



RULES

PUBLICATION 36/P

HULL SURVEYS OF OIL TANKERS

July
2020

Publications P (Additional Rule Requirements) issued by Polski Rejestr Statków complete or extend the Rules and are mandatory where applicable.

GDAŃSK

Publication 36/P – Hull Surveys of Oil Tankers – July 2020, based on the IACS Unified Requirements (UR) Z10.1/Rev.23, is an extension of the requirements contained in *Part I – Classification Regulations of the Rules for Classification and Construction of Sea-going Ships*.

This *Publication* was approved by PRS Executive Board on 29 May 2020 and enters into force on 1 July 2020.

This *Publication* replaces *Publication No. 36/P – Hull Surveys of Oil Tankers, January 2019*.

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1 GENERAL

1.1 Application

1.1.1 These requirements apply to hull surveys of all self-propelled oil tankers other than double hull oil tankers.

1.1.2 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. These requirements are additional to the classification requirements applicable to the remainder of the ships.

1.1.3 The requirements contain the minimum extent of examination, thickness measurements and tank testing. The survey shall be extended when substantial corrosion and/or structural defects are found and shall include additional close-up survey when necessary.

1.2 Definitions

Ballast tank – a tank which is used solely for the carriage of salt water ballast.

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 of the part of the ship over the above mentioned spaces.

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 the reach of hand.

Coating condition – is defined as follows:

GOOD – condition with only minor spot rusting,

FAIR – condition with local breakdown at edges of stiffeners and weld connections and/or rusting over 20% or more of areas under consideration, but less than as defined for poor condition,

POOR – condition with general breakdown of coating over 20% or more of areas or hard scale at 10% or more of areas under consideration.

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/13(3) are considered as cargo tanks.

Corrosion prevention system – 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 specification.

Oil tanker – a ship which is constructed primarily to carry oil in bulk and includes ship types such as combination carriers (ore/oil ships etc.).

Overall survey – a survey intended to report on the overall condition of the hull structure and determine the extent of additional close-up surveys.

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 issuance of any condition of class.

Representative tanks – those tanks which are expected to reflect the condition of other tanks of similar type and service and with similar corrosion prevention system. When selecting representative tanks account shall be taken of the service and repair history onboard and identifiable critical structural areas and/or suspect areas.

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

Substantial corrosion – an extent of corrosion such that assessment of corrosion pattern indicates wastage in excess of the 75% of allowable margins, but within the acceptable limits.

Suspect areas – locations showing substantial corrosion and/or considered by the surveyor to be prone to rapid wastage.

Transverse section – includes all longitudinal members such as plating, longitudinals and girders at the deck, sides, bottom, inner bottom and longitudinal bulkheads. For the transversely framed ships, a transverse section includes adjacent frames and their end connections in way of transverse sections.

1.3 Repairs

1.3.1 Any damage in association with wastage over the allowable limits (including buckling, grooving, detachment or fracture), or extensive areas of wastage over the allowable limits which affects or, in the opinion of the surveyor, will affect the ship's structural, watertight integrity, shall be promptly and thoroughly repaired. Areas to be considered include:

- bottom structure and bottom plating;
- side structure and side plating;
- deck structure and deck plating;
- watertight or oiltight bulkheads;
- hatch covers or hatch coamings, where fitted (combination carriers).

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

1.3.2 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 shall be implemented before the ship continues service.

1.3.3 Where the damage found on structure mentioned in 1.3.1 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 weathertight integrity and issue a **condition of class** with a specific time limit.

1.4 Thickness Measurements and Close-up Surveys

In any kind of survey, i.e. class, intermediate, annual or other surveys having the scope of the foregoing ones, thickness measurements, when required by Table II, of structures in areas where close-up surveys are required, shall be performed simultaneously with close-up surveys.

2 ANNUAL SURVEY

2.1 Schedule

2.1.1 Annual Surveys shall 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 Class Renewal Survey.

2.2 Scope

2.2.1 General

2.2.1.1 The survey shall consist of an examination for the purpose of ensuring, as far as practicable, that the hull and piping are maintained in a satisfactory condition and should take into account the service history, condition and extent of the corrosion prevention system of ballast tanks and areas identified in the survey report file.

2.2.2 Examination of the Hull

2.2.2.1 Examination of the hull plating and its closing appliances as far as can be seen.

2.2.2.2 Examination of watertight penetrations as far as practicable.

2.2.3 Examination of Weather Decks

2.2.3.1 Examination of cargo tank openings including gaskets, covers, coamings and flame screens.

2.2.3.2 Examination of cargo tanks pressure/vacuum valves and flame screens.

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

2.2.3.4 Examination of cargo, crude oil washing, bunker and vent piping systems, including vent masts and headers.

2.2.4 Examination of Cargo Pump Rooms and Pipe Tunnels (if fitted)

2.2.4.1 Examination of all pump room bulkheads for signs of oil leakage or fractures and, in particular, the sealing arrangements of all penetrations of pump room bulkheads.

2.2.4.2 Examination of the condition of all piping systems.

2.2.5 Examination of Ballast Tanks

2.2.5.1 Examination of ballast tanks where required as a consequence of the results of the Class Renewal Survey (p. 4.2.3) and Intermediate Survey (p. 3.2.2.1 and 3.2.2.2) shall be performed. When considered necessary by the surveyor, or when extensive corrosion exists, thickness measurements shall be performed and if the result of these measurements indicate that substantial corrosion is found, the extent of thickness measurement shall be increased in accordance with Table IV. These extended thickness measurements shall be performed before the survey is credited as completed. Suspect areas identified at previous surveys shall be examined. Areas of substantial corrosion identified at previous surveys shall have thickness measurements taken.

3 INTERMEDIATE SURVEY

3.1 Schedule

3.1.1 The Intermediate Survey shall be held either at the 2nd or 3rd Annual Survey.

3.1.2 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.

3.1.3 Surveys and thickness measurements of spaces, once credited towards class renewal survey can not be credited towards Intermediate Survey

3.2 Scope

3.2.1 General

3.2.1.1 The survey extent is dependent on the age of the vessel, as specified in 3.2.2 to 3.2.4.

3.2.1.2 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 shall be performed. 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.

3.2.2 Oil Tankers 5 – 10 Years of Age, the following applies:

3.2.2.1 All ballast tanks shall be examined. When considered necessary by the surveyor, thickness measurements and tightness testing shall be performed to ensure that the structural integrity remains effective.

3.2.2.2 A ballast tank shall be examined at subsequent annual intervals where:

- a hard protective coating has not been applied from the time of construction, or
- a soft or semi-hard coating has been applied, or
- substantial corrosion is found within the tank, or
- 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.

3.2.2.3 In addition to the requirements above, suspect areas identified at previous surveys shall be examined.

3.2.3 Oil Tankers 10–15 Years of Age, the following applies:

3.2.3.1 The requirements of the intermediate survey are of the same extent as the previous Class Renewal Survey as required in 4. and 5.1. However, pressure testing of cargo and ballast tanks and the requirements of longitudinal strength evaluation of hull girder as required in 8.1.1.1 are not required unless deemed necessary by the attending surveyor.

3.2.3.2 In application of 3.2.3.1, 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.

3.2.3.3 An under water survey may be considered in lieu of the requirements of 4.2.2.

3.2.4 Oil Tankers over 15 years of Age, the following applies:

3.2.4.1 The requirements of the Intermediate Survey are of the same extent as the previous Class Renewal Survey as required in 4 and 5.1, however, pressure testing of cargo and ballast tanks and the requirements for longitudinal strength evaluation of hull girder as required in 8.1.1.1 are not required unless deemed necessary by the attending surveyor.

3.2.4.2 In application of 3.2.4.1, 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 4.1.4.

3.2.4.3 In application of 3.2.4.1, a survey in dry dock shall 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 shall be performed in accordance with the applicable requirements for Intermediate Surveys, if not already performed. Lower portions of the cargo and ballast tanks are considered to be the parts below light ballast water line.

4 CLASS RENEWAL SURVEY

4.1 Schedule

4.1.1 Class Renewal Surveys shall be performed at 5 years intervals to renew the Class Certificate.

4.1.2 The first Class Renewal Survey shall 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 Class 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 Class Renewal Survey before extension was granted.

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

In cases where the ship has been laid up or has been out of service for a considerable period because of a major repair or modification and the Owner elects to only perform the overdue surveys, the next period of class will start class renewal survey. If the Owner elects to perform the next due class renewal survey, the period of class will start from the survey completion date.

4.1.4 The Class 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 Class Renewal Survey is commenced prior to the 4th Annual Survey, the entire survey shall be completed within 15 months if such work is to be credited to the Class Renewal Survey.

4.1.5 Surveys and thickness measurements of spaces, once credited towards Intermediate Survey can not be credited towards Class Renewal Survey.

4.2 Scope

4.2.1 General

4.2.1.1 The Class Renewal Survey shall 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 4.2.1.3, 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 performed at the due dates.

4.2.1.2 All cargo tanks, ballast tanks, including double bottom tanks, pump rooms, pipe tunnels, cofferdams and void spaces bounding cargo tanks, decks and outer hull shall be examined, and this examination shall be supplemented by thickness measurement and testing as required in 4.4 and 4.5, to ensure that the structural integrity remains effective. The aim of the examination is to discover substantial corrosion, significant deformation, fractures, damages and other structural deterioration, that may be present.

4.2.1.3 Cargo piping on deck, including crude oil washing (COW) piping, cargo and ballast piping within the above tanks and spaces shall be examined and operationally tested under working pressure to the satisfaction of attending surveyor to ensure that tightness and condition remain satisfactory. Special attention shall be given to any ballast piping in cargo tanks and any cargo piping in ballast tanks and void spaces, and surveyors shall be advised on all occasions when this piping, including valves and fittings are open during repair periods and can be examined internally.

4.2.2 Dry Dock Survey

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

4.2.3 Tank Protection

4.2.3.1 Where provided, the condition of the corrosion protection of cargo tanks shall be examined.

A ballast tank shall be examined at subsequent annual intervals where:

- a hard protective coating has not been applied from the time of construction, or
- a soft or semi-hard coating has been applied, or
- substantial corrosion is found within the tank, or
- 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, or

Thickness measurements shall be performed as deemed necessary by the surveyor.

4.3 Extent of Overall and Close-up Survey

4.3.1 An overall survey of all tanks and spaces shall be performed at each Class Renewal Survey.

4.3.2 The minimum requirements for close-up surveys at Class Renewal Survey are given in Table I.

4.3.3 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.

4.3.4 For areas in tanks where hard protective coatings are found to be in GOOD condition, the extent of close-up surveys according to Table I may be specially considered.

