM**

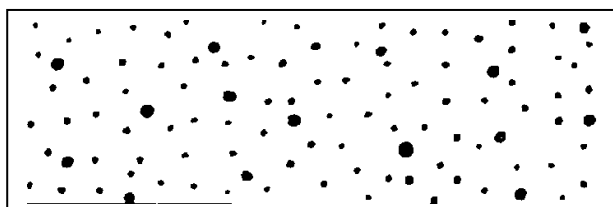
1% DISPERSION



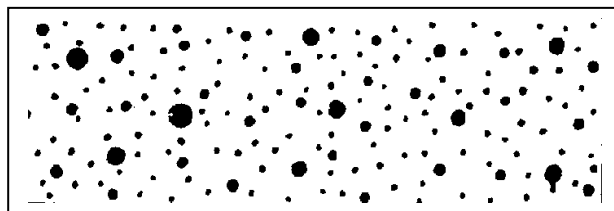
2,5% DISPERSION



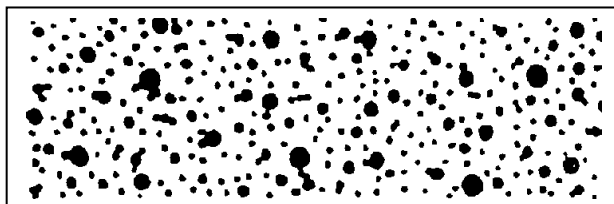
5 % DISPERSION



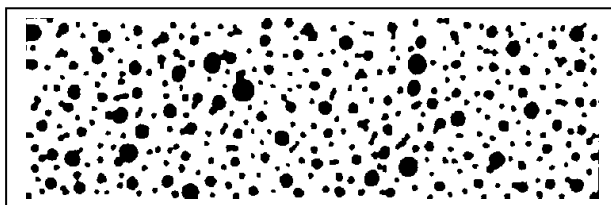
10 % DISPERSION



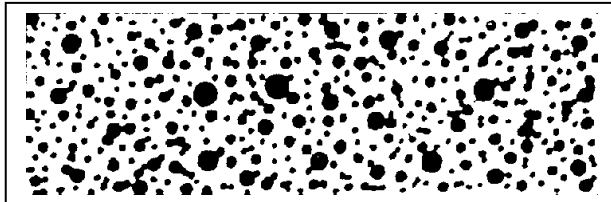
20 % DISPERSION



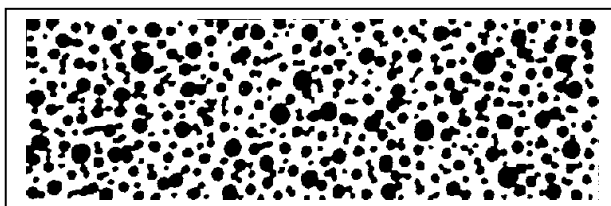
25 % DISPERSION



25 % DISPERSION



40 % DISPERSION



#### 400. Tolerances for anchor chains and accessories

401. Allowable reduction in nominal diameter of the chains for two measurements taken in the most worn sections over the two ends, extending for a minimum of three links, at each shot of 27.5 m: 12%.

#### 500. Tolerances for the anchors

501. Allowable reduction in the mass of anchors: 10%.

#### L2. TOLERANCES AND WEAR IN SHAFT LINES

##### 100. Bending deflections in propeller shafts

101. The bending deflection of propeller shafts is not to be larger than the value given by the equation:

$$f_e = 0,05 \times L_p$$

where:

$f_e$  = bending deflection in mm

$L_p$  = length of the drive shaft in m

## 200. Liners of propeller shafts

201. The liners of propeller shafts are to be overhauled and / or replaced when wear exceeds the value given by the equation:

$$em = 0,7 \times e$$

where:

em = minimum thickness or the liner in mm  
e = original thickness of the liner in mm