4.4 Extent of Thickness Measurements

4.4.1 The minimum requirements for thickness measurements at Class Renewal Survey are given in Table II.

4.4.2 Provisions for extended measurements for areas with substantial corrosion are given in Table IV, and may be additionally specified in *Survey Programme* as required by 5.1. These extended thickness measurements shall be performed before the survey is credited as completed. Suspect areas identified at previous surveys shall be examined. Areas of substantial corrosion identified at previous surveys shall have thickness measurements taken.

4.4.3 The surveyor may further extend the thickness measurement as deemed necessary.

4.4.4 For areas in tanks where hard protective coatings are found to be in GOOD condition, the extent of thickness measurements according to Table II may be specially considered.

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

4.4.6 In cases where two or three sections shall be measured, at least one shall include a ballast tank within 0.5L amidships. In case of oil tankers of 130 m 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 8.1.1.1, the sampling method of thickness measurements is given in Annex III, Appendix 3.

4.5 Extent of Tank Testing

4.5.1 The minimum requirements for ballast tank testing at Class Renewal Survey are given in 4.5.3 and Table III.

The minimum requirements for cargo tank testing at Class Renewal Survey are given in 4.5.4 and Table III.

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

- a) a tank testing procedure specifying fill heights, tanks being filled and bulkheads being tested, has been submitted by the Owner and reviewed by PRS prior to the testing being performed;
- b) there is no record of leakage, distortion or substantial corrosion that would affect the structural integrity of the tank;
- c) the tank testing has been satisfactorily performed within class renewal survey window not more than 3 months prior to the date of the survey on which the overall or close up survey is completed;
- d) the satisfactory results of the testing is recorded in the vessel's logbook;
- e) the internal and external condition of the tanks and associated structure are found satisfactory by the Surveyor at the time of the overall and close up survey.

4.5.2 The surveyor may extend the tank testing as deemed necessary.

4.5.3 Boundaries of ballast tanks shall be tested with a head of liquid to the top of air pipes.

4.5.4 Boundaries of cargo tanks shall be tested to the highest point that liquid will rise under service conditions.

5 PREPARATIONS FOR SURVEY

5.1 Survey Programme

5.1.1 The Owner in co-operation with PRS shall work out a specific *Hull Survey Programme* prior to the commencement of any part of:

- the Class Renewal Survey,

- the Intermediate Survey for oil tanker over 10 years of age.

The *Hull Survey Programme* shall be in a written format based on the information in Annex IVA. The survey shall not commence until the *Hull Survey Programme* has been agreed. The survey programme at Intermediate Survey may consist of the survey programme at the previous Class Renewal Survey supplemented by the *Executive Hull Summary* of that Class Renewal Survey and later relevant survey reports.

Prior to the development of the *Hull Survey Programme*, the *Survey Planning Questionnaire* shall be completed by the owner based on the information set out in Annex VIB, and forwarded to PRS. The *Survey Programme* shall be worked out taking into account any amendments to the survey requirements implemented after the last Class Renewal Survey performed.

5.1.2 In developing the survey programme, the following documentation shall be collected and consulted with a view to selecting tanks, areas and structural elements to be examined:

- .1 survey status and basic ship information;
- .2 documentation on board, as described in 6.2 and 6.3;
- .3 main structural plans of cargo and ballast tanks (scantlings drawings), including information regarding use of high-tensile steels (HTS);
- .4 Executive Hull Summary;
- .5 relevant previous damage and repair history;
- .6 relevant previous survey and inspection reports from both the recognized organization and the owner;
- .7 cargo and ballast history for the last 3 years, including carriage of cargo under heated conditions;
- .8 details of the inert gas plant and tank cleaning procedures;
- .9 information and other relevant data regarding conversion or modification of the ship's cargo and ballast tanks since the time of construction;
- .10 description and history of the coating and corrosion protection system (including previous class notations), if any;
- .11 inspections by the Owner's personnel during the last 3 years with reference to structural deterioration in general, leakages in tank boundaries and piping and condition of the coating and corrosion protection system if any. Guidance for reporting is shown in Table V;
- .12 information regarding the relevant maintenance level during operation including port state control reports of inspection containing hull related deficiencies, Safety Management System non-conformities relating to hull maintenance, including the associated corrective action(s);
- .13 any other information that will help identify suspect areas and critical structural areas.

5.1.3 The submitted *Hull Survey Programme* shall account for and fulfil, as a minimum, the requirements of Tables I, II and III for close-up survey, thickness measurement and tank testing, respectively, and shall include relevant information including at least:

- .1 basic ship information and particulars;
- .2 main structural plans of cargo and ballast tanks (scantling drawings), including information regarding use of high tensile steels (HTS);
- .3 arrangement of tanks;
- .4 list of tanks with information on their use, extent of coatings and corrosion protection systems;
- .5 conditions for survey (e.g., information regarding tank cleaning, gas freeing, ventilation, lighting, etc.);
- .6 provisions and methods for access to structures;
- .7 equipment for surveys;

- .8 identification of tanks and areas for close-up survey (see 4.3);
- .9 identification of areas and sections for thickness measurement (see 4.4);
- .10 identification of tanks for tank testing (see 4.5);
- .11 identification of the thickness measurement firm;
- .12 damage experience related to the ship in question;
- .13 critical structural areas and suspect areas, where relevant.

5.1.4 PRS will advise the Owner of the maximum acceptable structural corrosion diminution levels applicable to the vessel.

5.1.5 Use may also be made of *Guidelines for Technical Assessment in Conjunction with Planning for Enhanced Surveys of Oil Tankers*, contained in Annex I. These guidelines are a recommended tool which may be invoked at the discretion of PRS, when considered necessary and appropriate, in conjunction with the preparation of the required *Survey Programme*.

5.2 Conditions for Survey

5.2.1 The Owner shall provide the necessary means for carrying out survey safety, moreover:

- .1 in order to enable the attending surveyors to perform the survey, provisions for proper and safe access, shall be agreed between the owner and PRS in accordance with PRS Instruction to Surveyors, Part I-1, Para 2.3.
- .2 details of the means of access shall be provided in the *Survey Planning Questionnaire*.
- .3 in 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 shall not proceed.

5.2.2 Tanks and spaces shall be safe for access. Tanks and spaces shall be gas free and properly ventilated. Prior to entering a tank, void or enclosed space, it shall be verified that the atmosphere in that space is free from hazardous gas and contains sufficient oxygen. Requirements of *Publication 123/P – Safe Entry to Confined Spaces* must be fulfilled.

5.2.3 In preparation for survey and thickness measurements and to allow for a thorough examination, all spaces shall be cleaned including removal from surfaces of all loose accumulated corrosion scale. Spaces shall be sufficiently clean and free from water, scale, dirt, oil residues etc. to reveal corrosion, deformation, fractures, damages, or other structural deterioration as well as the condition of the coating. 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.

5.2.4 Sufficient illumination shall be provided to reveal significant corrosion, deformation, fractures, damages or other structural deterioration.

5.2.5 Where soft or semi-hard coating have been applied, safe access shall be provided for the surveyor to verify the effectiveness of the coating and to perform 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 shall be removed.

5.3 Access to Structures

5.3.1 For overall survey, means shall be provided to enable the surveyor to examine the tank structure in a safe and practical way.

5.3.2 For close-up survey, one or more of the following means for access, acceptable to the surveyor, shall be provided:

- permanent staging and passages through structures,
- temporary staging and passages through structures,
- hydraulic arm vehicles such as conventional cherry pickers, lifts and movable platform,
- boats or rafts,
- portable ladders,
- other equivalent means.

5.4 Equipment for Survey

5.4.1 Thickness measurement is normally to be performed by means of ultrasonic test equipment. The accuracy of the equipment shall be proven to the surveyor as required.

5.4.2 One or more of the following fracture detection procedures may be required if deemed necessary by the surveyor:

- radiographic equipment,
- ultrasonic equipment,
- magnetic particle equipment,
- dye penetrant.

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

5.4.4 Adequate and safe lighting shall be provided for the safe and efficient conduct of the survey.

5.4.5 Adequate protective clothing shall be made available and used (e.g. safety helmet, gloves, safety shoes, etc.) during the survey.

5.5 Rescue and Emergency Response Equipment

If breathing apparatus and/or other equipment is used as “Rescue and emergency response equipment” then it is recommended that the equipment should be suitable for the configuration of the space being surveyed.

5.6 Survey at Sea or at Anchorage

5.6.1 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 shall be in accordance with 5.1, 5.2, 5.3 and 5.4.

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

5.6.3 Surveys of tanks by means of boats or rafts may only be undertaken with the agreement of the PRS Surveyor, who shall 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.

5.6.4 When rafts or boats are used for close-up survey, the following conditions shall be fulfilled:

- .1 only rough duty, inflatable rafts or boats, having satisfactory residual buoyancy and stability even if one chamber is ruptured, shall be used;

- .2 the boat or raft shall be tethered to the access ladder and an additional person shall be stationed down the access ladder with a clear view of the boat or raft;
- .3 appropriate lifejackets shall be available to all participants;
- .4 the surface of water in the tank shall be calm (under all foreseeable conditions the expected rise of water within the tank is not exceed 0.25 m) and the water level stationary. On no account shall the level of the water to be rising while the boat or raft is in use;
- .5 the tank or space must contain clean ballast water only. Even a thin sheen of oil on the water is not acceptable;
- .6 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;
- .7 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).

5.6.5 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.

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

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

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

5.6.7 The use of rafts or boats alone in paragraphs 5.6.5 and 5.6.6 does not preclude the use of boats or rafts to move about within a tank during a survey.

5.7 Survey Planning Meeting

5.7.1 The establishment of proper preparation and the close co-operation between the attending PRS surveyors 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 shall be held regularly.

5.7.2 Prior to commencement of any part of the renewal and intermediate survey, a survey planning meeting shall be held between the attending PRS surveyors, the owner's representative in attendance, the thickness measurement firm operator, 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 performed. See also 7.1.2

5.7.3 The following is an indicative list of items that shall be addressed in the meeting:

- .1** schedule of the vessel (i.e. the voyage, docking and undocking manoeuvres, periods alongside, cargo and ballast operations, etc.);
- .2** provisions and arrangements for thickness measurements (i.e. access, cleaning/de-scaling, illumination, ventilation, personal safety);
- .3** extent of the thickness measurements;
- .4** acceptance criteria (refer to the list of minimum thicknesses);
- .5** extent of close-up survey and thickness measurement considering the coating condition and suspect areas/areas of substantial corrosion;
- .6** execution of thickness measurements;
- .7** taking representative readings in general and where uneven corrosion/pitting is found;
- .8** mapping of areas of substantial corrosion;
- .9** communication between attending surveyor(s), the thickness measurement firm operator(s) and owner representative(s) concerning findings.

6 DOCUMENTATION ON BOARD

6.1 General

6.1.1 The Owner shall obtain, supply and maintain on board documentation as specified in 6.2 and 6.3, which shall be readily available for the surveyor.

6.1.2 The documentation shall be kept on board for the lifetime of the ship.

6.2 Survey Report File

6.2.1 A Survey Report File shall be a part of the documentation on board consisting of:

- reports of structure surveys,
- *Executive Hull Summary*,
- thickness measurement reports.

6.2.2 The Survey Report File shall also be available in the Owner's and PRS offices.

6.3 Supporting Documents

6.3.1 The following additional documentation shall be available on board:

- *Survey Programme* as required by 5.1 until such time as last renewal or intermediate survey, as applicable, has been completed,
- main structural plans of cargo and ballast tanks (for CSR ships these plans shall include for each structural element both the as-built and renewal thickness. Any thickness for voluntary addition is also to be clearly indicated on the plans. The midship section plan to be supplied on board the ship shall include the minimum allowable hull girder sectional properties for hold transverse section in all cargo tanks);
- previous repair history,
- cargo and ballast history,
- extent of use of inert gas plant and tank cleaning procedures,
- inspections by ship's personnel with reference to:
 - structural deterioration in general,
 - leakages in bulkheads and piping,
 - condition of corrosion prevention system, if any,
 - a guidance for reporting is shown in Table V,

- any other information that will help identify critical structural areas and/or Suspect Areas requiring inspection.

6.4 Review of Documentation on Board

6.4.1 Prior to survey, the surveyor shall examine the completeness of the documentation on board and its contents as a basis for the survey.

7 PROCEDURES FOR THICKNESS MEASUREMENTS

7.1 General

7.1.1 The required thickness measurements, if not performed by PRS itself shall be witnessed by PRS surveyor. The surveyor shall be on board to the extent necessary to control the process.

7.1.2 The thickness measurement firm operator shall participate in the survey planning meeting to be held prior to commencing the survey.

7.1.3 Thickness measurements of structures in areas where close-up surveys are required shall be performed simultaneously with close-up surveys.

7.1.4 In all cases the extent of thickness measurements shall be sufficient as to represent the actual average condition.

7.2 Certification of Thickness Measurement Firm

7.2.1 The thickness measurements shall be performed by a qualified firm certified by PRS according to the principles stated in Table VII.

7.3 Reporting

7.3.1 A thickness measurement report shall be prepared and submitted to PRS.

The report is to give the location of measurements, the thickness measured, as well as corresponding original thickness. Furthermore, the report shall give the date when measurements were performed, type of measuring equipment, names of personnel and their qualifications and has to be signed by the operator. The thickness measurement report shall follow the principles as specified in the *Recommended Procedures for thickness measurements for oil tankers, ore/oil ships and etc.*, contained in Annex II.

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

8 REPORTING AND EVALUATION OF SURVEY

8.1 Evaluation of Survey Report

8.1.1 The data and information on the structural condition of the vessel, collected during the survey, shall be evaluated for acceptability and continued structural integrity of the vessel.

8.1.1.1 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 shall be evaluated by using the thickness of structural members measured, renewed and reinforced, as appropriate, during the special survey performed 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 Annex III.

8.1.1.2 The final result of evaluation of the ship's longitudinal strength required in 8.1.1.1, after renewal or reinforcement work of structural members, if performed as result of initial evaluation, shall be reported as a part of the *Executive Hull Summary* (Form 328.1HS or 328HS).

8.2 Reporting

8.2.1 Principles for survey reporting are shown in Table VIII.

8.2.2 When a survey is split between different survey stations, a report shall 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, shall be made available to the next attending surveyor(s), prior to continuing or completing the survey.

8.2.3 An *Executive Hull Summary* of the survey shall be issued to the Owner on PRS Form 328 HS – *Executive Hull Summary* and placed on board the vessel for reference at future surveys. The *Executive Hull Summary* shall be endorsed by PRS HO.

Table I
MINIMUM REQUIREMENTS FOR CLOSE-UP SURVEYS
AT CLASS RENEWAL SURVEY OF OIL TANKERS, ORE / OIL SHIPS, ETC.

I class renewal Age ≤ 5 Years	II class renewal 5 < Age ≤ 10 Years	III class renewal 10 < Age ≤ 15 Years	IV and subsequent class renewals Age > 15 Years
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	As III Class Renewal Survey
B) One deck transverse in a cargo oil tank	B) One deck transverse in each of the remaining ballast tanks, if any	A) All web frame rings in a cargo wing tank	Additional transverses included as deemed necessary by PRS
D) One transverse bulkhead in a ballast tank	B) One deck transverse in a cargo wing tank	A) A minimum 30% web frame rings in each remaining cargo wing tank	
D) One transverse bulkhead in a cargo oil wing tank	B) One deck transverse in two cargo centre tanks	C) All transverse bulkheads in all cargo and ballast tanks	
D) One transverse bulkhead in a cargo oil centre tank	C) Both transverse bulkheads in a wing ballast tank, if any, or a cargo wing tank used primarily for water ballast	E) A minimum 30% deck transverses and a bottom transverse in each cargo centre tank	
	D) One transverse bulkhead in each remaining ballast tank	F) As considered necessary by the surveyor	
	D) One transverse bulkhead in a cargo oil wing tank		
	D) One transverse bulkhead in two cargo centre tanks		

- 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 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 – page 51.

Note 1: The 30 % shall be rounded up to the next whole integer.

Table II
MINIMUM REQUIREMENTS FOR THICKNESS MEASUREMENTS
AT CLASS RENEWAL SURVEY OF OIL TANKERS, ORE/OIL SHIPS, ETC.

I class renewal Age ≤ 5 Years	II class renewal 5 < Age ≤ 10 Years	III class renewal 10 < Age ≤ 15 Years	IV and subsequent class renewals Age > 15 Years
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 ballast tank, if any, or a cargo tank used primarily for water ballast)	2) Within the cargo area: – each deck plate, – one transverse section	2) Within the cargo area: – each deck plate, – two transverse sections (at least 1 section shall include a ballast tank within 0.5L amidship) – all wind and water strakes	2) Within the cargo area: – each deck plate, – three transverse sections (at least 1 section shall include a ballast tank within 0.5L amidship), – 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
4) Measurements, for general assessment and recording of corrosion pattern of those structural members subject to close-up survey according to Table I.	4) Measurements, for general assessment and recording of corrosion pattern of those structural members subject to close-up survey according to Table I.	4) Measurements, for general assessment and recording of corrosion pattern of those structural members subject to close-up survey according to Table I.	4) Measurements, for general assessment and recording of corrosion pattern of those structural members subject to close-up survey according to Table I.

Table III
MINIMUM REQUIREMENTS FOR TANK TESTING AT CLASS RENEWAL SURVEY
OF OIL TANKERS, ORE/OIL SHIPS, ETC.

Class renewal survey No. 1 age ≤ 5 Years	Class renewal survey No. 2 and subsequent age > 5 Years
1) All ballast tank boundaries	1) All ballast tank boundaries
2) Cargo tank boundaries facing ballast tanks, void spaces, pipe tunnels, pump rooms or cofferdams.	2) All cargo tank bulkheads.

Table IV/Sheet 1**REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENTS
AT THOSE AREAS OF SUBSTANTIAL CORROSION****Class Renewal Survey of oil tankers, ore/oil ships, etc. within the cargo tank length****BOTTOM STRUCTURE**

Structural member	Extent of measurement	Pattern of measurement
1. Bottom plating	Minimum of 3 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 3 longitudinals in each bay where bottom plating measured	3 measurements in line across flange and 3 measurements vertically on 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 plate. 5 point pattern on girder/bulkhead brackets
4. Bottom transverse webs	3 webs in bays where bottom plating measured, with measurements at both ends and middle	5 points pattern over 2 square metre area. Single measurements on face flat
5. Panel stiffening	Where provided	Single measurements

Table IV/Sheet 2**REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENTS
AT THOSE AREAS OF SUBSTANTIAL CORROSION****Class Renewal Survey of oil tankers, ore/oil ships, etc. within the cargo tank length****DECK STRUCTURE**

Structural member	Extent of measurement	Pattern of measurement
1. Deck plating	Two bands across tank	Minimum of 3 measurements per plate per band
2. 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)
3. 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 plate. 5 point pattern on girder/bulkhead brackets
4. Deck transverse webs	Minimum of two webs with measurements at middle and both ends of span	5 points pattern over about 2 m ² areas. Single measurements on face plate
5. Panel stiffening	Where provided	Single measurements

Table IV/Sheet 3

**REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENTS
AT THOSE AREAS OF SUBSTANTIAL CORROSION**

Class Renewal Survey of oil tankers, ore/oil ships, etc. within the cargo tank length

SHELL AND LONGITUDINAL BULKHEADS

Structural member	Extent of measurement	Pattern of measurement
1. Deckhead and bottom strakes, and strakes in way of stringer platforms	Plating between each pair of longitudinals in a minimum of 3 bays	Single measurements
2. All other strakes	Plating between every 3rd pair of longitudinals in same 3 bays	Single measurements
3. Longitudinals – deckhead and bottom strakes	Each longitudinal in same 3 bays	3 measurements across web and 1 measurement on flange
4. Longitudinals – all others	Every 3rd longitudinal in same 3 bays	3 measurements across web and 1 measurement on flange
5. Longitudinals – bracket	Minimum of 3 at top, middle and bottom of tank in same 3 bays	5 point pattern over area of bracket
6. Web frames and cross ties	3 webs with minimum of three locations on each web, including in way of cross tie connections	5 point pattern over about 2 m ² area, plus single measurements on web frame and cross tie face flats

Table IV/ Sheet 4

**REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENTS
AT THOSE AREAS OF SUBSTANTIAL CORROSION**

Class Renewal Survey of oil tankers, ore/oil ships, etc. within the cargo tank length

TRANSVERSE BULKHEADS AND SWASH BULKHEADS

Structural member	Extent of measurement	Pattern of measurement
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, 3/4 width of tank	5 points pattern between stiffeners over 1 m length
2. All other strakes	Plating between pair of stiffeners at middle location	Single measurements
3. Strakes in corrugated bulkheads	Plating for each change of scantling at centre of panel and at flange or fabricated connection	5 point pattern over about 1m ² plating
4. Stiffeners	Minimum of three typical stiffeners	For web, 5 point pattern over span between bracket connections (2 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 patterns over areas 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 m ² . 3 measurements across face plate
7. Stringer platforms	All stringers with measurements at both ends and middle	5 point pattern over 1 m ² of area plus single measurements near bracket toes and on face plates

Table V**Ship's name****OWNERS INSPECTION REPORT****Structural condition**

For tank No:

Grade of steel: Deck:..... Side:

Bottom: Long. bhd:

Elements	Cracks	Buckles	Corrosion	Coating condition	Pitting	Modif./ Rep.
Deck						
Bottom						
Side						
Long. bhd.						
Transv. bhd.						