## 300. Water lubricated metal bearings

301. Metal bearings lubricated by water are to be refilled when the wear exceeds the value given by the equation

$$fm = dp \times C$$

where:

fm = maximum allowable bearing clearance in mm

dp = diameter of the propeller shaft in mm

C = constant determined below:

$$C = 0,030 \text{ for } dp \leq 150$$

$$C = 0,025 \text{ for } dp > 150 \leq 250$$

$$C = 0,020 \text{ for } dp > 250 \leq 350$$

$$C = 0,015 \text{ for } dp > 350 \leq 450$$

## 400. Water lubricated rubber bearings

401. The rubber bearings lubricated by water are to be refilled when the wear in any slot for passage of water exceeds the value given by the equation:

$$fm = 0,5 \times Pe$$

Where:

fm = maximum allowable bearing clearance in mm

Pe = original depth of the slot for lubrication of the bearing in mm

## 500. Oil lubricated metal bearings

501. The metal bearings lubricated by oil are to be overhauled when the wear exceeds the value given by the equation:

$$fm = dp \times C$$

where:

fm = Maximum allowable bearing clearance in mm.

dp = Diameter of the propeller shaft in mm

C = constant determined below:

$$C = 0,025 \text{ for } dp \leq 200$$

$$C = 0,020 \text{ for } dp > 200 \leq 300$$

$$C = 0,015 \text{ for } dp > 300 \leq 500$$

## L3. PROPELLER FITTING

### 100. Contact Area

101. The fitting between the propeller boss and the cone of the propeller shaft is to be obtained so that the contact area between the parts is substantial and distributed. The theoretical minimum acceptable percentage for the contact area will be equal to or greater than the following values:

- Propeller mounted on keyless cone: 70 %;
- Propeller mounted on cone with key: 80 %.

## L4. RECOMMENDED MAXIMUM ALLOWABLE RUDDER PINTLE CLEARANCE [IACS REC 61]

### 100. Rudder pintle clearance

101. Renewal limits are based upon pintle diameter without exceeding the following limits:

- Spade type rudders: 6 mm.
- Other rudders: 7.5 mm.

102. Special consideration is to be given to metal bearings and unique rudder types.

## L5. TOLERANCES IN SHIPBUILDING AND REPAIRS

### 100. Tolerances in shipbuilding and repair

101. The tolerances in IACS Rec 47 are to be applied.

## CHAPTER M REPORTING BY SURVEYORS OF DEFICIENCIES RELATING TO POSSIBLE SAFETY MANAGEMENT SYSTEM FAILURES [IACS PR17]

### CHAPTER CONTENTS

#### M1. INTRODUCTION

#### M2. SCOPE AND APPLICATION

### M1. INTRODUCTION

#### 100. Introduction

102. The purpose of this Chapter M is to ensure that the Organisation responsible for the issue of a SMC is notified when deficiencies relating to possible safety management system failures are identified by a surveyor.

### M2. SCOPE AND APPLICATION

#### 100. Application

101. The purpose of this Chapter, based on IACS PR17, is to ensure that the Organisation responsible for the issue of a SMC is notified when deficiencies relating to possible safety management system failures are identified by a surveyor.

102. This Chapter M describes the procedure for reporting by surveyors of deficiencies relating to possible safety management system failures and the subsequent action to be taken.

103. This procedure applies to all cases of Classification Societies' involvement in classing the ship and/or in issuing the SMC.

#### 200. Definitions

201. **"International Safety Management (ISM) Code"** means the International Management Code for the Safe Operation of Ships and for Pollution Prevention.

202. **"Document of Compliance"** (DOC) means a document issued to a Company that complies with the requirements of the ISM Code.

203. **"Safety Management Certificate"** (SMC) means a document issued to a ship which signifies that the company and its shipboard management operate in accordance with the approved safety management system.

204. **"Safety Management System"** (SMS) means a structured and documented system enabling Company personnel to implement effectively the company's safety and environmental protection policy.

205. **"Deficiency"** means a defect in, or a failure in the operation of, a part of the ship's structure or its machinery, equipment, fittings, or a failure in the documentation.

206. **"Report"** means the documentation completed by the surveyor containing as a minimum the information shown in Annex 1. The report may be in any format decided by the Classification Society.

### 300. When to complete the report

301. When deficiencies relating to possible safety management system failures are identified by the Surveyor during a periodical (Annual/Intermediate/Renewal) Class Survey or occasional Class Survey, Statutory Surveys, additional surveys relevant to Port State Control, Flag State Inspections or any other occasion, a report is to be completed by the Surveyor.

302. The RBNA shall internally document implementation of this Chapter (PR17), regardless if deficiencies have been found (for example "Deficiencies reported under PR17: Yes/No").

### 400. What to report

401. The following shall be reported by the surveyor.

- deficiencies relating to technical conditions which may lead to the limitation,
- suspension or withdrawal of a Class or Statutory Certificate;
- deficiencies relating to documentation;
- deficiencies relating to operational requirements;
- other deficiencies which may seriously affect the safety of ship, personnel or the
- environment.