Repairs performed due to:

Thickness measurements performed, dates:

Results in general:

Overdue surveys:

Outstanding conditions of class:

Comments:

Date of inspection:

Inspected by:

Signature:

Table VI

Table VI is superseded by Annex I – Guidelines for Technical Assessment in Conjunction with Planning for Enhanced Surveys of Oil Tankers. Class Renewal Survey – Hull.

Table VII

**PROCEDURES FOR CERTIFICATION OF FIRMS ENGAGED
IN THICKNESS MEASUREMENTS OF HULL STRUCTURES**

1 Application

This guidance applies to certification of the firms which intend to engage in the thickness measurement of hull structure of the vessels.

2 Procedures for Certification

2.1 Submission of documents

The following documents shall be submitted to PRS HO for approval:

- Outline of firms, e.g. organization and management structure.
- Experience of the firms on thickness measurement, inter alia, of hull structures of the vessel.
- Technicians careers, i.e. experiences of technicians as thickness measurement operators, technical knowledge of hull structure, etc.
- Operators shall be qualified according to recognized industrial NDT Standard.
- Equipment used for thickness measurement such as ultrasonic testing machines and its maintenance/calibration procedures.
- A guide for thickness measurement operators.
- Training programmes of technicians for thickness measurement.
- Measurement record format in accordance with PRS Recommended Procedures for Thickness Measurements of Oil Tankers, Ore/Oil Ships, etc. (Annex II).

2.2 Auditing the Firms

Upon reviewing the submitted documents with satisfactory results, the firm is audited in order to ascertain that the firm is duly organized and managed in accordance with the documents submitted, and eventually is capable of conducting thickness measurements of the hull construction of the ships.

2.3 Demonstration

Certification is conditional on an onboard demonstration of thickness measurements, as well as satisfactory reporting.

3 Certification

3.1 Upon satisfactory results of both the audit of the firm in (2.2) and the demonstration tests in (2.3) above, PRS will issue a *Certificate of Approval*, as well as a notice to the effect that the thickness measurement operation system of the firm has been certified by PRS.

Note: Details concerning approval of firms engaged in thickness measurements are included in *Publication 51/P – Procedural Requirements for Service Suppliers*.

3.2 Renewal/endorsement of the Certificate is made at intervals not exceeding 3 years by verification that original conditions are maintained.

4 Information on any Alteration to the Certified Thickness Measurement Operation System

In case where any alteration to the certified thickness measurement operation system of the firm is made, such an alteration shall be immediately reported to PRS. Re-audit is made where deemed necessary by PRS.

5 Cancellation of Approval

Approval may be cancelled in the following cases:

- Where the measurements were improperly performed or the results were improperly reported.
- Where the PRS surveyor found any deficiencies in the approved thickness measurement operation system of the firm.
- Where the firm failed to inform PRS on any alteration defined in 4 above.

TABLE VIII

REPORTING PRINCIPLES

As a principle, for oil tankers subject to ESP, PRS Surveyor shall include the following content in his report for survey of hull structure and piping systems, as relevant for the survey.

1. General

1.1 A survey report shall be generated in the following cases:

- in connection with commencement, continuation and/or completion of periodical hull surveys, i.e. annual, intermediate and special surveys, as relevant;
- when structural damages / defects have been found;
- when repairs, renewals or modifications have been performed;
- when **conditions of class** have been issued or deleted.

1.2 The purpose of reporting shall provide:

- evidence that prescribed surveys have been performed in accordance with applicable PRS Rules;
- documentation of surveys performed with findings, repairs performed and **conditions of class** issued or deleted;
- survey records, including actions taken, which shall form an auditable documentary trail. Survey reports shall be kept in the survey report file required to be on board;
- information for planning of future surveys;
- information which may be used as input for maintenance of classification rules and instructions.

1.3 When a survey is split between different survey stations, a report shall 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, shall be made available to the next attending surveyor, prior to continuing or completing the survey. Thickness measurement and tank testing performed is also to be listed for the next Surveyor.

2. Extent of Survey

2.1 Identification of compartments where an overall survey has been performed.

2.2 Identification of locations, in each tank, where a close-up survey has been performed, together with information of the means of access used.

2.3 Identification of locations, in each tank, where thickness measurement has been performed.

Note: As a minimum, the identification of location of close-up survey and thickness measurement shall include a confirmation with description of individual structural members corresponding to the extent of requirements stipulated in the present Publication 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 shall include location within each tank by reference to frame numbers.

2.4 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 shall be identified.

2.5 Identification of tanks subject to tank testing.

2.6 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:

- examination including internal examination of piping with valves and fittings and thickness measurement, as relevant, has been performed;
- operational test to working pressure has been performed.

3. Result of the Survey

3.1 Type, extent and condition of protective coating in each tank, as relevant (rated GOOD, FAIR or POOR).

3.2 Structural condition of each compartment with information on the following, as relevant:

.1 Identification of findings, such as:

- corrosion with description of location, type and extent;
- areas with substantial corrosion;
- cracks / fractures with description of location and extent;
- buckling with description of location and extent;
- indents with description of location and extent

.2 Identification of compartments where no structural damages/defects are found. The report may be supplemented by sketches/photos.

3.3 Thickness measurement report shall be verified and signed by the Surveyor controlling the measurements on board.

3.4 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 shall be included, as relevant:

- measured and as-built transverse sectional areas of deck and bottom flanges;
- diminution of transverse sectional areas of deck and bottom flanges;
- details of renewals or reinforcements performed, as relevant (as per 4.2)

4. Actions Taken with respect to Findings

4.1 Whenever the attending Surveyor is of the opinion that repairs are required, each item to be repaired shall be identified in the survey report. Whenever repairs are performed, details of the repairs effected shall be reported by making specific reference to relevant items in the survey report.

4.2 Repairs performed shall be reported with identification of:

- compartment;
- structural member;
- repair method (i.e. renewal or modification) including:
 - steel grades and scantlings (if different from the original);
 - sketches/photos, as appropriate;
- repair extent,
- NDT / tests.

4.3 For repairs not completed at the time of survey, **conditions of class** shall be issued 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** 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.

5. Forms

To fulfil the reporting requirements resulting from Hull Survey of Oil Tanker, the following Forms shall be used:

- 328Z – Oil Tanker Hull Survey Report (renewal),
- 328.1Z – Oil Tanker Hull Survey Report (annual/intermediate),
- 328HS – Executive Hull Summary,
- 328.1HS – Preliminary Executive Hull Summary,
- 328DP – Data on Ship Hull Surveys,
- DSR – Data Sheet for Reporting,

Other related to survey reports.

TABLE IX

EXECUTIVE HULL SUMMARY

Forms 328HS and 328.1HS shall be used.

ANNEX I

GUIDELINES FOR TECHNICAL ASSESSMENT IN CONJUNCTION WITH PLANNING FOR ENHANCED SURVEYS OF OIL TANKERS

CLASS RENEWAL SURVEY – HULL

CONTENTS

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References:

1. PRS Publication 36/P – Hull Survey 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.

1 INTRODUCTION

These guidelines contain information and suggestions concerning technical assessments which may be of use in conjunction with the planning of enhanced Class Renewal Surveys of oil tankers.

As stated in 5.1.5 of the *Publication*, the guidelines are a recommended tool which may be invoked at the discretion of PRS, when considered necessary and appropriate, in conjunction with the preparation of the required *Survey Programme*.

2 PURPOSE AND PRINCIPLES

2.1 Purpose

The purpose of the technical assessment 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 measurements, close-up surveys 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.

2.2 Minimum Requirements

However, these guidelines may not be used to reduce the requirements pertaining to thickness measurements, close-up survey and tank testing contained in Tables I, II and III, respectively and in p. 4.5 of this *Publication*, which are, in all cases, to be complied with as a minimum.

2.3 Timing

As with other aspects of survey planning, the technical assessment described in these guidelines shall be worked out by the Owner or operator in cooperation with PRS well in advance of the commencement of the Class Renewal Survey, i.e. prior to commencing the survey and normally at least 12 to 15 months before the survey's completion due date.

2.4 Aspects to be Considered

Technical assessment, 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:

- design features such as stress levels on various structural elements, design details and extent of use of high tensile steel;
- former history with respect to corrosion, cracking, buckling, indents and repairs for the particular ship, as well as similar vessels, where available;
- 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 assessment of the relative risks of susceptibility to damage or deterioration of various structural elements and areas shall 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.

3 TECHNICAL ASSESSMENT

3.1 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 are assumed to be dealt with as a normal routine by surveyors.

Technical assessment performed in conjunction with the survey planning process are, in principle, be as shown schematically in Figure 1. Figure 1 depicts how technical assessment can be performed in conjunction with the survey planning process.

The approach is basically an evaluation of the risk based on the knowledge and experience related to design and corrosion:

The design shall 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.

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. Corrosion may also lead to cracking and/or buckling.

3.2 Methods

3.2.1 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 shall be included.

Typical damage experience to be considered will consist of:

- number, extent, location and frequency of cracks.
- location of buckles.

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 shall be analyzed, noted and marked on sketches.

In addition, general experience shall be utilized. For example, reference shall 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. Such figures shall 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. An example is given in Figure 2.

The review of the main structural drawings, in addition to using the above mentioned figures, shall include checking for typical design details where cracking has been experienced. The factors contributing to damage shall be carefully considered.

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.

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 shall be considered.

The selected areas of the structure identified during this process shall be recorded and marked on the structural drawings to be included in the Survey Programme.

3.2.2 Corrosion

In order to evaluate relative corrosion risks, the following information is generally to be considered:

- usage of tanks and spaces,
- condition of coatings,
- cleaning procedures,
- previous corrosion damage,
- ballast use and time for cargo tanks,
- Corrosion Risk Scheme (see Ref. 3, Table 3.1),
- location of heated tanks.

"Condition Evaluation and Maintenance of Tanker Structures, 1992", Ref. 3 gives definitive examples which can be used for judging and describing coating condition, using typical pictures of conditions.

The evaluation of corrosion risks shall be based on information in Ref. 3, together with relevant information on the anticipated condition of the ship derived from the information collected in order to prepare the *Survey Programme* and the age of the ship.

The various tanks and spaces shall be listed with the corrosion risks nominated accordingly.

3.2.3 Locations for Close-up Survey and Thickness Measurement

On the basis of corrosion risks and the evaluation of design experience, the locations for initial close-up survey and thickness measurement (sections) may be nominated.

The sections subject to thickness measurement shall normally be nominated in tanks and spaces where corrosion risk is judged to be the highest.

The nomination of tanks and spaces for close-up survey shall, initially, be based on the highest corrosion risk, and shall always include ballast tanks. The principle for the selection shall be that the extent is increased by age or where information is insufficient or unreliable.

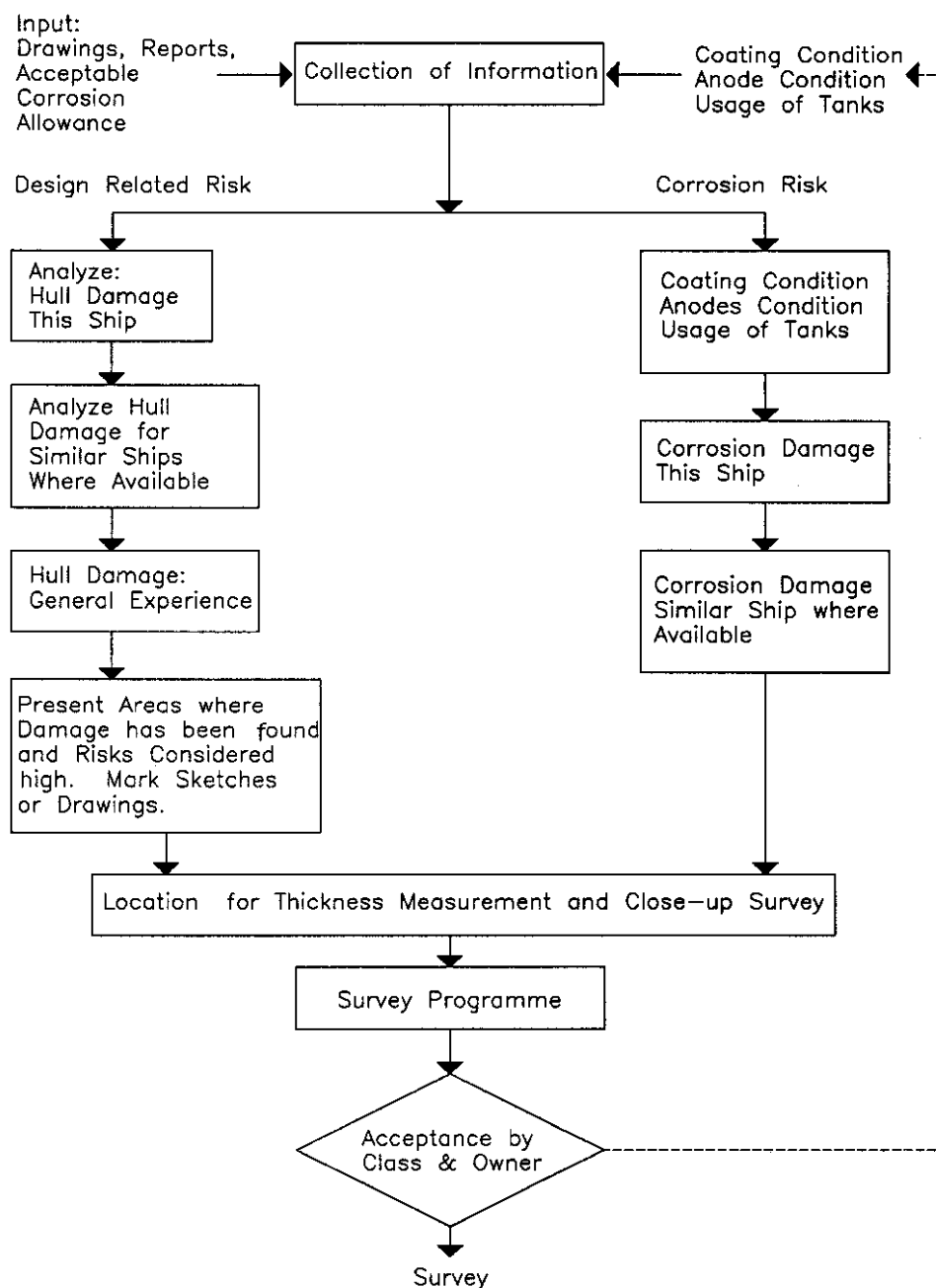


Figure 1. Technical assessment and the survey planning process

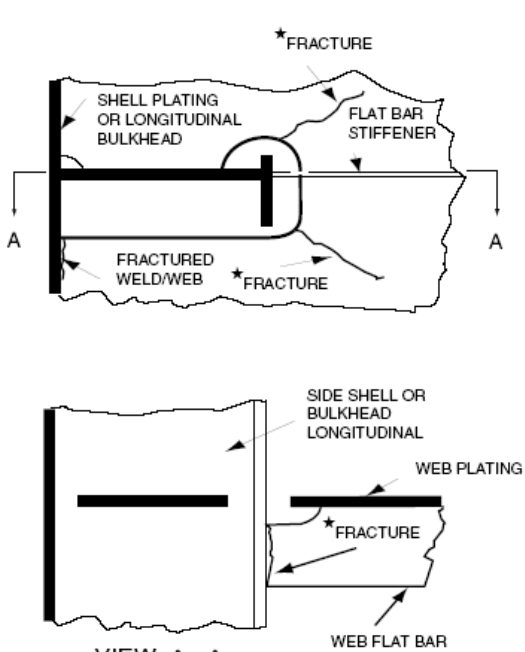
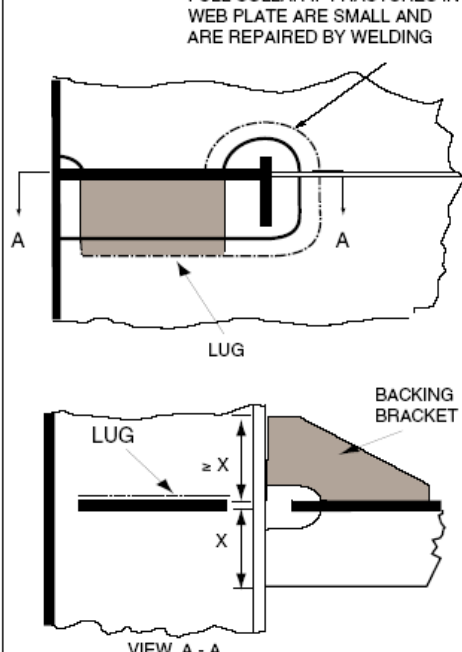
LOCATION: Connection of longitudinals to transverse webs EXAMPLE No. 1 : Web and flat bar fractures at cut-outs for longitudinal stiffener connections		
TYPICAL DAMAGE		PROPOSED REPAIR
 <p>NOTE ★ONE OR MORE FRACTURES MAY OCCUR</p>		<p>FULL COLLAR IF FRACTURES IN WEB PLATE ARE SMALL AND ARE REPAIRED BY WELDING</p>  <p>WEB AND FLAT BAR CROPPED AND PART RENEWED OR ALTERNATIVELY WELDED</p>
FACTORS CONTRIBUTING TO DAMAGE <ol style="list-style-type: none"> 1. Asymmetrical connection of flat bar stiffener resulting in high peak stresses at the heel of the stiffener under fatigue loading. 2. Insufficient area of connection of longitudinal to web plate. 3. Defective weld at return around the plate thickness. 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. 5. High stress in the web of the transverse. 6. Dynamic sea way load/ship motions. 		
FIGURE 1	TANKER STRUCTURE CO-OPERATIVE FORUM SUBJECT: CATALOGUE OF STRUCTURAL DETAILS	FIGURE 1

Figure 2. Typical damage and repair example (Reproduced from Ref. 2)

ANNEX II**RECOMMENDED PROCEDURES FOR THICKNESS MEASUREMENTS
OF OIL TANKERS, ORE / OIL SHIPS, ETC.**

1. This, not mandatory, document shall be used for recording thickness measurements as required by Tables II and IV. It is also preferred for recording thickness measurements during Owner's inspection (Table V).
2. Reporting forms TM1-T, TM2-T, TM3-T, TM4-T, TM5-T and TM6-T shall be used for recording thickness measurements and the maximum allowable diminution shall be stated. The maximum allowable diminution could be stated in an attached document.
3. The remaining forms (sheet 1, 2, 3, 4 and 5) are guidance diagrams and notes relating to the reporting forms and the procedure for thickness measurements.

CONTENTS**General particulars****Reporting forms**

TM1-T	Report on thickness measurement of all deck plating, all bottom shell plating or side shell plating
TM2-T (I)	Report on thickness measurement of shell and deck plating (one, two or three transverse sections) – Strength deck and sheerstrake plating
TM2-T (II)	Report on thickness measurement of shell and deck plating (one, two or three transverse sections) – Shell plating
TM3-T	Report on thickness measurement of longitudinal members (one, two or three transverse sections)
TM4-T	Report on thickness measurement of transverse structural members in the cargo oil and water ballast tanks within the cargo tank length
TM5-T	Report on thickness measurement of w.t./o.t. transverse bulkheads within the cargo tank or cargo hold spaces
TM6-T	Report on thickness measurement of miscellaneous structural members

Guidance: diagrams and notes

Thickness measurement – oil tankers, ore/oil ships, etc. Oil tanker – typical transverse section indicating longitudinal and transverse members

Thickness measurement – oil tankers, ore/oil ships, etc. Ore/oil ship – typical transverse section indicating longitudinal and transverse members

Thickness measurement – oil tankers, ore/oil ships, etc. Transverse section outline

Thickness measurement – oil tankers, ore/oil ships, etc. Typical transverse sections showing all longitudinal members to be reported on TM2-T and TM3-T

Thickness measurement – oil tankers, ore/oil ships, etc. Close-up Survey requirements.

GENERAL PARTICULARS

Ship's name:

IMO number:

PRS reg. No.:

Port of registry:

Gross tons:

Deadweight:

Date of build:

Classification society:

Name of firm performing thickness measurement:

Thickness measurement firm certified by:

Certificate No:

Certificate valid from to

Place of measurement:

First date of measurement:

Last date of measurement:

Class renewal survey/intermediate survey due:*

Details of measurement equipment:

Qualification of operator:

Report Number

consisting of

sheets

Name of operator:

Name of surveyor:

Signature of operator:

Signature of surveyor:

Firm official stamp:

PRS stamp:

* Delete as appropriate



TM1-T **Report on THICKNESS MEASUREMENT of ALL DECK PLATING, ALL BOTTOM SHELL PLATING or SIDE SHELL PLATING***

(* – delete as appropriate)

Ship's Name PRS reg. No. Report No.