402. The surveyor must inform the master or Company representative that this information may be communicated to the Organisation responsible for the issue of the SMC.

### 500. Reporting and follow up

501. The report shall be submitted to the **responsible department within the surveyor's Society for review**. The **responsible department** should finally judge whether the reported deficiencies are possibly related to SMS failures.

502. When the responsible department within the surveyor's society judges that the reported deficiencies are not related to possible SMS failures the report is to be filed.

503. When the responsible department within the surveyor's society judges that the reported deficiencies are related to possible SMS failures the report shall be sent to either:

- the Classification Society that has issued the SMC, if the contact details can be found on the IACS



website: [www.iacs.org.uk](http://www.iacs.org.uk), located under: PR17  
Contact Details, or

- b. the flag Administration, if the SMC is issued by the flag Administration.

#### *Guidance*

*It is not unusual for the SMC Certification to be done by a Class Society other than the official Class Society of the vessel.*

*In such cases, the report is to be forwarded to the Society responsible for the SMC certification, registered on the above mentioned IACS website.*

*However, a Flag Administration, such as DPC, may issue the SMC certificate; in this case, the report is forwarded to the Flag Administration.*

*In short, the report is to be issued to the Society or Flag Administration responsible for the SMC certification.*

#### *End of Guidance*

504. The Classification Society that has issued the SMC shall review the report, and decide on what action, if any, should be taken.

506. Minimum contents of the Report on deficiencies related to possible Safety Management System failures: the report shall bear the title “Safety Management System failure according to IACS PR 17”

- a. Identification of ship
    - a.1. IMO number
    - a.2. Ship’s name
    - a.3. Flag
  - b. Identification of Survey / Attendance
  - c. Identification of SMC
    - c.1. Issuer of the SMC
    - c.2. Issuer of the DOC
  - d. Category of Deficiency
    - d.1. Technical
    - d.2. Operational
    - d.3. Documentation
    - d.4. Other
  - e. Details of deficiencies
507. Guidance for what to report:

**TABLE T.M2.507.1 – GUIDANCE TO REPORT**

Category of deficiency Examples	Category of deficiency Examples
Technical deficiencies	<ul style="list-style-type: none"> <li>- Combination of deficiencies, that together indicates that the maintenance system is not effectively implemented.</li> <li>- Poor condition of hull, main deck, closing appliances, railings, ladders</li> <li>- Defective / missing firefighting and lifesaving appliances, oil pollution prevention equipment.</li> <li>- Leaks and oil in E/R spaces, pump-rooms etc.</li> </ul> <p>Deficiencies should not be reported, when:</p> <ul style="list-style-type: none"> <li>- they are considered normal wear and tear for the ship type and age and</li> <li>- there is evidence that deficiencies are being dealt with adequately by</li> <li>- the Company including the personnel working on board.</li> </ul>
Documentation deficiencies	<p>Expired classification or statutory certificates or certificates not endorsed as required.</p> <ul style="list-style-type: none"> <li>- Overdue surveys, overdue audits or overdue conditions of class.</li> <li>- Ship's copy of Document of Compliance (DOC) not valid or not relevant to ship type.</li> <li>- Original Safety Management Certificate (SMC) has incorrect data or endorsements missing.</li> <li>- Entries for relevant drills etc. in Log Book not completed in accordance with mandatory requirements.</li> <li>- Fire Plan not up to date</li> </ul>
Operational deficiencies	<p>Accidents and hazardous occurrences not reported to the Company.</p> <ul style="list-style-type: none"> <li>- Crew not able to satisfactorily conduct practical demonstrations of shipboard operations, such as starting the fire pump, emergency generator, lifeboat engine, etc.</li> <li>- Crew not able to communicate effectively in the execution of their duties.</li> <li>- Inability of crew to perform satisfactorily mandatory drills such as fire drills, LSA drills, pollution prevention drills, etc.</li> </ul>
Other deficiencies	<p>Ship's complement not complying with the Minimum Safe Manning Certificate.</p> <ul style="list-style-type: none"> <li>- Master, officers and ratings not certified as required by the STCW Convention.</li> <li>- Serious deficiencies in respect to housekeeping and maintenance of galley, crew accommodation, and provisions stores.</li> </ul>

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