STRAKE POSITION																	
PLATE POSITION	No. or letter	Org. thick. mm	Foreward reading						Aft Reading						Mean Diminution %		Maximum Allowable Diminution
			Gauged		Diminution P		Diminution S		Gauged		Diminution P		Diminution S		P	S	mm
			P	S	mm	%	mm	%	P	S	mm	%	mm	%			
12th forward																	
11th																	
10th																	
9th																	
8th																	
7th																	
6th																	
5th																	
4th																	
3rd																	
2nd																	
1st																	
Amidships																	
1st aft																	
2nd																	
3rd																	
4th																	
5th																	
6th																	
7th																	
8th																	
9th																	
10th																	
11th																	
12th																	

Operator's signature

NOTES – See next page

NOTES

(to the Table TM1-T)

1. This report shall be used for recording the thickness measurement of:
 - A – All strength deck plating within the cargo area.
 - B – All keel, bottom shell plating and bilge plating within the cargo area.
 - C – Side shell plating including the selected wind and water strakes outside cargo area.
 - D – All wind and water strakes within cargo area.
2. The strake position shall be clearly indicated as follows:
 - 2.1 For strength deck indicate the number of the strake of plating inboard from the stringer plate.
 - 2.2 For bottom plating indicate the number of the strake of plating outboard from the keel plate.
 - 2.3 For side shell plating give number of the strake of plating below sheerstrake and letter as shown on shell expansion.
3. For oil tankers all deck plating strakes shall be recorded; for ore/oil ships only the deck plating strakes outside line of openings shall be recorded.
4. Measurements shall be taken at the forward and aft areas of all plates and where plates cross ballast/cargo tank boundaries separate measurements for the area of plating in way of each type of tank shall be recorded.
5. The single measurements recorded shall represent the average of multiple measurements.
6. The maximum allowable diminution could be stated in an attached document.

TM2-T (I)

Report on THICKNESS MEASUREMENT of SHELL AND DECK PLATING (one, two or three transverse sections)

Ship's Name PRS reg. No. Report No.

STRENGTH DECK AND SHEERSTRAKE PLATING																											
STRAKE POSITION	FIRST TRANSVERSE SECTION AT FRAME NUMBER								SECOND TRANSVERSE SECTION AT FRAME NUMBER								THIRD TRANSVERSE SECTION AT FRAME NUMBER										
	No. or letter	Org. thick.	Max. alwb. dim.	Gauged		Diminution P		Diminution S		No. or letter	Org. thick.	Max. alwb. dim.	Gauged		Diminution P		Diminution S		No. or letter	Org thick.	Max. alwb. dim.	Gauged		Diminution P		Diminution S	
				P	S	mm	%	mm	%				P	S	mm	%	mm	%				P	S	mm	%	mm	%
Stringer Plate																											
1st strake inboard																											
2nd																											
3rd																											
4th																											
5th																											
6th																											
7th																											
8th																											
9th																											
10th																											
11th																											
12th																											
13th																											
14th																											
centre strike																											
sheer strike																											
TOPSIDE TOTAL																											

Operator's signature

NOTES – See next page

NOTES

(to the Table TM2-T (I))

1. This report form shall be used for recording the thickness measurement of:
Strength deck plating and sheerstrake plating transverse sections:
One, two or three sections within the cargo area comprising the structural items (1), (2) and (3) as shown on the diagrams of typical transverse sections.
2. For oil tankers all deck plating strakes shall be recorded and for ore/oil ships, only the deck plating strakes outside the line of openings shall be recorded.
3. The topside area comprises deck plating, stringer plate and sheerstrake (including rounded gunwales).
4. The exact frame No. of measurement shall be stated.
5. The single measurements recorded shall represent the average of multiple measurements.
6. The maximum allowable diminution could be stated in an attached document.

TM2-T (II)

Report on THICKNESS MEASUREMENT of SHELL AND DECK PLATING (one, two or three transverse sections)

Ship's Name PRS reg. No. Report No.

SHELL PLATING																											
STRAKE POSITION	FIRST TRANSVERSE SECTION AT FRAME NUMBER									SECOND TRANSVERSE SECTION AT FRAME NUMBER									THIRD TRANSVERSE SECTION AT FRAME NUMBER								
	No. or letter	Org. thick. mm	Max. alwb. dim. mm	Gauged		Diminution P		Diminution S		No. or letter	Org. thick. mm	Max. alwb. dim. mm	Gauged		Diminution P		Diminution S		No. or letter	Org. thick. mm	Max. alwb. dim. mm	Gauged		Diminution P		Diminution S	
				P	S	mm	%	mm	%				P	S	mm	%	mm	%				P	S	mm	%	mm	%
1st below sheer strake																											
2nd																											
3rd																											
4th																											
5th																											
6th																											
7th																											
8th																											
9th																											
10th																											
11th																											
12th																											
13th																											
14th																											
15th																											
16th																											
17th																											
18th																											
19th																											
20th																											
keel strake																											
BOTTOM TOTAL																											

Operator's signature

NOTES – See next page

NOTES

(to the Table TM2-T (II))

1. This report form shall be used for recording the thickness measurements of:
Shell plating transverse sections:
One, two or three sections within the cargo area comprising the structural items (4), (5), (6) and (7) as shown on the diagrams of typical transverse sections.
2. The bottom area comprises keel, bottom and bilge plating.
3. The exact frame station of measurement shall be stated.
4. The single measurements recorded shall represent the average of multiple measurements.
5. The maximum allowable diminution could be stated in an attached document.

TM3-T

Report on THICKNESS MEASUREMENT of LONGITUDINAL MEMBERS (one, two or three transverse sections)

Ship's Name PRS reg. No. Report No.

[illegible]

Operator's signature

NOTES – See next page

NOTES

(to the Table TM3-T)

1. This report form shall be used for recording the thickness measurement of:
Longitudinal Members at transverse sections:
One, two or three sections within the cargo area comprising the appropriate structural items (8) to (20) as shown on the diagrams of typical transverse sections.
2. The exact frame station of measurement shall be stated.
3. The single measurements recorded shall represent the average of multiple measurements.
4. The maximum allowable diminution could be stated in an attached document.

TM4-T

**Report on THICKNESS MEASUREMENT of TRANSVERSE STRUCTURAL MEMBERS
In the cargo oil and water ballast tanks within the cargo tank length**

Ship's Name PRS reg. No. Report No.

TANK DESCRIPTION:									
LOCATION OF STRUCTURE:									
STRUCTURAL MEMBER	ITEM	Original thickness	Max. alwb. dim.	Gauged		Diminution P		Diminution S	
		mm	mm	P	S	mm	%	mm	%

Operator's signature

NOTES – See next page

NOTES

(to the Table TM4-T)

1. This report form shall be used for recording the thickness measurement of transverse structural members, comprising the appropriate structural items (25) to (33) as shown on diagrams of typical transverse section.
2. Guidance for areas of measurement is indicated on page 62 of this document.
3. The single measurements recorded shall represent the average of multiple measurements.
4. The maximum allowable diminution could be stated in an attached document.

TM5-T

**Report on THICKNESS MEASUREMENT of W.T./O.T. TRANSVERSE BULKHEADS
within the cargo tank or cargo hold spaces**

Ship's Name PRS reg. No. Report No.

[illegible]

Operator's signature

NOTES – See next page

NOTES

(to the Table TM5-T)

1. This report form shall be used for recording the thickness measurement of W.T./O.T. transverse bulkheads.
2. Guidance for areas of measurement is indicated on page 62 of this document.
3. The single measurements recorded shall represent the average of multiple measurements.
4. The maximum allowable diminution could be stated in an attached document.

TM6-T

Report on THICKNESS MEASUREMENT of MISCELLANEOUS STRUCTURAL MEMBERS

Ship's Name PRS reg. No. Report No.

[illegible]

Operator's signature

NOTES – See next age

NOTES

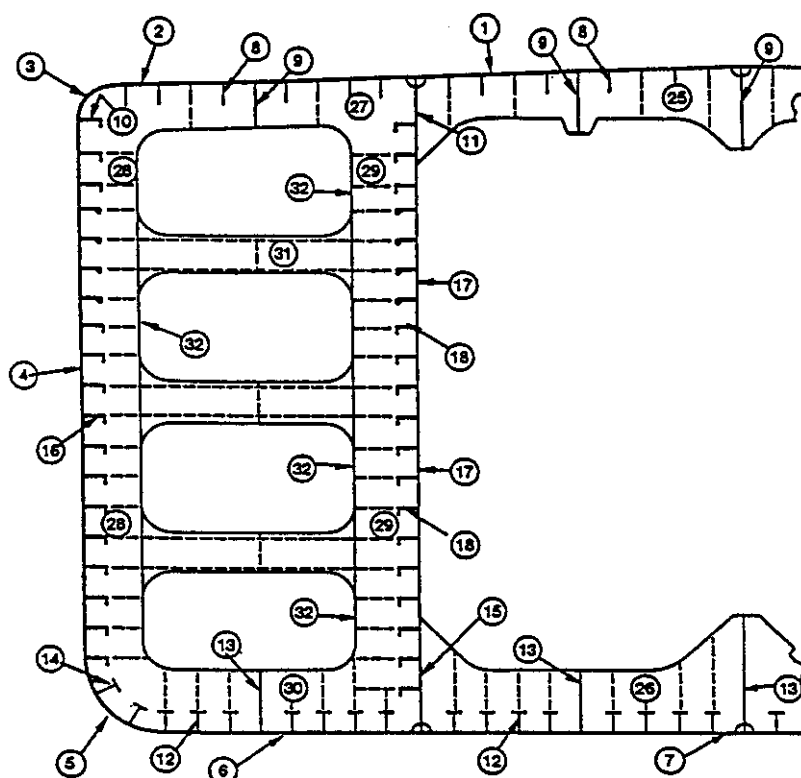
(to the Table TM6-T)

1. This report form shall be used for recording the thickness measurement of miscellaneous structural members, including the structural items (36), (37) and (38).
2. The single measurements recorded shall represent the average of multiple measurements.
3. The maximum allowable diminution could be stated in an attached document.

Sheet 1

Thickness measurement – oil tankers, ore/oil ships, etc.

Oil tanker – typical transverse section indicating longitudinal and transverse members

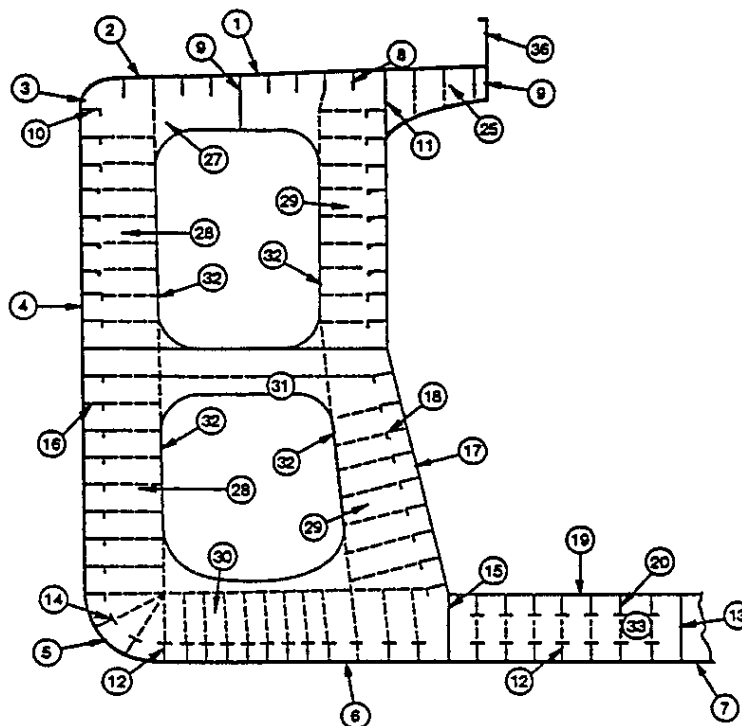


Report on TM2-T (I) &	Report on TM3-	Report on TM4-
<ul style="list-style-type: none"> ① Strength deck plating ② Stringer plate ③ Sheerstrake ④ Side shell plating ⑤ Bilge plating ⑥ Bottom shell plating ⑦ Keel plate 	<ul style="list-style-type: none"> ⑧ Deck longitudinals ⑨ Deck girders ⑩ Sheerstrake longitudinals ⑪ Longitudinal bulkhead top strake ⑫ Bottom longitudinals ⑬ Bottom girders ⑭ Bilge longitudinals ⑮ Longitudinal bulkhead lower strake ⑯ Side shell longitudinals ⑰ Long. bulkhead plating (remainder) ⑱ Longitudinal bulkhead longitudinals ⑲ Inner bottom plating ⑳ Inner bottom longitudinals 	<ul style="list-style-type: none"> ⑳ Deck transverse centre tank ㉑ Bottom transverse centre tank ㉒ Deck transverse wing tank ㉓ Side shell vertical web ㉔ Long. bulkhead vertical web ㉕ Bottom transverse wing tank ㉖ Struts ㉗ Transverse web face plate
Report on TM6-T		
<ul style="list-style-type: none"> ㉘ Hatch coamings ㉙ Deck plating between hatches ㉚ Hatch covers 		

Sheet 2

Thickness measurement – oil tankers, ore/oil ships, etc.

Ore/oil ship – typical transverse section indicating longitudinal and transverse members



Report on TM2-T (I) & (II)	
①	Strength deck plating
②	Stringer plate
③	Sheerstrake
④	Side shell plating
⑤	Bilge plating
⑥	Bottom shell plating
⑦	Keel plate

Report on TM6-T	
③⑥	Hatch coamings
③⑦	Deck plating between hatches
③⑧	Hatch covers
③⑨	Hatch covers
④①	Hatch covers

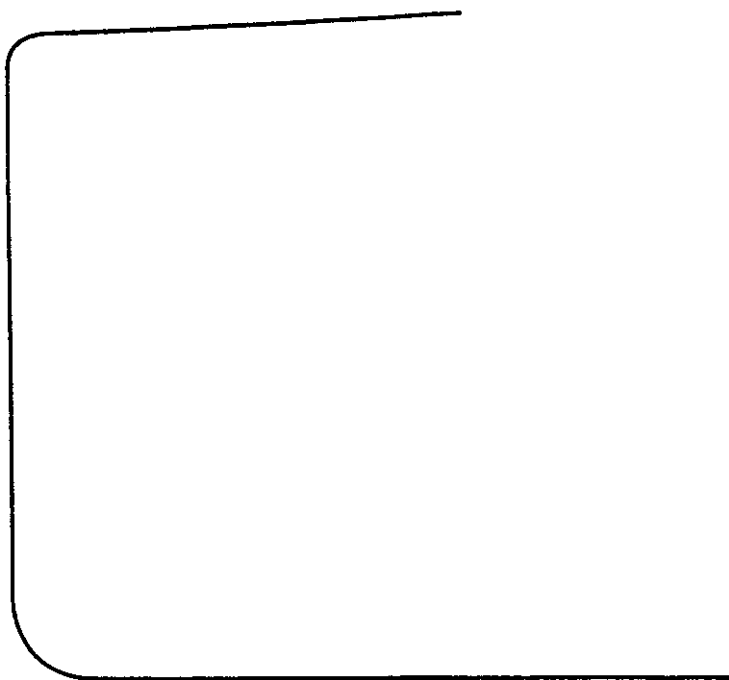
Report on TM2-T	
⑧	Deck longitudinals
⑨	Deck girders
⑩	Sheerstrake longitudinals
⑪	Longitudinal bulkhead top strake
⑫	Bottom longitudinals
⑬	Bottom girders
⑭	Bilge longitudinals
⑮	Longitudinal bulkhead lower strake
⑯	Side shell longitudinals
⑰	Long. bulkhead plating (remainder)
⑱	Longitudinal bulkhead longitudinals
⑲	Inner bottom plating
⑳	Inner bottom longitudinals
㉑	
㉒	
㉓	
㉔	

Report on TMA-T	
㉕	Deck transverse centre tank
㉖	Bottom transverse centre tank
㉗	Deck transverse wing tank
㉘	Side shell vertical web
㉙	Long. bulkhead vertical web
㉚	Bottom transverse wing tank
㉛	Struts
㉜	Transverse web face plate
㉝	D.B. Floors
㉞	
㉟	

Sheet 3

Thickness measurement – oil tankers, ore/oil ships, etc.

Transverse section outline. To be used for longitudinal and transverse members where typical oil tanker or oil/ore ship sections are not applicable.

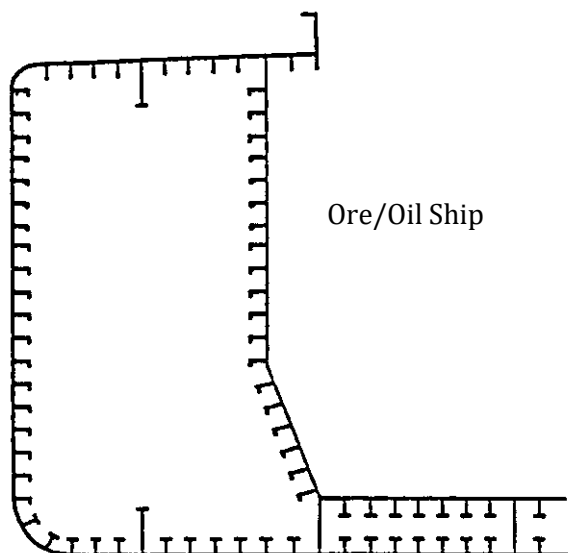
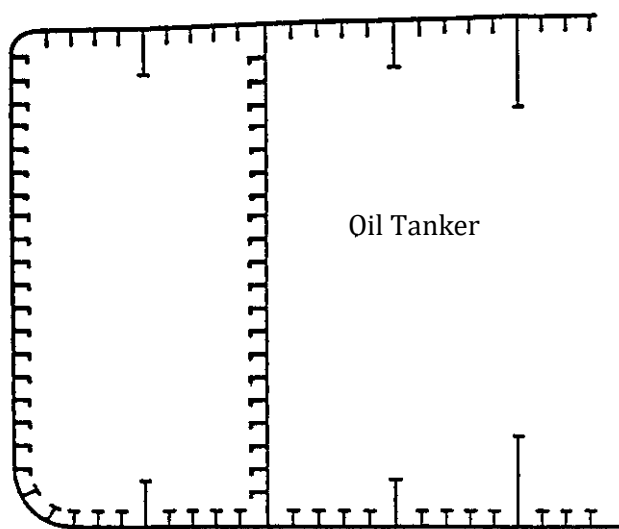


Report on TM2-T (I) & (II)	Report on TM2-T	Report on TMA-T
<ol style="list-style-type: none"> ① Strength deck plating ② Stringer plate ③ Sheerstrake ④ Side shell plating ⑤ Bilge plating ⑥ Bottom shell plating ⑦ Keel plate 	<ol style="list-style-type: none"> ⑧ Deck longitudinals ⑨ Deck girders ⑩ Sheerstrake longitudinals ⑪ Longitudinal bulkhead top strake ⑫ Bottom longitudinals ⑬ Bottom girders ⑭ Bilge longitudinals ⑮ Longitudinal bulkhead lower strake ⑯ Side shell longitudinals ⑰ Long. bulkhead plating (remainder) ⑱ Longitudinal bulkhead longitudinals ⑲ Inner bottom plating ⑳ Inner bottom longitudinals ㉑ ㉒ ㉓ ㉔ 	<ol style="list-style-type: none"> ㉕ Deck transverse centre tank ㉖ Bottom transverse centre tank ㉗ Deck transverse wing tank ㉘ Side shell vertical web ㉙ Long. bulkhead vertical web ㉚ Bottom transverse wing tank ㉛ Struts ㉜ Transverse web face plate ㉝ D.B. Floors ㉞ ㉟ ㊱
Report on TM6-T		
<ol style="list-style-type: none"> ㉞ Hatch coamings ㉟ Deck plating between hatches ㊱ Hatch covers 		

Sheet 4

Thickness measurement – oil tankers, ore/oil ships, etc.

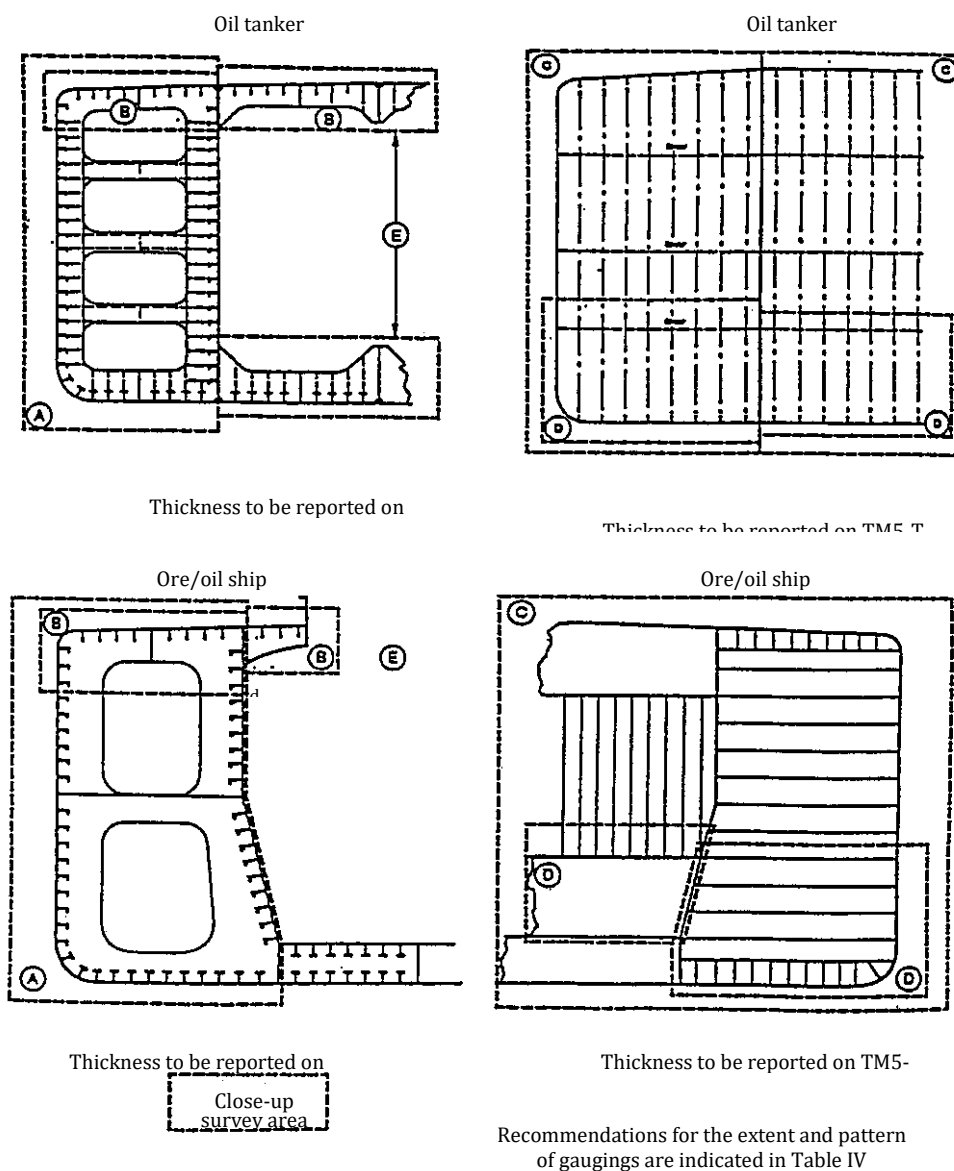
Typical transverse sections showing all longitudinal members to be reported on TM2-T
and TM3-T



Sheet 5

Thickness measurement – oil tankers, ore/oil ships, etc.

Close-up Survey requirements



ANNEX III

CRITERIA FOR LONGITUDINAL STRENGTH OF HULL GIRDER FOR OIL TANKERS

1 GENERAL

1.1 These criteria shall be used for the evaluation of longitudinal strength of the ship's hull girder as required by section 8.1.1.1.

1.2 In order that ship's longitudinal strength to be evaluated can be recognised as valid, fillet welding between longitudinal internal members and hull envelopes shall be in sound condition so as to keep integrity of longitudinal internal members with hull envelopes.

2 EVALUATION OF LONGITUDINAL STRENGTH

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 shall be evaluated in accordance with the requirements of this Annex on the basis of the thickness measured, renewed or reinforced, as appropriate, during the Class Renewal Survey. The condition of the hull girder for longitudinal strength evaluation shall be determined in accordance with the methods specified in Appendix 3.

2.1 Calculation of transverse sectional areas of deck and bottom flanges of hull girder

2.1.1 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 shall be calculated by using the thickness measured, renewed or reinforced, as appropriate, during the special survey.

2.1.2 If the diminution of section 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 shall be taken:

- .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
- .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 Appendix 1, by using the thickness measured, renewed or reinforced, as appropriate, during the special survey.

2.2 Requirements for transverse section modulus of hull girder

2.2.1 The actual section moduli of transverse section of the ship's hull girder calculated in accordance with the foregoing paragraph 2.1.2.2 shall satisfy either of the following provisions, as applicable:

- .1** for ships constructed on or after 1 July 2002, the actual section moduli of the transverse section of the ship's hull girder shall not be less than 90 % of the required section modulus for new buildings specified in the *Rules for the Classification and Construction of Sea-going Ships, Part II – Hull*; or
- .2** for ships constructed before 1 July 2002, the actual section moduli of the transverse section of the ship's hull girder shall fulfil the criteria for minimum section modulus for ships in service required by PRS, provided that in no case it is less than the diminution limit of the minimum section modulus as specified in appendix 2.

APPENDIX 1**CALCULATION CRITERIA OF SECTION MODULI OF MIDSHIP SECTION
OF HULL GIRDER**

1 Calculation criteria of section moduli of midship section of hull girder according to the *Rules for Classification and Construction of Sea-going Ships, Part II – Hull*, para. 15.7.

APPENDIX 2**DIMINUTION LIMIT OF MINIMUM LONGITUDINAL STRENGTH OF SHIPS IN SERVICE**

1 The diminution limit of the minimum section modulus of oil tankers in service is given by the following formula:

$$W_o = cL^2 B (\delta + 0.7) k \quad (\text{cm}^3)$$

where:

L = Length of ships. L is the distance, in meters, 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 shall not 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.

δ = Moulded block coefficient at draught d corresponding to summer load waterline, based on L and B . δ shall not be taken less than 0.60.

$$\delta = \frac{\text{moulded displacement (m}^3\text{) at draught } d}{L B d}$$

$$c_w = 0.9c_n$$

$$c_w = 10.75 - \left(\frac{300 - L}{100} \right)^{1.5} \quad \text{for } 130 \text{ m} \leq L \leq 300 \text{ m}$$

$$c_w = 10.75 \quad \text{for } 300 \text{ m} < L < 350 \text{ m}$$

$$c_w = 10.75 - \left(\frac{L - 350}{150} \right)^{1.5} \quad \text{for } 350 \text{ m} \leq L \leq 500 \text{ m}$$

k – material factor, e.g.

$k = 1.0$ for mild steel with yield stress of 235 N/mm² and over;

$k = 0.78$ for high tensile steel with yield stress of 315 N/mm² and over,

$k = 0.72$ for high tensile steel with yield stress of 355 N/mm² and over.

2 Scantlings of all continuous longitudinal members of the ship's hull girder based on the section modulus requirement in 1 above shall be maintained within 0.4 L amidships. However, in special cases, based on consideration of type of ship, hull form and loading conditions, the scantlings may be gradually reduced towards the end of 0.4 L part, bearing in mind the desire not to inhibit the ship's loading flexibility.

3 However, the above standard may not be applicable to ships of unusual type or design, e.g. for ships of unusual main proportions and/or weight distributions.

APPENDIX 3

SAMPLING METHOD OF THICKNESS MEASUREMENTS FOR LONGITUDINAL STRENGTH EVALUATION AND REPAIR METHODS

1 Extent of longitudinal strength evaluation

Longitudinal strength shall be evaluated within $0.4L$ amidships for the extent of the hull girder length that contains tanks therein and within $0.5L$ amidships for adjacent tanks which may extend beyond $0.4L$ amidships, where tanks mean ballast tanks and cargo tanks.

2 Sampling method of thickness measurement

2.1 Pursuant to the requirements of section 2.4 of this *Publication*, transverse sections shall be chosen such, that thickness measurements can be taken for as many different tanks in corrosive environments as possible, e.g. ballast tanks sharing a common plane boundary with cargo tanks fitted with heating coils, other ballast tanks, cargo tanks permitted to be filled with sea water and other cargo tanks. Ballast tanks sharing a common plane boundary with cargo tanks fitted with heating coils and cargo tanks permitted to be filled with sea water shall be selected where present.

2.2 The minimum number of transverse sections to be sampled shall be in accordance with Table II. The transverse sections shall be located where the largest thickness reductions are suspected to occur or are revealed from deck and bottom plating measurements prescribed in 2.3 and shall be clear of areas which have been locally renewed or reinforced.

2.3 At least two points shall be measured on each deck plate and/or bottom shell plate required to be measured within the cargo area in accordance with the requirements of Table II.

2.4 Within $0.1D$ (where D is the ship's moulded depth) of the deck and bottom at each transverse section to be measured in accordance with the requirements of Table II, every longitudinal and girder shall be measured on the web and face plate, and every plate shall be measured at one point between longitudinals.

2.5 For longitudinal members other than those specified in 2.4 to be measured at each transverse section in accordance with the requirements of Table II, every longitudinal and girder shall be measured on the web and face plate, and every plate shall be measured at least in one point per strake.

2.6 The thickness of each component shall be determined by averaging all of the measurements taken in way of the transverse section on each component.

3 Additional measurements where the longitudinal strength is deficient

3.1 Where one or more of the transverse sections are found to be deficient in respect of the longitudinal strength requirements given in this Annex, the number of transverse sections for thickness measurement shall be increased such that each tank within the $0.5L$ amidships region has been sampled. Tank spaces that are partially within, but extend beyond, the $0.5L$ region, shall be sampled.

3.2 Additional thickness measurements shall also be performed on one transverse section forward and one aft of each repaired area to the extent necessary to ensure that the areas bordering the repaired section also comply with the requirements of this Publication.

4 Effective repair methods

4.1 The extent of renewal or reinforcement performed to comply with this Annex shall be in accordance with 4.2.

4.2 The minimum continuous length of a renewed or reinforced structural member shall not be less than twice the spacing of the primary members in way. In addition, the thickness diminution in way of the butt joint of each joining member forward and aft of the replaced member (plates, stiffeners, girder webs and flanges, etc.) shall not be within the substantial corrosion range (75% of the allowable diminution associated with each particular member). Where differences in thickness at the butt joint exceed 15% of the lower thickness, a transition taper shall be provided.

4.3 Alternative repair methods involving the fitting of straps or structural member modification shall be subject to special consideration. In considering the fitting of straps, it shall be limited to the following conditions:

- to restore and/or increase longitudinal strength;
- the thickness diminution of the deck or bottom plating to be reinforced shall not be within the substantial corrosion range (75% of the allowable diminution associated with the deck plating);
- the alignment and arrangement, including the termination of the straps, is in accordance with a standard recognized by PRS;
- the straps are continuous over the entire $0.5L$ amidships length; and
- continuous fillet welding and full penetration welds are used at butt welding and, depending on the width of the strap, slot welds. The welding procedures applied shall be acceptable to PRS.

4.4 The existing structure adjacent to replacement areas and in conjunction with the fitted straps, etc. shall be capable of withstanding the applied loads, taking into account the buckling resistance and the condition of welds between the longitudinal members and hull envelope plating.

ANNEX IVA

HULL SURVEY PROGRAMME

1. *Hull Survey Programme* (Form 328PR) covers the minimum extent of overall surveys, close-up surveys, thickness measurements and pressure testing within the cargo length area, cargo holds, ballast tanks, including fore and aft peak tanks, required by the present Publication.
2. *Hull Survey Programme* shall be evaluated by the Owner in co-operation with PRS.

ANNEX IVB

SURVEY PLANNING QUESTIONNAIRE

Survey Planning Questionnaire (Form 628) is dedicated to complete necessary information to enable the Owner, with PRS cooperation, to develop *Hull Survey Programme* required by the present Publication. The Questionnaire, reflecting current information, shall be worked out by the Owner. Completed Questionnaire shall be delivered to PRS.

List of amendments effective as of 1 July 2020

<i>Item</i>	<i>Title/Subject</i>	<i>Source</i>
various items	Substitution of the term "recommendation" by the term "condition"	IACS decision